Trade, foreign inputs and firms' decisions: Theory and Evidence.

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Abstract

We investigate the effect of different channels through which input trade liberalization affects firms' export decisions. We develop a trade model with heterogeneous firms and sectors of varying imported input intensity that reproduces different mechanisms through which the access to foreign inputs affects the performance of domestic firms. In industries with lower input tariffs (or more intensive in imported intermediate goods), more firms become exporters and export larger volumes. The effect of firm productivity on export status and export sales is greater for firms producing in these industries. The export selection process is reinforced by the access to foreign inputs. We provide strong empirical evidence in support of these theoretical predictions based on plant-level panel data from two developing countries, Argentina (1992-2001) and Chile (1990-1999). Our empirical findings suggest that the probability of exporting and the volume of export sales are larger for firms producing in industries that have a better access to foreign inputs.

Keywords: Firm heterogeneity, input trade liberalization, foreign intermediate goods, firm productivity and plant panel data.

JEL Classification: F10, F12 and F41.

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1 Introduction

Recent theoretical literature on international trade based on models with heterogeneous firms emphasizes the role of trade liberalization in the selection of the most productive firms on the export markets. Most of these models focus on a specific type of trade policy characterized by changes in variable trade costs for final goods, which affect both exports and foreign competition. Another aspect of trade integration is access to a wide range of foreign inputs. In developing countries, the access to more efficient and sophisticated foreign inputs affects factor prices and therefore the competitiveness of firms. Firms producing in industries that are more intensive in imported inputs will benefit more from trade integration. Theoretical works have highlighted the role of foreign intermediate goods on enhancing efficiency gains (Markusen (1989), Grossman and Helpman (1991) and Coe and Helpman (1995)). Nevertheless, within the new framework of heterogeneous firms, not much attention has been paid to the impact of firms' access to more efficient intermediate goods from abroad on the export selection process.

Robust empirical evidence has been recently found using firm level data confirming that a significant proportion of domestic firms use foreign intermediate goods. Biscourp and Kramarz (2006), Bernard, Jensen and Schott (2005), Amiti and Konings (2005), Kasahara and Lapham (2007) and Muuls and Pisu (2008), all show that producers selling on both the domestic and export markets import intermediate goods. There is also empirical evidence of a positive relationship between imported inputs and firm productivity. Using firm panel data, Halpern, Koren and Szeidl (2005) for Hungary, and Kasahara and Lapham (2007) for Chile find that imported inputs improve plant productivity.

Along the same lines, recent empirical works have highlighted the role of input trade liberalization in shaping firms' performance. Schor (2004) for Brazil, and Amiti and Konings (2005) for Indonesia show that input tariff reductions boost firm total factor productivity. Goldberg et al. (2008) for India find that firms in sectors with the largest input tariff cuts have a larger increase in firms' ability to manufacture new products. This indicates that access to new input varieties from abroad enables the creation of new varieties in the domestic market.

The aim of this paper is to investigate the effect of different channels through which input trade liberalization affects firms' decisions to participate in the foreign market. We extend the monopolistic competition trade model with heterogeneous firms built by Melitz and Ottaviano (2008) introducing two factors, domestic and imported intermediate goods. We develop a trade model with heterogeneous firms in terms of productivity levels and sectors of varying imported input intensity, that reproduces different mechanisms through which access to foreign inputs affects the performance of domestic firms and their export decisions. Moreover, this model disentangles the differentiated impact of import tariffs on final goods, on the one side, and import tariffs on intermediate goods, on the other side, in a single theoretical framework. Changes in variable trade costs for final goods tie in with import competition effects, while variations in input tariffs or in the intensity on foreign intermediate goods across sectors trigger relative factor price movements.

We introduce firm heterogeneity in terms of different initial marginal costs, similar to Melitz (2003).

Firms may decide to sell their final goods on the foreign market, incurring a variable trade cost. The most efficient firms self-select on the export market, which is in line with empirical work showing that exporters are more productive and larger than firms selling solely to the domestic market.[1] Foreign intermediate goods involve a variable trade cost too. Heterogeneity across industries is determined by technical differences in the requirement of foreign inputs. Some industries rely more on foreign technology embodied in imported inputs. Firms producing in industries that are more intensive in imported intermediate goods have lower marginal costs. This assumption is realistic for developing countries, like Argentina and Chile, which are highly dependent on foreign technology. In the next section, we show that, for both countries, the variation in imported input intensity during the nineties is mainly explained by variation across sectors, while the within-industry variation is extremelly small. Moreover, this theoretical assumption helps us to empirically identify the impact of the access to foreign inputs on firms' export decision and export revenues.

The model predicts that the access to imported inputs bolsters the performance of domestic firms in a number of ways. The lower the input tariffs of the industry (or the higher the industry intensity on foreign intermediate goods) the greater the competitiveness of domestic firms. Access to cheaper imported inputs reinforces the export selection process. Improvement of the competitiveness of domestic firms increases expected export revenues allowing more firms to enter the export market (extensive margin of trade) and to increase the volume of their exports (intensive margin of trade). The model predicts that the positive effect of firm productivity on the intensive and the extensive margin of trade is more pronounced in industries that have lower input tariffs or that rely more on foreign intermediate goods.

We find strong empirical support for the model's predictions using two different plant (firm) level panel data from Chile (1990-1999) and Argentina (1992-1998). In the Argentine case unilateral trade liberalization at the beginning of the 1990s was unpredictable by domestic firms. We focus on the effects of input trade liberalization on export decision of Argentine firms, exploiting the variation across industries in the change in input tariff cuts between 1992 and 1995. In the case of Chile, trade liberalization was homogeneous across industries. In order to identify the effect of the access to foreign inputs in Chile, we exploit variation across industries in terms of technical differences in the use of foreign intermediate goods reflected by imported input intensity. First, we explore whether Argentine firms producing in industries with larger input tariff cuts have larger export sales and higher probability of entering the foreign market. Second, we investigate the positive interaction effect between firm productivity and input tariff cuts on firms' export activity. Then, we test the differential impact of firm productivity on export revenues across industries depending on the intensity in the use of imported intermediate goods for Chile and Argentina. Finally, we empirically study whether the effect of firm productivity on export decision is stronger for firms producing in industries that rely more on foreign inputs for both countries.

Our results highlight that input trade liberalization has positive effects on the extensive and intensive margin of trade. One standard deviation reduction in the change in input tariffs from 1992 to 1995 in

[1] Clerides, Lach and Tybout (1998), Bernard and Jensen (1999), and Aw, Chung and Roberts (2000) all find that exporters perform better than non-exporters.

Argentina: (i) increases firms' export sales up to 27 percentage points, and (ii) raises the probability of exporting by 5,5 to 8 percentage points. We also provide empirical evidence on the differential effect of firm productivity on export activity depending on whether the firm belongs to an industry with input tariff cuts above or below the median. Our results support the existence of a heterogeneous impact of firms' efficiency on export activity depending on the imported intermediate goods intensity in Argentina and Chile: considering only firms producing in industries with imported input intensity over the median, the impact of firm productivity on export sales and export participation doubles.

This paper also contributes to the new theoretical literature that studies the relationship between trade liberalization, imported intermediate goods and firms' production choices. Different trade models featuring heterogeneous firms have been developed based on the pioneering work of Melitz (2003), and Bernard, Jensen, Eaton and Kortum (2003). Drawing on Melitz (2003) and Antras (2003), Antras and Helpman (2004) introduce firm heterogeneity in order to explain firms' different organizational choices. Their model can explain the growth in imported intermediate goods due to intra-firm imports. We are interested in a complementary argument that can also explain the growth in trade in inputs in developing countries.

Based on Melitz (2003) and Verhoogen (2008), Kugler and Verhoogen (2008) develop a quality model that introduces heterogeneous inputs in terms of different quality levels and complementarity between plant productivity and input quality in producing output. Their model predicts that output price-plant size and input price-plant size are positively correlated within industries. Nevertheless, their model makes no distinction between domestic and imported intermediate goods. We focus instead on how changes in the industry intensity of foreign intermediate goods impact on the export selection process.

Our paper is closely related to Kasahara and Lapham (2007), who analyze firms' import decisions. They build on Melitz (2003), introducing fixed and variable trade costs for imports of intermediate goods. In their model, a reduction in variable trade costs for intermediate goods has a similar effect as changes in export barriers. It hastens the exit of the least productive firms. The main difference with our model is found in the mechanisms via which input trade liberalization affects firms' decisions. Since our aim is to disentangle the impact of import barriers on final goods from those on intermediate goods, we build on Melitz and Ottaviano (2008), using a quasi-linear demand system.[2] In this framework, the price elasticity of demand depends on both the number of foreign competitors and on variable trade costs for intermediate inputs. In our model, import competition and the access to imported intermediate goods have opposite effects on the selection process.

Finally, our model is also related to Raff and Schmitt (2008) and Debaere et al. (2009) who consider sourcing decisions of retail firms, on the one side, and the relationship between the intensity of international sourcing, firm productivity and the thickness of local service markets, on the other side. These papers are also built on Melitz and Ottaviano (2008) framework of heterogeneous firms. Our model points up gains

[2]In Kasahara and Lapham's model, as in Melitz (2003), the selection process is driven by an appreciation of the real wage due to the increase in the market shares of the most productive firms selling on the export market following trade liberalization. With the C.E.S. demand specification, mark-ups are constant and import competition plays no role in the selection process in these models.

from input trade liberalization induced by firms' access to a broader range of cheapest imported intermediate inputs. A reduction in the relative price of imported inputs or an increase in the intensity of foreign inputs drives down domestic prices, which increases demand. On the supply side of the economy, in the short run, there is an upturn in the competitiveness of domestic firms. The access to foreign intermediate goods, reduces marginal costs and thereby, reinforces the export selection process.

The rest of the paper is structured as follows. Section II provides a first look at the data and describes trade liberalization reforms in Argentina and Chile. Section III shows the set-up of the model. Section IV presents the main theoretical findings. Section V presents the data and the identification strategy. Section VI presents the empirical results. Section VII concludes.

2 Empirical motivation

Trade Liberalization in Argentina and Chile

This section presents basic summary statistics and highlights the features of the data that motivate our theoretical framework. We use firm level data on imported intermediate goods, export sales and other firm characteristics from Chile (1991-1999) and Argentina (1992-2001).[3] The main feature of trade reform in Chile and Argentina is the substantial trade integration process experienced by both countries in the late 1970s and early 1990s, respectively. In this section we describe the different trade policy instruments applied by these countries.

Argentina's trade policy during the 1980s was one of trade protection with an emphasis on import substitution. The unilateral trade liberalization process in 1991 was highly unpredictable since the new government won the elections on the basis of national self-sufficient policies and economy regulation oriented policies. In the context of the hyperinflations of 1989 and 1990, the government shifted to market oriented policies and launched a vast unilateral trade liberalization process in 1991 as a part of IMF program. Tariff reductions can be considered as an unanticipated policy change from the perspective of domestic firms in Argentina.

Argentina's average import tariff fell from 11% in 1992 to 9% in 1995.[4] At the beginning of the 1990s Argentina also engaged in the regional trade liberalization process of the MERCOSUR with Brazil, Paraguay and Uruguay. Import tariffs raise in some industries in Argentina during this period was related to the harmonization process to establish an external common tariff within the MERCOSUR. The external common tariff rate with third countries was finally established in 1995. We use the variation in tariffs from 1992 to 1995 that represents an unpredictable change in trade policy since afterwards the change in tariffs was dictated by variations in the external common tariffs of the MERCOSUR.

Our interest policy variable is the input tariffs. They are calculated following the methodology of Goldberg et al. (2008). Input tariffs are computed at the 4-digit industry level by running the output tariffs through

[3]The Chilean plant database is provided by the ENIA Survey and Argentine firm level database was built from two surveys, "Technological Behavior of Argentine Industrial Firms", conducted by INDEC covering four years (1992, 1996, 1998 and 2001). See section V for a detailed explanation on the databases.

[4]The source of the MFN import tariffs is the "Secretaria del MERCOSUR".

Argentina's input-output matrix. For each 4-digit industry, we generate an input tariff as the weighted average of tariffs on the intermediate goods used in the production of final goods of that 4-digit industry, where the weights are built by the input industry's share of the output industry's total output share.[5]. Table 1 in Appendix reports input tariffs in 1995 by 4-digit-SIC-industry level. There is a wide variation in the level of input tariffs across industries ranging from 0 (Publishing of newspapers and Coke oven products) to 67% (Building/repairing boats). There is also a significant variation in input tariffs changes across 4-digit industries during 1992-1995. The percentage change in input tariffs ranges from -91 to 53 pp from 1992 to 1994 and from -100 to 91 from 1992 to 1995. This strong variation in input tariffs across industries was not only unpredictable but also weakly correlated with industry characteristics like size or skill intensity.[6] In the empirical section, we exploit this wide variation in input tariffs across industries to study how firms' export decision is affected by input trade liberalization.

Chilean trade reform was one of the earliest and most radical examples of trade liberalization in Latin American. The main feature of trade reform in Chile is the substantial trade integration process experienced in the late 1970s. In Chile, average nominal tariff rates fell from 98% in 1973 to 10% in 1979. During the debt crisis, the government rose import tariffs from 15% in 1982 up to 35% in 1985. Afterwards, average nominal tariff rates fell again from 35% in 1986 to 10% at the beginning of the 1990s.

Different from the Argentine case, the identification of trade liberalization effects in Chile can be problematic since the reduction in import tariffs was almost homogeneous across all industries and remained constant in the 1990s. The radical drop in the average nominal tariff rate came along with the homogenization of tariff rates among industries. Even their rise in early 1980s, during the debt crisis, was uniform.

For this reason, in the case of Chile we identify the impact of the access to foreign inputs by variations across industries in the imported input intensity. During the trade liberalization period, firms increase the use of imported intermediate goods. The proportion of firms using foreign intermediate goods raise as well and the imported input intensity (see section 5.1). This is reflected in a raise of imported input intensity at the industry level.

There is a wide variation in imported input intensity across 3-digit industries in both countries.[7] Table 2 in Appendix describes the imported intermediate goods intensity of 25 manufacturing sectors in Chile and 44 in Argentina. Sectors are defined in the 3-digit ISIC industry classification for Chile and 3-digit SIC industry level for Argentina. There is a significant variation in imported input intensity across sectors with a 0.21 of average imported input intensity for petroleum products to 0.01 for basic metal for Chile and 0.67 for tubes to 0.01 for wood, medical instruments and crafts. In this table, we split the sample into high- and low-imported input intensity according to whether firms belong to an industry with a level of imported intermediate goods intensity above or below the median across 3-digit industries.

[5] See section 5 for the formal construction of input tariffs

[6] The correlation between the change in tariffs and industry size at the 4-digit industry level is 0.25 while the correlation with skill intensity is the -0.14.

[7] Imported input intensity at the sectoral level is calculated as the ratio of imported intermediate goods to total production at the 3-digit industry level.

This variation could arise from within industry variation of firms' import decision of intermediate goods. Table 3 shows the decomposition of the variation in imported input intensity during the period in between-industry and within-industry variations for both countries. The foreign input intensity rose by 37% at the three-digit industry level in Chile (1989-1999) and 14% in Argentina (1992-2001). In both cases, this increase is entirely explained by the between-industry variation. In Chile, 30% of the increase is explained by the between-industry indicator, while only 7% is explained by the within-industry indicator. In Argentina, 13% of the total variation (14%) is due to the between indicator, while only 1% is explained by the within-industry indicator.

Do firms belonging to sectors that have lower input tariffs are more likely to export and have larger export volumes? Do firms belonging to sectors that rely more on foreign intermediate goods perform better in the export market than firms in less imported input intensive sectors? To provide a preliminary answer to these questions, Table 4 describes the performance of firms belonging to industries that have experienced above and below the median input tariffs cuts between 1992 and 1995 in Argentina. Firms producing in industries with larger tariffs cuts are on average more efficient in terms of labor productivity and they are also larger in terms of employment. They have larger export sales and the fraction of firms participating in the export market is larger in these industries that have a better access to foreign inputs. Table 5 shows the performance of firms belonging to high- and low-imported input intensity for Chile and Argentina. In both cases, firms producing in high foreign input-intensive industries are on average more productive in terms of labor productivity (value added over total employment), larger in terms of total employment, have larger export sales and the percentage of firms exporting is greater. This evidence points out a positive correlation between export performance and the intensity on foreign inputs.

In the next section we develop a simple model that rationalizes this variation in input tariffs and in imported input intensity across industries and the different channels through which variation in imported input costs affect firms' export decision (the extensive margin of trade) and the volume of export sales (the intensive margin of trade).

3 Set-up of the model

3.1 Consumer's preferences

The representative consumer has preferences over a continuum of varieties indexed by $i \in \Omega$ and a homogeneous good used as numeraire. We use the linear demand system with horizontal product differentiation developed by Ottaviano, Tabuchi and Thisse (2002). This demand system allows for endogenous mark-ups, which depend on the number of foreign firms competing on the domestic market. Goods preferences are described by the quasi-linear quadratic utility function:

$$U = q_0^c + \alpha \int_{i \in \Omega} q_i^c di - \frac{1}{2}\gamma \int_{i \in \Omega} \left(q_i^c\right)^2 di - \frac{1}{2}\beta \left(\int_{i \in \Omega} q_i^c di \right)^2 \quad (1)$$

Where $\alpha, \gamma, \beta > 0$; q_0^c is the consumption of the numeraire good ($q_0^c > 0$) and q_i^c is the consumption level of each variety of the differentiated good. The numeraire good is produced using only labor in perfect competition. This gives the unit wage (w_i). The substitution between the differenciated varieties and the numeraire is captured by α and β parameters, while γ represents the degree of product differentiation between the varieties. The maximization of the quasi-linear quadratic utility function subject to the consumer's budget constraint gives the optimal linear demand for the typical Ω-variety. The budget constraint is $R = w_i + q_0 = \int_{i\in\Omega} p_i q_i^c di + q_0^c$. The inverse demand for each variety $i \in \Omega$ is determined by $p_i = \alpha - \gamma q_i^c - \beta Q^c = \frac{\alpha}{\gamma} - \frac{1}{\gamma} p_i - \beta \frac{1}{\gamma} N \widetilde{q}$, where N is the total amount of varieties consumed and $\widetilde{q}$ is the average demand of the economy.

From the inverse demand we obtain the average demand of the economy $\widetilde{q} = \frac{\alpha}{\beta N} - \frac{\gamma}{\beta N} q_i^c - \frac{1}{\beta N} p_i$. Plugging the average demand into the budget constraint for varieties, the linear market demand system can be expressed as:

$$q_i \equiv q_i^c L = \frac{\alpha}{\beta N + \gamma} L - \frac{L}{\gamma} p_i + \frac{\beta N}{\beta N + \gamma} \frac{L}{\gamma} \widetilde{p} \tag{2}$$

Where average prices are $\widetilde{p} = \frac{1}{N} \int_{i\in\Omega} p_i di$, L are consumers in the domestic country. The set of varieties consumed, $\Omega' \subset \Omega$, is determined by the positive demand condition derived from equation 2:

$$p \leq \frac{1}{\beta N + \gamma} (\alpha\gamma + \beta N \widetilde{p}) \tag{3}$$

Unlike the Dixit-Stiglitz preferences, in the case of a linear demand system, the price elasticity of demand depends on the number of varieties (N) in the economy and on their average price. This effect represents the "toughness" of competition affecting pricing decisions.

3.2 Production

Take two asymmetric countries, home and foreign. All foreign country variables are indexed with an asterisk (*). In each country, there is a continuum of firms, each producing a different range of final goods in monopolistic competition. Heterogeneous firms with different marginal costs are introduced. After paying the fixed entry cost, firms draw their initial marginal cost (c) from a common distribution G(c) with support $[0, c_M]$, where c_M is the upper bound.

Production of the final good requires two types of intermediate inputs: domestic (z) and imported (m). In order to get the model to be as tractable as possible, we assume that one unit of domestic input is produced using one unit of labor in a competitive market. Labor is inelastically supplied. These assumptions imply that domestic inputs have a price equal to the unit wage. We assume that imported inputs are supplied by a third country to both asymmetric economies in perfect competition. The price of imported intermediate

goods takes into account the import barriers on intermediate goods set by each country: $p_m = p_z \tau_m$, where $\tau_m > 1$.[8]

We assume differences across industries in terms of the imported inputs requirements in the production process λ_s. This sectoral variable is indexed with "s". This parameter measures the units of imported intermediate goods required to produce a unit of final good at the industry level. The higher the value of λ_s the larger the industry intensity in foreign inputs and the higher the efficiency in the production process of these intermediate goods. This is a realistic assumption for developing countries that rely on foreign technology embodied in foreign inputs.[9] We adopt a CES production function that combines intermediate inputs (z,m) to produce output.

$$q = \frac{1}{c}\left(z^{\phi} + (\lambda_s m)^{\phi}\right)^{\frac{1}{\phi}} \tag{4}$$

The elasticity of substitution between the two types of inputs is $\theta = \frac{1}{1-\phi}$. Domestic and imported intermediate goods are imperfect substitutes: $0 < \phi < 1$ and $1 \leq \theta \leq \infty$. Firms' domestic and imported input demands are determined by profit maximization. By plugging Equation 4 into profit function $\pi = pq - p_z z - p_m m$, profit maximization process yields the following relationship between input demands and their relative price: $\frac{m}{z} = \left(\frac{1}{\tau_m}\right)^{\frac{1}{1-\phi}} \lambda_s^{\frac{\phi}{1-\phi}}$. The relative factor demand depends on the foreign input intensity parameter (λ_s) and on tariffs on imported inputs (τ_m). The lower input tariffs or the higher imported input intensity, the lower the relative price of foreign inputs and thereby, the lower the marginal costs. Since domestic inputs are produced with a unit of labor whose wage is normalized to one, the price of domestic intermediate goods is equal to $p_z = w = 1$ and the price of imported input is $p_m = \tau_m$.

Firms maximize their domestic profits, $\pi_D = p_D q_D - p_z z - p_m m$, and export profits, $\pi_X = p_X q_X - p_z z - p_m m$, independently. The optimal price and output from profit maximization are determined by:

$$q_D(c) = \frac{L}{\gamma}(p_D - c\chi); \qquad q_X(c) = \frac{L^*}{\gamma}(p_X - c\chi\tau^*) \tag{5}$$

Where $\chi = \left[1 + \left(\frac{\tau_m}{\lambda_s}\right)^{\frac{\phi}{\phi-1}}\right]^{\frac{\phi-1}{\phi}}$ and $\tau^* > 1$ is the unit variable trade cost for final goods. In this model, domestic producers' per unit cost includes the initial heterogeneous marginal cost (c), trade costs for intermediate goods (τ_m) as well as the industry imported input intensity (λ_s). Note that the effect of a reduction of χ is similar to an homogeneous increase in productivity for all firms within the same industry.[10]

From Equation 3, we derive the price threshold condition for positive demand: $p = \frac{1}{\beta N + \gamma}(\alpha\gamma + \beta N\widetilde{p})$.

[8] The aim of this paper is to focus on the impact of input tariffs and variations in the intensity in foreign inputs across industries, thus, we assume that f.o.b. prices of intermediate goods are the same across countries. This assumption does not affect the results.

[9] This assumption of sector heterogeneity will then help us to empirically identify the effect of foreign inputs on firms' export decisions. See section V.

[10] Using the the optimal price and output, the maximized value of profits earned from domestic and export sales is: $\pi_D(c) = q_D(c)(p_D(c) - c\chi)$; $\pi_X(c) = q_X(c)(p_X(c) - c\chi\tau^*)$. Domestic exporters have to incur a variable trade cost of τ^* in order to sell their goods in the foreign country.

Those firms that have high marginal costs and set prices above this price threshold will earn negative profits. Hence, these firms are not productive enough to produce and decide to exit the market. Let c_D be the cost of the marginal firm, which earns zero profit from the domestic market and charges a price equal to the per unit cost of production: $p_D(c_D) = c_D\chi$. Where χ is a decreasing function of the industry foreign input intensity parameter λ_s and an increasing function of τ_mSimilarly, the marginal exporter is the firm that earns zero export profits and sets a price equal $p^*(c_X) = c_X\chi\tau^*$. In both cases, the demand level of the marginal domestic firm and the marginal exporter is zero. All firms with cost $c < c_D$ have a positive demand level and hence earn positive profits from the domestic market. Firms with costs between $c_X < c < c_D$ only produce for the domestic market, while those firms with $c < c_X$ are productive enough to sell abroad. Let c_M be the upper bound cost of the distribution and assuming that $c_M > c_D$, those firms with marginal costs $c_D < c < c_M$ exit the market since they have negative profits. [11] The domestic and export cost cutoffs are then determined by the following non-negative profit condition[12]:

$$c_D = \sup\{c : \pi_D(c) > 0\} = \frac{p}{\chi}; \quad c_X = \sup\{c : \pi_X(c) > 0\} = \frac{p^*}{\chi\tau^*} \tag{6.A}$$

$$c_D^* = \sup\{c : \pi_D(c) > 0\} = \frac{p^*}{\chi^*}; \quad c_X^* = \sup\{c : \pi_X(c) > 0\} = \frac{p}{\chi^*\tau} \tag{6.B}$$

From these conditions, we can express the home (foreign) country's export cost cutoff c_X (c_X^*) as an implicit function of the foreign (domestic) cost cutoff c_D^* (c_D) :

$$c_X = \frac{c_D^*}{\tau^*}\left(\frac{\chi^*}{\chi}\right); \quad c_X^* = \frac{c_D}{\tau}\left(\frac{\chi}{\chi^*}\right) \tag{7.A 7.B}$$

The cost of the marginal exporter in the domestic country increases with a reduction in final good import barriers set by the foreign country (τ^*) and also with an increase in the imported input intensity (λ_s) and a reduction in intermediate good import barriers established by the home country $\chi(\tau_m)$. Hence, in this model the number of exporters in a country (extensive margin of trade) varies not only with foreign trade policy but also with trade policy set by the home country.

These cutoffs then determine all performance variables. Prices, output, revenues, profits and absolute mark-ups (μ) can be expressed as functions of c, c_D, c_X.[13]

[11] If $c_M = c_D$ all firms produce on the domestic market.

[12] Where $\chi = \left[1 + \left(\frac{\tau_m}{\lambda_s}\right)^{\frac{\phi}{\phi-1}}\right]^{\frac{\phi-1}{\phi}}$ and $\chi^* = \left[1 + \left(\frac{\tau_m^*}{\lambda_s^*}\right)^{\frac{\phi}{\phi-1}}\right]^{\frac{\phi-1}{\phi}}$.

[13] Using Equations 3 to 5, $p_D(c) = \frac{\chi}{2}[c_D + c]$; $q_D(c) = \frac{L}{2\gamma}\chi[c_D - c]$, $p_X(c) = \frac{\chi\tau^*}{2}[c_X + c]$; $q_X(c) = \frac{L^*\chi\tau^*}{2\gamma}[c_X - c]$, $\mu_D(c) = \frac{\chi}{2\lambda_s}[c_D - c]$; $\mu_X(c) = \frac{\chi}{\tau}{}^*2\lambda_s[c_X - c]$, $r_D(c) = \frac{L\chi^2}{4\gamma}[c_D^2 - c^2]$; $r_X(c) = \frac{L^*\chi^2\tau^{*2}}{4\gamma}[c_X^2 - c^2]$, $\pi_D(c) = \frac{L\chi^2}{4\gamma}[c_D - c]^2$; $\pi_X(c) = \frac{L^*\chi^2\tau^{*2}}{4\gamma}[c_X - c]^2$

3.3 Equilibrium

The equilibrium level of the cost cutoff (c_D) is determined by the free entry condition (FE) and and the non-negative profit condition (equations 6.A and 6.B). Firms decide their production location before entering and paying the sunk entry cost (f_E). Once they incur this sunk entry cost, their unit cost level c is revealed. Free entry condition implies that expected profits are equal to zero in equilibrium:

$$\int_0^{c_D} \pi_D(c)\, dG(c) + \int_0^{c_X} \pi_X(c)\, dG(c) = f_E \tag{8}$$

In order to obtain closed solutions, we follow Melitz and Ottaviano (2008) and assume that cost draws are distributed in line with a Pareto distribution in both countries. The cumulative distribution function of costs is $G(c) = \left(\frac{c}{c_M}\right)^k, c \in [0, c_M]$, with the upper bound cost c_M and a shape parameter k indexing the dispersion of cost levels among firms. Assuming the Pareto distribution for cost draws, we solve for export and domestic profits.[14] Plugging equations 7.A and 7.B, respectively, these equations can be re-written as:

$$\chi^2 \left[L (c_D)^{k+2} + L^* \rho^* (c_D^*)^{k+2}\right] = \gamma\eta; \qquad \chi^{*2} \left[L^* (c_D^*)^{k+2} + L\rho (c_D)^{k+2}\right] = \gamma\eta \tag{9.A 9.B}$$

Where $\eta = 2(k+1)(k+2)(c_M)^k f$, $\rho^* = (\tau^*)^{-k} \left(\frac{\chi^*}{\chi}\right)^{k+2}$ and $\rho = (\tau)^{-k} \left(\frac{\chi}{\chi^*}\right)^{k+2}$. By solving this system of equations, we obtain the long run equilibrium domestic (foreign) cost cutoff levels, c_D (c_D^*):

$$c_D = \left[\frac{\gamma\eta}{L} \frac{\left(\frac{1}{\chi^2} - \frac{\rho^*}{\chi^{*2}}\right)}{(1 - \rho\rho^*)}\right]^{\frac{1}{k+2}} \tag{10}$$

These cutoff levels pin down all variables at equilibrium. Domestic prices are $p_D = \frac{1}{2}(p + \chi c), c \in [0, c_D/\chi]$ and import prices are $p_X^* = \frac{1}{2}(p^* + \tau^*\chi^* c), c \in [0, c_D/\chi^*\tau^*]$. Aggregate productivity is measured by the inverse of the average cost of surviving firms derived from: $\widetilde{c} = \frac{1}{G(c_D)} \int_0^{c_D} c\, dG(c) = \frac{k}{k+1} c_D$. The average cost then determines the average price and mark-up, $\widetilde{p} = \chi \left[\frac{2k+1}{2k+2}\right] c_D$ and $\widetilde{\mu}(c) = \chi \left[\frac{1}{k+1}\right] c_D$.

4 Theoretical findings

Disentangling the impact of input trade liberalization in the short run

In the previous section, we have derived the long-run equilibrium where entry and exit decisions were endogenously determined. Since countries are asymmetric, trade liberalization induces relocation of new-entrant firms across countries in the long-run equilibrium (see next subsection). In order to focus on the direct effects of trade liberalization, we first explore the short-run effects of input trade liberalization. The

[14] Where domestic and export profits are $\pi_D(c) = \frac{L\chi^2}{4\gamma}[c_D - c]^2$; $\pi_X(c) = \frac{L^*\chi^2\tau^{*2}}{4\gamma}[c_X - c]^2$.

short run is too brief a timeframe for firm entry and exit to be possible. Thus, in the short-run scenario the additional entry of firms is restricted. Incumbents decide whether to produce (become active) or not (shut down) for the domestic and foreign market. Those incumbents that decide to cease production become inactive but they can restart their production afterwards without incurring the fixed entry cost. Based on Chen, Imbs and Scott (2006), we analyze the demand and supply side of the economy to determine a relationship between the number of firms (N) and the marginal domestic cost cutoff in the short-run equilibrium.

The demand side of the economy is represented by the number of varieties consumed (N) determined by Equation 3. Using Equation 6.A, the price threshold for positive demand (derived from Equation 3) and the average price, we obtain the equilibrium value of total varieties (domestic and foreign) on the domestic market.

$$N = \frac{2\gamma\left(k+1\right)\left(\frac{\alpha}{\chi} - c_D\right)}{\beta c_D} \qquad \text{whenever } c_D < c_M \tag{11}$$

This equation determines the economy's demand. There is a negative relationship between the marginal firm's cutoff cost (c_D) and the number of firms (N) (downward sloping curve). On the demand side of the economy, a high domestic cost cutoff value implies higher prices in the economy, reducing demand and then the number of firms. The demand side does not depend directly on import barriers on final goods, but in this model it does depend directly on the industry intensity on foreign inputs and on import barriers on intermediate goods. For a given level of c_D, the higher the intensity on foreign inputs or the lower import barriers on intermediate goods, the higher the number of varieties. The reduction in factor input costs lowers prices in the economy, raising demand.

On the supply side, in the short run, the endogenous number of sellers in the home country (N) is made up of the fixed number of domestic firms ($\overline{G}(c_D)\overline{N_D}$) and foreign firms ($\overline{G}(c_X^*)\overline{N_D^*}$) producing for the domestic market. The decision that incumbents make is whether to export or not. Using $G(c_D) = \left(\frac{c_D}{c_M}\right)^k$, $G(c_X^*) = \left(\frac{c_X^*}{c_M^*}\right)^k$ and Equation 7.B, we obtain the following equation, which characterizes the supply side of the economy in the short run:

$$N = \underbrace{\left(\frac{c_D}{c_M}\right)^k \overline{N_D}}_{\text{Domestic producers}} + \underbrace{\left[\left(1+\left(\frac{\tau_m}{\lambda_s}\right)^{\frac{\phi}{\phi-1}}\right)^{\frac{\phi-1}{\phi}}\right]^k \frac{1}{\chi^{*k}\tau^k}\left(\frac{c_D}{c_M^*}\right)^k \overline{N_D^*}}_{\text{Foreign Exporters selling in the domestic market}} \tag{12}$$

There is a positive relationship between c_D and N. A high domestic cost cutoff level enables more firms to become active and produce on the domestic market (both domestic firms and foreign exporters). Although the number of firms is fixed in the short run, changes in trade variable costs induce an adjustment via the fraction of active producers. For a given level of c_D, a reduction in trade barriers on final goods set by the home country increases competitive pressures from abroad (the number of active foreign exporters selling on

the domestic market). The high-cost domestic firms that can no longer face foreign competition shut down. This import competition effect is already present in Melitz and Ottaviano (2008). Unlike the case of final good import barriers, the channel through which changes in input tariffs operates is based on variations in factor input costs. Hence the lower the import barriers on intermediate goods in the home country, the higher the competitiveness of domestic firms. [15] Thereby, it becomes harder for foreign exporters (importers) to access the domestic market. A raise in the intensity of imported inputs at the industry level has a similar impact as variations in input tariffs.

The relationship between the number of firms and the domestic cost cutoff is determined by the intersection between the demand curve (equation 11) and the supply curve (equation 12).

$$\frac{\frac{\alpha}{\chi} - c_D}{c_D^{k+1}} = \frac{\beta}{2\left(k+1\right)\gamma}\left[\frac{\overline{N_D}}{c_M^k} + \left(\frac{\chi}{\chi^*}\right)^k \frac{1}{\tau^k}\frac{\overline{N_D^*}}{c_M^{*k}}\right] \tag{13}$$

Disentangling the impact of input trade liberalization in the long run

In the long-run equilibrium, the mass of entrants in each country (N_E, N_E^*) is no longer fixed and is endogenously determined by the free entry condition, Equation 8. This condition establishes that expected operating profits are equal to the fixed entry cost in the long-run equilibrium. Since entry and exit are endogenous, the number of firms and the domestic cost cutoff are determined simultaneously. Therefore, the supply side of the economy is now represented by Equation 10 (equilibrium domestic cost cutoff) characterized by a horizontal line. The demand side remains unchanged and thus it is still represented by Equation 11.

The trade policy effects might be inverted in the long-run equilibrium compared to the short-run effects analyzed in the previous section. The reason is that entry and exit by firms induce them to reallocate their production and might offset the short-run trade liberalization effects. A unilateral reduction in final good import barriers reduces competition on the domestic market in the long run and thereby raises the domestic cost cutoff (less selection of firms) as well as prices and mark-ups among domestic survivors. As in Melitz and Ottaviano (2008), in order to face foreign competition some domestic firms decide to reallocate their production and sell abroad in the foreign country in the long run, which represents a more protected market. There are fewer firms selling on the domestic market (N falls) and more abroad (See appendix).

The impact of input trade liberalization on the domestic cost cutoff is ambiguous in the long-run. There are two opposite mechanisms induced by changes in λ_s and τ_m, affecting the domestic cutoff in the long run. Both channels are related to the reduction in factor input costs. The first channel is characterized by the net entry of high-marginal-cost firms on the domestic market due to the reduction in the relative price of imported inputs (increasing c_D). The second channel is related to changes in the domestic export cutoff (represented by increases in ρ^*) induced by the reduction in factor input costs. The higher the intensity on

[15] As trade costs for inputs come down, more firms decide to produce (become active) on the domestic market and there is therefore an increase in domestic competitive pressures.

imported inputs or the lower the import barriers on intermediate goods, the higher the number of domestic firms exporting (the extensive margin of trade). The increase in domestic exporters selling on the foreign market creates incentives for foreign firms to shift their production towards the home market to escape from import competition (from domestic exporters). In the long run, the entry of foreign firms on the domestic market increases import competition (reducing c_D). In this case, an increase in the efficiency of imported inputs λ_s or a reduction in τ_m has a similar effect to a reduction in τ^*: an increase in N and a fall in c_D (pro competitive effect of trade).

In the long run, a reduction in factor input costs (χ) [16] increases the domestic cost cutoff (c_D) when the following condition holds (see Appendix):

$\frac{\partial c_D}{\partial \chi} < 0$ if and only if $\tau^{*k} \left(\frac{\chi}{\chi^*}\right)^k > \frac{k}{2} + 1$

$\frac{\partial c_D}{\partial \chi} > 0$ Otherwise

The effects of input trade liberalization on the intensive margin of exports

The access to foreign inputs affects firms in different sectors differently. Variations in input tariffs and imported input intensity at the sectoral level affect the competitiveness of domestic firms participating in the foreign market. Firms producing in industries with lower input tariffs (or higher imported input intensity) are more efficient and have larger foreign sales. In the short run, for a given level of $\overline{c_D^*}$, the higher the imported input intensity and the lower the import barriers on intermediate goods, $\chi(\tau_m, \lambda_s)$, the larger the export profits and sales and thereby, the higher the intensive margin of trade (volume of exports). Using equation 6.A, export revenues can be written as:

$$r_X = \frac{L^*}{4\gamma}\left[\left(\overline{c_D^*}\chi^*\right)^2 - \left(c\chi\tau^*\right)^2\right]$$

Proposition 1: *Firms producing in industries with lower input tariffs (or higher imported input intensity) have larger export revenues.*

Proof: *Partially differentiating r_X with respect to τ_m, and to λ_s, respectively, yields to:*

$\frac{\partial r_X}{\partial \tau_m} < 0, \qquad \frac{\partial r_X}{\partial \lambda_s} > 0$

Note also that export revenues are an increasing function of firm productivity. This is a common feature of heterogeneous firms' models. The lower the marginal cost c of the firm, the greater the export revenues.

This effect is reinforced in the long run. The most productive firms will export greater volumes and have larger export revenues. This effect is higher in industries that have lower input tariffs or that are more intensive in the use of foreign intermediate goods. The cross-derivative of export revenues with respect to firm productivity and input tariffs (the sectoral intensity on imported inputs) shows that there is a positive

[16] By an increase in λ_s or a reduction in τ_m

interaction effect between firm performance and input tariffs (the industry intensity on foreign inputs) on export revenues (see Appendix).

Proposition 2: *The most productive firms have larger export revenues, and the impact of firm productivity on export revenues is higher for firms producing in industries that have lower input tariffs (or that rely more on imported inputs).*

Proof: *The cross-derivative of export revenues with respect to firm productivity and input tariffs (the sectoral intensity on imported inputs) yields to:*

$$\frac{\partial^2 r_X}{\partial c \partial \tau_m} > 0, \qquad \frac{\partial^2 r_X}{\partial c \partial \lambda_s} > 0$$

The effects of input trade liberalization on the extensive margin of exports

In the short run, the number of domestic exporters active on the foreign market will also increase with the access to imported intermediate goods. Firms belonging to industries that have lower input tariffs will be more likely to export relative to firms producing in industries where input barriers are larger. Similarly, firms producing in industries that rely more on foreign intermediate goods in the production process, will have a higher probability of entering the export market relative to firms producing in low imported input intensive industries. This theoretical implication is directly related with the previous result concerning the intensive margin of trade. Since the most productive firms have larger export revenues, and this effect is more pronounced in industries with lower input tariffs (or imported input intensive industries), in these industries more firms become exporters.

The foreign country's short-run supply side is characterized by:

$$N^* = \underbrace{\left(\frac{c_D^*}{c_M^*}\right)^k \overline{N_D^*}}_{\text{Foreign producers}} + \underbrace{\left(\frac{\chi^*}{\chi}\right)^k \frac{1}{\tau^{*k}} \left(\frac{c_D^*}{c_M}\right)^k \overline{N_D}}_{\text{Domestic Exporters selling in the foreign market}}$$

The higher the imported input intensity and the lower the import barriers on intermediate goods at the sectoral level, the lower the imported input costs, $\chi(\lambda_s, \tau_m)$, and the larger the number of exporters. Thereby, for a given level of c_D^* ,the extensive margin of trade increases the more production relies on foreign intermediate goods.

In the long run, the extensive margin of trade (the number of new exporters) is measured by changes in the export cutoff (c_X). The model predicts that a reduction in import barriers on intermediate goods pushes up the competitiveness of domestic firms, allowing more firms to sell on the foreign market. Similarly, the cost cutoff of exporting varies across sectors with different imported intermediate goods intensity. In those industries, where the production process requires a more intensive use of imported intermediate goods, more firms become exporters. The export selection effect is reinforced by the access to foreign inputs. Plugging c_D^* (equation 10 for the foreign market) into equation 7.A gives:

$$c_X = \frac{\chi^*}{\chi}\frac{1}{\tau^*}\left[\frac{\gamma\eta}{L^*}\frac{\left(\frac{1}{\chi^{*2}}-\frac{\rho}{\chi^2}\right)}{(1-\rho\rho^*)}\right]^{\frac{1}{k+2}}$$

Proposition 3: *The cost cutoff of exporting is higher in industries that have lower input tariffs or that are more intensive in foreign intermediate goods.*

Proof: *See Appendix.*

5 Testing the model

5.1 Data and descriptive analysis

This section tests the theoretical model's main predictions, drawing on two different plant (firm) level databases from Chile (1990-1999) and Argentina (1992-2001).

The Chilean database provided by the ENIA ("Encuesta Nacional Industrial Anual") Survey is a comprehensive manufacturing census covering all plants with more than ten employees from 1979 to 1999 (3,900 plants per year). The data covers value-added, investment in capital equipment, imported inputs, foreign technology assistance, and skilled and unskilled labor, among others. Since export sales are reported from 1990 onwards, we use the 1990s sub-sample in most of our empirical estimates. In these estimations, we use total factor productivity estimated by Bas and Ledezma (2008) based on the Levinsohn and Petrin (2003) methodology. Table 6 (Appendix) shows the average estimates of the total factor productivity at 3-digit industry level.

The Argentine database was built from two surveys of the "Technological Behavior of Argentine Industrial Firms" conducted by INDEC ("Instituto Nacional de Estadistica y Censos") in 1998 and 2003 respectively.[17] This database covers four years (1992, 1996, 1998 and 2001) and there are about 1,650 firms in each survey. Both surveys are representative of the Argentine manufacturing sector. The sample covers about 50% of total industrial sales and employment and 55% of exports. Since we use the variation in input tariffs from 1992 to 1995 that represents an unpredictable change in trade policy, in the main regressions we use the subsample of firms active in the period 1992-1996. When we test the effect of variations in imported input intensity, we use a balanced panel for the four years. The balanced panel contains 650 firms with positive sales covered by both surveys. The data covers the same variables as the Chilean database.[18] In the case of Argentina, we use labor productivity, measured by value added over total employment, since we do not have the initial capital stock to estimate total factor productivity.

[17] This is the same database that has been used by Bustos (2008) to study the impact of trade liberalization on technology upgrading.

[18] A number of sector-specific deflators (Isic-3dig Rev2 1992) are applied to value-added, technological measures, materials and investment in both databases.

Table 7 (Appendix) summarizes the main firms' characteristics for Chile and Argentina. In both countries, the percentage of imports of intermediate goods over total imports accounted by domestic firms corresponds to 85% in Chile and 62% in Argentina, while multinational firms only account for 15% and 38% of imported inputs in each country. This evidence supports the main argument of this paper: in developing countries, highly dependent on foreign technology, there are a number of domestic firms relying on imported intermediate inputs. Moreover, as it is shown in table 7, exporters producing with imported intermediate goods (Exporters-Importers) perform better in terms of employment, value added, technological investment and capital and skill intensity, than those firms that are only exporters or importers.

We next investigate these differences in firms' performance by estimating the export and import premia using a pooled Ordinary Least Squares (OLS) as in Bernard and Jensen (1999) and Kasahara and Lapham (2007). We classify firms in five trade orientation status: only importer, only exporter, exporter-importer, multinationals (foreign) and firms that do not participate in international trade (the omitted category). Columns 1-3 of table 8 show these estimates, while columns 4-6 report the first-difference estimations. As expected, the values of the premia coefficients are much lower in the specification in differences, but they are still significant in most cases. Confirming the previous descriptive statistics, the export and import premia in terms of value added, size (employment) and technology spending is higher for those firms that produce with foreign inputs for the export markets in Chile as well as in Argentina.

5.2 Identification strategy

In the case of Argentina we use both input tariffs and imported input intensity at the sectoral level to identify the impact of input trade liberalization on firms' export decisions. Input tariffs are computed following the methodology of Goldberg et al. (2008). For each 4-digit industry, we generate an input tariff as the weighted average of tariffs on the intermediate goods used in the production of final goods of that 4-digit industry, where the weights are built by the input industry's share of the output industry's total output share using Argentina's input-output matrix.[19] We compute input tariffs, τ_{mkt}, as following:

$$\tau_{mst} = \sum_z \alpha_{zs}\tau_{zt}$$

where $\alpha_{\mathbf{zs}}$ is the value share of input z in the production of output in 4-digit industry s. Take as an example an industry that uses three different intermediates goods in the production of a final good. Suppose that each intermediate good faces a tariff of 5, 10 and 15 per cent and value shares of 0.10, 0.30 and 0.60, respectively. Using this methodology, the input tariff for this industry is 12.5 percent (5 $\times$0.10 + 10$\times$0.30+15$\times$0.60). The median of the input tariffs is then calculated for each of the 4-digit SIC industries in our sample. We divide

[19] Argentina's input-output table is available for the year 1976 and 1997. We use the latest one since is the most close to our dataset.

the sample into high- and low- input tariffs, according to whether firms belong to an industry with a level of input tariffs above or below the median across 4-digit industries.

We then compute the percentage change of input tariffs in the period as the change in input tariffs from 1995 to 1992 over the level of tariffs in 1992. The median of this measure is then calculated for each 4-digit ISIC industries. Since we also explore whether firms belonging to industries that have different levels of input tariff cuts react, we split the sample into industries that have experienced above and below the median input tariff cuts.

In the case of Argentine firms, we exploit the variation in input tariff levels across 4-digit industries in different years (1993, 1994 and 1995). There is a wide variation in input tariffs across 4-digit industries ranging from 0 to 67% with an average of 17% in 1995 (see Table 1 in Appendix). We also exploit the variation in input tariff cuts across industries between 1995 and 1992. As we pointed out in the motivation section, trade liberalization in Argentina at the beginning of the 1990s was considered as an unanticipated policy change from the perspective of domestic firms. Input tariffs changes are weakly correlated with industry characteristics like size or skill intensity.[20] Nevertheless, if industries have different performance before trade liberalization, input tariffs cuts could be picking up the effects of some omitted industry level variable. In order to deal with this issue, we first introduce a set of 4-digit industry level variables in the initial period such as size, skilled intensity and imported input intensity. We also introduce 2-digit-SIC industry fixed effects that take into account unobserved industry characteristics at a more aggregated level.

In the case of Chile, an identification issue arises since the reduction in import tariffs was almost homogeneous across all industries. For this reason, in order to remain as close as possible to the model, we use as a proxy of λ_s the average imported input intensity at the industry level. λ_s can be easily derived from the relative demand of foreign intermediate goods[21]:

$$\frac{m}{z} = \left(\frac{1}{\tau_m}\right)^{\frac{1}{1-\phi}} \lambda_s^{\frac{\phi}{1-\phi}}.$$

For the case of Chile, given that import tariffs are homogeneous across industries, variations in the intensity of imported inputs are entirely explained by technical differences across industries (λ_s). We construct a measure of imported input intensity in the production function, an empirical counterpart for the parameter λ in the theoretical model. We calculate the ratio of foreign intermediate goods to total production at the 4-digit industry level.

$$\text{Imported input intensity}_{s,t}(\lambda) = \sum_{i=1}^{N} \frac{\text{Imported intermediate goods}_{i,s,t}}{\text{Total production}_{i,s,t}}$$

The median of this measure is then calculated for each of the 4-digit ISIC industries in our sample. We then split the sample into high- and low-imported input intensity, according to whether firms belong to an

[20] The correlation between the change in tariffs and industry size at the 4-digit industry level is 0.25 while the correlation with skill intensity is the -0.14.

[21] This is the relative demand of imported inputs in quantity, in the empirical estimations we measure this demand in values using specific deflators for imported intermediate goods.

industry with a level of imported input intensity above or below the median across 4-digit industries. To mitigate concerns of reverse causality relating export and import status, we define industry intensity in foreign intermediate goods in the pre-sample period.[22]

Exploiting the cross-sector variation in the foreign intermediate goods intensity helps establish the causal effect of foreign inputs on the extensive and intensive margins of export. Focusing on technological features of industries has the advantage of reducing a potential endogeneity bias between export and import decisions of firms. Several papers show that firms that export also import intermediate goods (Bernard, Jensen and Schott (2005), Kasahara and Lapham (2007), Muuls and Pisu (2008)). In the previous section, we also show, in Tables 7 and 8 (Appendix), descriptive evidence for the firm level samples of Chile and Argentina. Firms that use imported intermediate goods are more likely to sell their goods in the foreign market, but also the access to foreign markets through exporting might allow firms to build linkages with foreign suppliers. Under the assumption that technological characteristics of industries determine an important part of the relative importance of the use of foreign inputs in production at the firm level, using data at the industry level provides a measure of λ that reduces concerns about this endogeneity bias and allows us to keeping in with the theoretical findings.

In this case, we identify the impact of foreign inputs on firms' export activity, by using the variation across sectors with different levels of imported input intensity. This framework separates the variation in the intensive and extensive margin of exports due to the access to imported intermediate goods from the variation emanating from other sources by exploiting variation across high and low imported input intensive industries.

6 Empirical results

6.1 Input tariffs and the intensive margin of exports

The theoretical findings analyzed in the previous section yield a set of testable predictions concerning the impact of the access to foreign intermediate goods on the intensive and the extensive margin of exports.

Proposition 1 directly implies that firms producing in industries that have a better access to foreign intermediate goods have larger export revenues. Thus, firms within industries with lower input tariffs export larger volumes. We test this prediction estimating the following reduced form equation of export revenues:

$$LogX_{isk\ (96)} = \alpha_1 \tau_{m\ s(95)} + \alpha_2 Z_{isk(92)} + \alpha_3 S_{s(92)} + \upsilon_k + \epsilon_{isk} \quad \text{(I)}$$

Where $LogX_{isk\ (96)}$ is the logarithm of export sales of firm i producing in 4-digit SIC industry s, belonging to 2-digit SIC industry k, in year 1996 and $\tau_{m\ s(95)}$ are input tariffs of 4-digit SIC industry s in year 1995. $Z_{isk(92)}$ is a set of firm level variables expressed in logarithm in year 1992 that control for observable firm characteristics that might affect export volumes. The model predicts that most productive and larger firms

[22] The pre-sample period for Chile is 1989-1991 and for Argentina is 1992.

have greater export volumes. Thus, we include firms' labor productivity (value added over total employment) and firms' size (total employment). Previous empirical works show that export sales are also positively correlated with firms' skill intensity and capital intensity (Bernard and Jensen(1995), Bas(2008), Muendler and Corseuil(2002)). In our study both capital and skilled intensity are key control variables since firms that have better access to foreign technology embodied in imported inputs might rely more on capital and skilled labor in the production process. Multinational firms are globally engaged in foreign markets and are more likely to import inputs. In the same line, several empirical works also highlight that multinational firms are more productive and have larger sales (Yeaple, 2008 and Bernard et al., 2008). We include a multinational status variable by classifying multinational firms as firms that have more than 50% of foreign capital. All firm control variables are lag of one period (1992) to take into account potential endogeneity issues between firm performance and export sales. This strategy is similar to previous works on the probability of exporting developed by Bernard and Jensen (2004).

Since our variable of interest varies at the 4-digit industry level, we control for observable industry characteristics that might be correlated with input tariffs. $S_{s(92)}$ is a set of 4-digit SIC industry level s control variables such as size, skill intensity and imported input intensity.[23] In all specifications we include 2-digit SIC industry level fixed effects, υ_k. Disturbances are corrected for clustering across 4-digit industries.

Estimation of equation (I) by OLS is reported in columns (1) to (5) in Table 9. Column (1) shows the effect of the input tariffs in 1995 on firms' export sales in 1996, once we take into account the effect of firm productivity and size in the initial period. As predicted by the model, both firm productivity and size have a positive effect on export revenues. The coefficient of input tariffs is negative and significant as predicted by the model, implying that firms belonging to 4-digit SIC industries with lower input tariff have larger export sales. This effect is robust to the inclusion of additional firm level controls in column (2) such as skill intensity, capital intensity and multinational status in 1992.

Next, we address an important concern. Input tariffs might simply be picking up the effects of other 4-digit industry characteristics such as size, skill intensity or imported input intensity. Column (3) introduces these 4-digit industry level control variables. The coefficient of input tariffs is still negative and significant at the 5% level. Input tariffs variation across industries might be also capturing the variation in output tariffs. In column (4) we include output tariffs in 1995. The coefficient of input tariffs is lower but still negative and significant at the 10% level. This estimated coefficient (-0.278) implies that one standard deviation reduction (0,99) in input tariffs increases export sales up to 27 percentage points in 1996. As a robustness check we then test the impact of the variation across industries in input tariffs in 1994 on firms' export sales in 1996, taking into account the effect of output tariffs in 1994. The coefficient is very similar, negative and significant at the 10% (column (5)).

A common feature of heterogeneous firms' models is that the most productive firms have larger export revenues. In our model, this effect is higher in industries that have lower input tariffs. In developing countries,

[23] We use the firm level data to compute the 4-digit industry level variables. The median of total employment, skill intensity and imported input intensity firm-level measures is calculated for each of 4-digit industries in our sample.

firms producing in industries, which rely more on the use of foreign technology, are more competitive and thereby export greater volumes. Proposition 2 implies that the positive effect of firm productivity on the intensive margin of trade (export sales) is higher in industries that have lower input tariffs. In order to test this prediction, we estimate the following reduced form equation of export revenues:

$$LogX_{isk\ (96)} = \delta_1 Prod_{isk(92)} \times High\tau_{m(s)} + \delta_2 Prod_{isk(92)} \times Low\tau_{m\ (s)} + \delta_4 Z_{isk(92)} + \delta_5 S_{s(92)} + \upsilon_k + \epsilon_{iks} \text{(II)}$$

where $LogX_{isk\ (96)}$ is the logarithm of export sales of firm i producing in 4-digit SIC industry s, belonging to 2-digit SIC industry k, in year 1996 and $Prod_{iks(92)}$ is the logarithm of value added over total employment of firm i producing in 4-digit SIC industry s, belonging to 2-digit SIC industry k, in year 1992. In order to test the interaction effect between firm productivity and the level of foreign input access of the industry, we divide firms in groups of high- and low- input tariffs level, according to whether they belong to an industry with a level of input tariffs above or below the median across 4-digit SIC industries. We next interact firm productivity with the two indicator variables of foreign input access. $High\tau_{m(s)} = 1$ if the firm belongs to 4-digit SIC industry with a level of input tariffs above the median, and zero otherwise. $Low\tau_{m(s)} = 1$ if the firm belongs to an industry with input tariffs below the median, and zero otherwise.

Columns (6) and (7) of Table 9 report these results. We use the same firm level control variables as in the previous regressions. As predicted by the model both coefficients of the interaction terms are positive, but only the coefficient corresponding to the interaction term between firm productivity and low input tariffs is significant at the 5% level (column 6). In column (7) we also include the 4-digit industry level control variables and the output tariffs. The estimated coefficient of the interaction term between firm productivity and low input tariffs (0.085) in column (7) implies that for industries that have lower input tariffs the impact of firm productivity on export sales is greater. A Wald test under the null hypothesis that $\delta_1 = \delta_2$ leads us to reject the equality between the coefficients of both interactions.

Robustness checks

In this section we address an important issue. In the previous estimations we control for observable firm and 4-digit industry characteristics, but we do not deal explicitly with unobserved constant firm heterogeneity. Taking first differences of equation (I) eliminates time-invariant firm unobserved heterogeneity:

$$\Delta LogX_{isk\ (96\text{-}92)} = \alpha_1 \Delta\tau_{m\ s(95\text{-}92)} + \alpha_2 Z_{isk(92)} + \alpha_3 S_k + \Delta\upsilon_k + \Delta\epsilon_{isk} \text{ (D.I)}$$

Estimation of equation (D.I) by OLS is reported Table 10. In all specifications we include 2-digit industry level fixed effects and firm level control variables. Column (1) shows the effect of the change in input tariffs between 1995 and 1992 on the change in export sales between 1996 and 1992. The coefficient of input tariffs change is negative and significant, implying that firms belonging to industries with larger input tariff cuts a higher increase in export sales. This effect is robust to the inclusion of 4-digit industry level controls in

column (2) such as size, skill intensity and foreign input intensity. Change in input tariffs might be picking up the effects of output trade liberalization. Column (3) introduces the change in output tariffs from 1992 to 1995. The coefficient of input tariffs change remains negative and significant at the 10% level. This estimated coefficient (-0,458) implies that one standard deviation reduction (0,55) in input tariffs increases export sales up to 25 percentage points in 1996.

We then test the interaction effect between firm productivity and the change in input tariffs between 1995 and 1992 on the intensive margin of exports, taking first differences of equation (II):

$$\Delta Log X_{isk\ (96\text{-}92)} =$$
$$\delta_1 Prod_{isk\ (92)} \times Above\Delta\tau_{m\ s(95\text{-}92)} + \delta_2 Prod_{isk(92)} \times Below\Delta\tau_{m\ s(95\text{-}92)} + \delta_3 Z_{isk(92)} + \delta_4 S_k + \Delta\upsilon_k + \Delta\epsilon_{isk}$$
(D.II)

Columns (4) and (5) of table 10 show the estimation of equation (D.II) by OLS. We divide 4-digit SIC industries in groups of below- and above- input tariff cuts, according to whether they have experienced input tariff changes above or below the median across 4-digit SIC industries. We create a dummy variable $Above\Delta\tau_{m\ s(95\text{-}92)}$ ($Below\Delta\tau_{m\ s(95\text{-}92)}$) equal to one if the firm belongs to a 4-digit industry that have experienced above (below) the median input tariff cuts. Then we include two interaction terms between firm productivity in 1992 and the above (below) the median input tariff cuts indicator variable ($Prod_{isk\ (92)} \times Above\Delta\tau_{m\ s(95\text{-}92)}$ and $Prod_{isk\ (92)} \times Below\Delta\tau_{m\ s(95\text{-}92)}$). We use the same firm level and 4-digit industry level control variables as in the previous regressions. As predicted by the model both coefficients of the interaction terms are positive, but only the coefficient corresponding to the interaction term between above the median input tariffs cuts is significant (column (4)). In column (5) we introduce the 4-digit industry level control variables. This estimated coefficient (0.108) implies that for industries that have larger input tariff cuts the impact of firm productivity on export sales is greater. A Wald test under the null hypothesis that $\delta_1 = \delta_2$ leads us to reject the equality between the coefficients of both interactions.

6.2 Input tariffs and the extensive margin of exports

In the theoretical model, firm export decision is determined by expected export revenues. Only those firms that have positive export profits will be able to enter the export market. The export cost cutoff is determined by the non-negative profit condition (equation 6.A). The probability that a firm i producing in a 4-digit industry s, belonging to a 2 digit industry k, exports at time t is given by:

$$Prob(X_{iskt} > 0) = P\left[\pi_X > 0\right] = P\left[c < c_X\right]$$

The probability of exporting is an increasing function of the productivity of the firm $\left(\frac{1}{c}\right)$ and a decreasing function of input tariffs (τ_m). The access to high quality-cheaper foreign inputs reinforces the export selection

effect. Proposition 3 implies that firms producing in industries with lower input tariffs are more likely to export. This prediction is tested by estimating the determinants of the probability of entering the export market using the following reduced form linear probability model:

$$Exporter_{isk\ (96)} = \gamma_1 \tau_{m\ s(95)} + \gamma_2 Z_{isk(92)} + \gamma_3 S_{s(92)} + \upsilon_k + e_k (III)$$

Where $Exporter_{isk\ (96)}$ is a dummy variable equal to one if the firm i producing in 4-digit industry s, belonging to a 2 digit industry k, has positive export sales in year 1996 and zero otherwise, and $\tau_{m\ s(95)}$ are input tariffs of 4-digit SIC industry s in year 1995. Table 11 reports the estimation results of equation (III) by OLS. Column (I) shows the impact of the variation across 4-digit industries in the access to foreign inputs in 1995 on the probability of entering the export market. Once we control for the effect of firm productivity and size in the initial period (1992), firms producing in industries with lower input tariffs are more likely to export. The coefficient of input tariffs is still negative and significant as predicted by the model, when we control for additional observable firm level characteristics in column (2) such as skill intensity, capital intensity and multinational status in 1992. This effect is robust to the inclusion in column (3) of other 4-digit industry characteristics that might be correlated with input tariffs like size, skill intensity or imported input intensity. In column (4) we include output tariffs in 1995. The coefficient of input tariffs is lower but still negative and significant at the 1% level. This estimated coefficient (-0.085) implies that one standard deviation reduction (0,99) in input tariffs increases the probability of exporting up to 8 percentage points in 1996. As a robustness check we then test the impact of the variation across industries in input tariffs in 1994 on firms' export status in 1996. The coefficient is very similar, negative and significant at the 5% (column (5)).

The model also predicts that the most productive firms have larger export revenues and are more likely to become exporters, and the effect of productivity on the export decision is greater for firms producing in industries with lower input tariffs. The lower the input tariffs, the higher the effect of firm productivity on the extensive margin of exports. We test the differential effect of firm productivity on firms' export decision across industries with different levels of access to foreign inputs by estimating the following model:

$$Exporter_{isk\ (96)} =$$
$$\beta_1 Prod_{isk(92)} \times High\tau_{m(s)} + \beta_2 Prod_{isk(92)} \times Low\tau_{m\ (s)} + \beta_4 Z_{isk(92)} + \beta_5 S_{s(92)} + \upsilon_k + e_{iks} \qquad (IV)$$

Where $Prod_{isk(92)} \times High\tau_{m(s)}$ is the interaction term between firm productivity and the dummy variable indicating that the firm produces in a 4-digit industry with input tariffs above the median; and $Prod_{isk(92)} \times Low\tau_{m(s)}$ is the interaction term between firm productivity and the dummy variable indicating that the firm produces in a 4-digit industry with input tariffs lower than the median. The two last columns of Table 11 report these results. Column (6) shows the results once we control for firm level characteristics and in column (7) we include the full set of industry level control variables. Only the coefficient corresponding to the

interaction term between firm productivity and the dummy variable indicating that the firm produces in a 4-digit industry with input tariffs lower than the median is significant. Firms producing in industries with lower input tariffs have twice higher probability of entering in the export market.

Robustness checks

In this section we study whether our previous results are robust when we deal with unobserved constant firm heterogeneity. We estimate equation (III) in first differences to remove the time-invariant firm unobserved heterogeneity:

$$\Delta Exporter_{isk\ (96\text{-}92)} = \gamma_1 \Delta \tau_{m\ s(95\text{-}92)} + \gamma_2 Z_{isk(92)} + \gamma_3 S_k + \Delta \upsilon_k + \Delta \epsilon_{isk} \quad \text{(D.III)}$$

Columns (1) to (3) of Table 12 show the impact of input tariff cuts between 1992 and 1995 ($\Delta \tau_{m\ s(95\text{-}92)}$) on the change in export decision between 1992 and 1996 of Argentine firms ($\Delta Exporter_{isk\ (96\text{-}92)}$). Column (1) shows that the fall in input tariffs between 1992 and 1995 raises the probability of entering the export market. Firm productivity and size in the initial period have a positive and significant effect on the entry decision in the export market. Once we control for the skill intensity, capital intensity and multinational status at the firm level (column (2)), the coefficient of the change in input tariffs is still negative and significant. Column (3) shows that we are not picking up the effect of output tariff cuts and other industry level controls. Under the different specifications, input tariff cuts raises the likelihood of exporting: our results imply that one standard deviation (0,55) reduction of input tariffs raises the probability of exporting by 3,3 percentage points.

The model also predicts that the positive impact of firm productivity on export decision is more significant in industries that have greater input tariff cuts. We then test the interaction effect between firm productivity and the change in input tariffs between 1995 and 1992 on the extensive margin of exports. We estimate equation (IV) taking first differences:

$$\Delta Exporter_{isk\ (96\text{-}92)} =$$
$$\beta_1 Prod_{isk\ (92)} \times Above \Delta \tau_{m\ s(95\text{-}92)} + \beta_2 Prod_{isk(92)} \times Below \Delta \tau_{m\ s(95\text{-}92)} + \beta_3 Z_{isk(92)} + \beta_4 S_k + \Delta \upsilon_k + \beta \epsilon_{isk}$$
$$\text{(D.IV)}$$

To test this prediction we introduce two interaction terms: (1) a dummy variable indicating whether a 4-digit industry experienced above the median input tariff cuts interacted with firm productivity in 1992 ($Prod_{isk\ (92)} \times Above \Delta \tau_{m\ s(95\text{-}92)}$) and (2) a dummy variable indicating whether a 4-digit industry experienced below the median input tariff cuts interacted with firm productivity in 1992 ($Prod_{isk(92)} \times Below \Delta \tau_{m\ s(95\text{-}92)}$). The coefficients of these interaction terms are positive but only significant at the 10% level for firms producing in industries with larger input tariff cuts (column 4 of Table 12). This result is robust to the inclusion of additional industry level control variables (column 5). Firms producing in industries with larger input tariff cuts have a twice higher probability of entering the export market.

6.3 Imported input intensity and the intensive margin of exports

Since in the case of Chile, trade liberalization was homogeneous across industries, we identify the effect of the access to foreign inputs by exploiting variation across industries in terms of technical differences in the use of foreign intermediate goods reflected by imported input intensity (an empirical counterpart for the parameter λ). The theoretical model predicts that more productive firms have larger export sales and that this effect is higher in industries that are more intensive in the use of imported intermediate goods. To test this positive interaction effect between firm performance and the intensity in foreign inputs, we estimate the following model:

$$Log(X_{ist}) = \chi_1 TFP_{is(t\text{-}1)} \times High\lambda_s + \chi_2 TFP_{is(t\text{-}1)} \times Low\lambda_s + \chi_3 Z_{it} + \upsilon_t + \mu_i + \nu_{it} \quad \text{(V)}$$

We estimate equation (V) for the panel of Chilean firms (1991-1999) and Argentine firms (1996-2001) with firm fixed effects to control for the unobserved firm heterogeneity. In the case of Chile we use plant $TFP_{is(t\text{-}1)}$, the logarithm of total factor productivity in the previous period estimated at the 3-digit industry level using the Levinsohn and Petrin (2003) methodology (see Table 6). In order to test the interaction effect between plant productivity and the industry imported intermediate input intensity of the corresponding industry, we divide firms in groups of high- and low-imported input intensity, according to whether they belong to an industry with a level of imported input intensity above or below the median across 3(4)-digit ISIC industries s in the pre-sample period.[24] We next interact firm total factor productivity with two indicator variables of foreign input intensity. $High\lambda_s = 1$ if firm i belongs to an industry with a level of imported input intensity above the median, and zero otherwise. $Low\lambda_s = 1$ if the firm i belongs to an industry with a level of imported input intensity below the median, and zero otherwise. This framework separates the variation in the intensive margin of trade due to the access to imported intermediate goods from the variation emanating from other sources by exploiting variation across sectors. This specification allows us to test whether the coefficients associated with the interactions are statistically different from each other.[25] The model predicts positive signs for the coefficients χ_1 and χ_2 and $\chi_1 > \chi_2$ in absolute terms.

In addition to the firm level controls used in the previous regressions, we include in Z_{it} a financial indicator variable for the case of Chile.[26] Recent empirical evidence, using firm level data, points out that financial constraints could also explain export patterns (Manova, 2006 and Muuls, 2008). Moreover, firms facing credit constraints are smaller, less efficient and have lower domestic and export sales. The financial indicator is a dummy variable equal to one when the firm reports having paid a tax on credit. Finally, we also introduce year-fixed effects to control for macroeconomic shocks (υ_t) and firm-fixed effects (μ_i). The introduction of firm fixed effects is important to control for unobservable firm characteristics that do not vary over time. The fixed effects subsume all the direct effects of time and firm characteristics on export sales.

[24] For the case of Chile, the most desegregated industry level information corresponds to the 3-digit industry level to which a firm belongs.

[25] As a robustness check, we also run the same regressions for the two sub-samples separately.

[26] There is no data available on credit constraints for Argentina.

Table 13 depicts the results for Chile. Column (1) reports the results for the full sample of firms. As predicted by the heterogeneous firms' models, firms' total factor productivity and size affect positively the intensive margin of trade. Column (2) reports the result for the interaction terms between firm productivity and the high- and low-imported input intensity dummies, where the only controls are firms' size, firm fixed effects and time fixed effects. Both coefficients of the interaction terms are positive as expected. The one corresponding to the interaction term with the high foreign input intensity dummy is higher than for the interaction with the low imported input intensity dummy. A Wald test under the null hypothesis $\chi_1 = \chi_2$ leads us to reject equality between the two coefficients. Our results are robust to the introduction of firm level controls in column (3). The coefficient corresponding to firms producing in imported input intensive industries continues to be larger.

For reference, in the column (4) we report the estimation of equation (V) using firm TFP and the firm level controls without splitting the sample. As can be seen by the differences in the coefficients, looking at the average of total factor productivity hides the heterogeneity across industries according to their imported input intensity. The coefficient of the interaction term between firm productivity and the high imported input intensity dummy (column (3)) is larger than the coefficient of the average productivity in the full sample regression (column (4)).[27]

Similar results hold for Argentina. Table 14 depicts the results for the sample of Argentine firms. Column 1 highlights that firm labor productivity has a greater impact on export sales. However, once we split the sample into high- and low-imported input intensive industries, the effect of firm performance is only significant for firms belonging to industries that rely more on imported inputs (column (2)). Once we control for other firm observable characteristics in column (3), the magnitude of the coefficients of the interaction terms and their statistical significance increase. The effect firm productivity on export sales is much higher in industries that are more intensive in foreign inputs. The Wald test reveals that the equality between the two coefficients is rejected. This result is also confirmed when we compared the coefficients of the interaction terms in column (3) with the coefficient of the average productivity in column (4).[28]

These results confirm that the positive effect of firm productivity on the intensive margin of exports appears relatively stronger form firms producing in industries that rely more on foreign inputs.

6.4 Imported input intensity and the extensive margin of exports

We now proceed to study the whether the positive effect of firm productivity on the export decision is more pronounced for firms producing in industries with a greater requirement of foreign intermediated goods. The

[27] In results available upon request, we performed the same regressions in the two different samples across firms producing in high and low imported input intensive industries. These estimations confirm the previous results. The coefficient of firm total factor productivity for the sub-sample of firms producing in industries that rely more on foreign intermediate goods is significant with 1% confidence level and it is two times larger than the coefficient of productivity for firms in low imported input intensive industries.

[28] When we run the same regressions, available upon request, for the two separated sub-samples, only the coefficient of firm productivity is positive and significant at the 1% level for the sample of firms producing in high imported input intensive industries.

probability of exporting is an increasing function of both the productivity of the firm $\left(\frac{1}{c}\right)$ and of the imported input intensity (λ_s). As was shown by proposition 1 and 2, the most productive firms have larger export revenues and are more likely to become exporters, and this effect is greater for firms producing in industries that rely more on imported inputs. We test the differential effect of firm productivity on the export decision across levels of imported input intensity for both countries using the following model:

$$Exporter_{ist} = \kappa_1 TFP_{is(t\text{-}1)} \times High\lambda_s + \kappa_2 TFP_{is(t\text{-}1)} \times Low\lambda_s + \kappa_3 Z_{ist} + \upsilon_t + \mu_i + e_{it} \qquad (VI)$$

The dependent variable is a dummy equal to one if the firm i sells in the foreign market in t. $TFP_{is(t\text{-}1)} \times High\lambda_s$ is an interaction term between firm total factor productivity in the previous year and the high imported input intensity dummy, and $TFP_{is(t\text{-}1)} \times Low\lambda_s$ is an interaction term between firm total factor productivity in the previous year and the low imported input intensity dummy. The same firm characteristics that might affect export volumes can also affect export decision. Thereby, we control for the same observable firm characteristics as in the previous regressions (Z_{ist}). The inclusion of firm fixed effects,μ_i, and year fixed effects, υ_t, control for unobservable firm characteristics and macroeconomic shocks that might systematically affect export decision. Proposition 3 states that the sign of κ_1 and κ_2 is positive and that $\kappa_1 > \kappa_2$ in absolute terms.

Table 15 depicts the results for Chilean plants. As expected, plant total factor productivity increases the probability of exporting (column (1)). This effect is twice stronger for firms producing in high intensive imported input industries (column 2 and 3). The coefficient corresponding to the interaction term between plant total factor productivity and the high foreign input intensity dummy is twice higher than the one for the interaction with the low imported input intensity dummy. A Wald test under the null hypothesis $\kappa_1 = \kappa_2$ leads us to reject equality between the two coefficients.[29]

Table 16 reports the results for the sample of Argentine firms. Column (1) shows that the more productive firms are more likely to export. Once we introduce the interaction terms with the high and low imported input intensive industries, the effect of firm labor productivity on the export decision appears to be only significant and much more important (twice higher) for firms producing in foreign input intensive industries (column (2) and (3)).[30]

We have performed estimations under alternatives econometric methodologies. As a robustness' check we estimate a probit and a logit model with plant fixed effects. The conditional logit model allow us to estimate the effect of each independent variable on the probability that a firm switches from a non-exporter status to exporter status. The results are very similar to the linear probability model. Table 17 and 18 report these results. We find robust empirical support for the second prediction of the model. The positive effect of firm

[29]When we run the same regressions separately in the two different sub-samples across firms producing in high and low imported input intensive industries, the differential impact of plant productivity on the probability of exporting appears to be more pronounced. Only the coefficient of plant productivity is positive and significant with 1% confidence level for the sub-sample of high imported input intensity.

[30]As in the previous regressions for Chile, when we run the same regressions separately in the two different sub-samples of industries these results are stronger.

efficiency on the export decision is stronger in industries where the production process relies more on foreign technology.

7 Concluding Remarks

Input trade liberalization impacts the competitiveness of domestic firms differently across sectors. In this paper we have developed a simple model of trade and heterogeneous firms to study how the access to cheaper and more efficient foreign intermediate goods affects firms' export decisions. Our model shows that changes in import barriers on intermediate goods (or on the industry imported input intensity) reduce relative factor costs and enhance the performance of domestic firms. Both the domestic and export selection processes are reinforced by the access to more efficient imported intermediate inputs. Thereby, the reduction in trade frictions on intermediate goods affects the creation of new varieties, and at the same time, has a positive impact on the intensive and extensive margins of exports.

This theoretical framework yields testable predictions concerning the way in which trade integration shapes firms' decisions. First, firms producing in industries with lower input tariffs (or higher foreign input intensity) have larger export revenues. Second, firms should be more likely to export in these industries. Finally, the positive effect of firm productivity on export sales and export participation is more pronounced for firms producing in industries that have better access to foreign intermediate goods.

We provide evidence in support of the model's key predictions, drawing on plant-level panel data on Chile and Argentina's manufacturing sector. For the Argentine case we exploit the variation on input tariffs across 4-digit industries, while for the Chilean case we identify the access to foreign inputs by the imported input intensity at the industry level since tariffs reductions were homogeneous across industries in Chile. We find results that are highly consistent with our theory. Input trade liberalization enhances firms' export sales and the probability of entering the export market. Our results also support the existence of a differentiated effect of firms' productivity on export activity depending on input tariffs and on the foreign input intensity of the industry. The positive effect of firm productivity on the intensive and the extensive margin of exports is larger for firms producing in industries with lower input tariffs in Argentina. Similarly, considering only firms producing in industries with imported input intensity over the median, the impact of firm productivity on export sales and export status can almost duplicate in Argentina and Chile.

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8 Appendix

Determination of the number of entrants in the long-run equilibrium

The number of entrants in each country can be solved using the following system of equations to determine the number of domestic ($N = G(c_D)N_E + G(c_X^*)N_E^*$) and foreign firms ($N^* = G(c_D^*)N_E^* + G(c_X)N_E$) in the home and foreign country.

$N_E = \frac{c_M^k}{1-\tau^{-k}\tau^{*-k}} \left[\frac{N}{c_D^k} - \tau^{-k} \left(\frac{\chi}{\chi^*} \right)^k \frac{N^*}{c_D^{*k}} \right]$

Plugging equation 11 for the home and foreign country into the above expression, yields to:

$N_E = \frac{c_M^k 2\gamma(k+1)}{[1-\tau^{-k}\tau^{*-k}]\beta} \left[\frac{\left[\frac{\alpha}{\chi} - c_D\right]}{c_D^{k+1}} - \left(\frac{\chi}{\chi^*} \right)^k \frac{\left[\frac{\alpha}{\chi^*} - c_D^*\right]}{\tau^k c_D^{*k+1}} \right]$

This equation also implies a partitiong status between domestic firms and exporters ($c_X < c_D$).

Selection into the export markets

Under the assumption of an equilibrium in which each country produces the differentiated good and thus there is $N_E > 0$, only the lowest-cost firms are able to export ($c_X < c_D$, $c_X^* < c_D^*$).

Proof: $N_E > 0 \quad \Leftrightarrow \frac{\left[\frac{\alpha}{\chi} - c_D\right]}{c_D^{k+1}} > \left(\frac{\chi}{\chi^*} \right)^k \frac{\left[\frac{\alpha}{\chi^*} - c_D^*\right]}{\tau^k c_D^{*k+1}}$

$\Leftrightarrow \frac{\frac{\alpha}{\chi} - c_D}{\frac{\alpha}{\chi^*} - c_D^*} \left(\frac{c_D^*}{c_D} \right)^{k+1} > \tau^{-k} \left(\frac{\chi}{\chi^*} \right)^k$

$\Leftrightarrow \quad \left[\frac{\left(\frac{\alpha}{\tau\chi^*}\right) - c_X^*}{\frac{\alpha}{\chi^*} - c_D^*} \right] \left(\frac{c_D^*}{c_X^*} \right)^{k+1} > 1$

This is incompatible with $c_X^* > c_D^*$. Therefore,

$\Leftrightarrow c_X^* < c_D^*$

This condition also holds for the domestic and export cutoff of the home country.

Disentangling the long run effects of trade liberalization on the domestic cutoff

A reduction in final good import barriers (τ) increases the domestic cost cutoff (c_D) in the long run $\frac{\partial c_D}{\partial \tau} < 0$.

Proof: Partially differentiating c_D (Equation 10) with respect to τ, yields:

$\frac{\partial c_D}{\partial \tau} = - \left[\frac{k}{k+2} \right] c_D^{-(k+1)} \frac{\gamma\eta}{L} \frac{\left[\frac{1}{\chi^2} - \frac{\rho^*}{\chi^{*2}} \right] (\tau)^{-k-1} (\tau^*)^{-k}}{\left[1 - (\tau)^{-k} (\tau^*)^{-k}\right]^2} < 0.$

The impact of changes in import barriers on intermediate goods is ambiguous in the long run. It depends on the relative strength of two opposite forces.

$$c_D^{k+2} = \frac{\gamma\eta}{L} \frac{\overbrace{\left[\left(1+\left(\frac{\tau_m}{\lambda_s}\right)^{\frac{\phi}{\phi-1}}\right)^{\frac{1-\phi}{\phi}}\right]^2}^{\text{Channel 1}} - \overbrace{\left(\frac{\chi^*}{\tau^*}\right)^k \left[\left(1+\left(\frac{\tau_m}{\lambda_s}\right)^{\frac{\phi}{\phi-1}}\right)^{\frac{1-\phi}{\phi}}\right]^{k+2}}^{\text{Channel 2}}}{[1-\tau^{*-k}\tau^{-k}]}$$

In the long run, a reduction in factor input costs (χ) [31] increases the domestic cost cutoff (c_D) when the following condition holds:

$\frac{\partial c_D}{\partial \chi} < 0$ if and only if $\tau^{*k}\left(\frac{\chi}{\chi^*}\right)^k > \frac{k}{2}+1$

$\frac{\partial c_D}{\partial \chi} > 0$ Otherwise

This condition implies that channel 1 (factor prices) overwhelms channel 2 (import competition).

Proof: Rearranging terms, equation 10 can be expressed as a function of τ_m:

$$c_D = \left[\frac{\left[\psi\chi^{-2} - \psi\left(\frac{\chi^*}{\tau^*}\right)^k \chi^{-k-2}\right]}{[1-\tau^{*-k}\tau^{-k}]}\right]^{\frac{1}{k+2}} \qquad \psi = \frac{\gamma\eta}{L}$$

$$\frac{\partial c_D}{\partial \tau_m} = \frac{2}{k+2} \frac{c_D^{-k-1}\psi\chi^{-3-k}}{[1-\tau^{*-k}\tau^{-k}]\tau^{*k}\chi^{*-k}} \frac{\partial \chi}{\partial \tau_m}\left[\left(\frac{k}{2}+1\right) - \tau^{*k}\left(\frac{\chi}{\chi^*}\right)^k\right]$$

Proof. of proposition 1: Partially differentiating $r_X = \frac{L^*}{4\gamma}\left[(c_D^*\chi^*)^2 - (c\chi\tau^*)^2\right]$ with respect to τ_m and λ_s, and using $c_D^* = \left(\frac{\gamma\eta}{L^*}\frac{\chi^{*-2}-\chi^k\tau^{-k}\chi^{*-k-2}}{1-\tau^{*-k}\tau^{-k}}\right)^{\frac{1}{k+2}}$ yields

(A.1) $\frac{\partial r_X}{\partial \tau_m} = \frac{L^*}{2\gamma}\left(\frac{\partial c_D^*}{\partial \tau_m} c_D^* \chi^{*2} - \chi\frac{\partial \chi}{\partial \tau_m} c^2\tau^{*2}\right)$

(A.2) $\frac{\partial r_X}{\partial \lambda_s} = \frac{L^*}{2\gamma}\left(\frac{\partial c_D^*}{\partial \lambda_s} c_D^* \chi^{*2} - \chi\frac{\partial \chi}{\partial \lambda_s} c^2\tau^{*2}\right)$

Hence $\frac{\partial r_X}{\partial \tau_m} < 0$ and $\frac{\partial r_X}{\partial \lambda_s} > 0$ since:

(i) Partially differentiating χ with respect to τ_m yields

$\frac{\partial \chi}{\partial \tau_m} = \left(\frac{\tau_m}{\chi}\right)^{\frac{1}{\phi-1}} \lambda_s^{-\frac{\phi}{\phi-1}} > 0$

(ii) Partially differentiating $\chi = \left[1+\left(\frac{\tau_m}{\lambda_s}\right)^{\frac{\phi}{\phi-1}}\right]^{\frac{\phi-1}{\phi}}$ with respect to λ_s yields

$\frac{\partial \chi}{\partial \lambda_s} = -\chi^{\frac{-1}{\phi-1}} \tau_m^{\frac{\phi}{\phi-1}} (\lambda_s)^{\frac{\phi}{1-\phi}-1} < 0$

(iii) Partially differentiating c_D^* with respect to τ_m yields

[31] By an increase in λ_s or a reduction in τ_m

$\frac{\partial c_D^*}{\partial \tau_m} = \frac{-k}{k+2}\left(c_D^*\right)^{-(k+1)}\left(\frac{\gamma\eta\chi^{k-1}\chi^{*-k-2}}{L^*(1-\tau^{*-k}\tau^{-k})\tau^k}\right)\frac{\partial \chi}{\partial \tau_m} < 0$

(iv) Partially differentiating c_D^* with respect to λ_s yields

$\frac{\partial c_D^*}{\partial \lambda_s} = \frac{-k}{k+2}\left(c_D^*\right)^{-(k+1)}\left(\frac{\gamma\eta\chi^{k-1}\chi^{*-k-2}}{L^*(1-\tau^{*-k}\tau^{-k})\tau^k}\right)\frac{\partial \chi}{\partial \lambda_s} > 0$

Proof. of proposition 2: Partially differentiating $r_X = \frac{L^*}{4\gamma}\left[\left(c_D^*\chi^*\right)^2 - \left(c\chi\tau^*\right)^2\right]$ with respect to the marginal cost c, yields

$\frac{\partial r_X}{\partial c} = -\frac{L^*}{2\gamma}\left(\chi\tau^*\right)^2 c < 0$

The cross-derivative of export revenues with respect to firm productivity and input tariffs (the sectoral intensity on imported inputs) yields

(B.1) $\frac{\partial^2 r_X}{\partial c \partial \tau_m} = -\frac{L^*}{\gamma}\chi\tau^{*2}c\frac{\partial \chi}{\partial \tau_m} < 0$

(B.2) $\frac{\partial^2 r_X}{\partial c \partial \lambda_s} = -\frac{L^*}{\gamma}\chi\tau^{*2}c\frac{\partial \chi}{\partial \lambda_s} > 0$

Proof. of proposition 3: Plugging ρ and ρ^* into c_X, we obtain $c_X = \frac{\chi^*}{\chi}\frac{1}{\tau^*}\left[\frac{\gamma\eta}{L^*}\frac{\chi^{*-2}-\chi^{*-k-2}\tau^{-k}\chi^k}{(1-\tau^{*-k}\tau^{-k})}\right]^{\frac{1}{k+2}}$

where $\chi(\lambda_s,\tau_m) = \left[1+\left(\frac{\tau_m}{\lambda_s}\right)^{\frac{\phi}{\phi-1}}\right]^{\frac{\phi-1}{\phi}}$. Partially differentiating c_X with respect to τ_m and λ_s yields

(C.1) $\frac{\partial c_X}{\partial \tau_m} = -\frac{\partial \chi}{\partial \tau_m}\frac{\chi^*}{\chi}\frac{1}{\tau^*}\left[\frac{c_D^*}{\chi} + \frac{\gamma\eta\chi^{k-1}\chi^{*-k-2}}{c_D^{*(k+1)}L^*(1-\tau^{*-k}\tau^{-k})\tau^k}\frac{k}{k+2}\right]$

(C.2) $\frac{\partial c_X}{\partial \lambda_s} = -\frac{\partial \chi}{\partial \lambda_s}\frac{\chi^*}{\chi}\frac{1}{\tau^*}\left[\frac{c_D^*}{\chi} + \frac{\gamma\eta\chi^{k-1}\chi^{*-k-2}}{c_D^{*(k+1)}L^*(1-\tau^{*-k}\tau^{-k})\tau^k}\frac{k}{k+2}\right]$

Recall from proposition 1 that $\frac{\partial \chi}{\partial \tau_m} > 0$ and $\frac{\partial \chi}{\partial \lambda_s} < 0$, hence $\frac{\partial c_X}{\partial \tau_m} < 0$ and $\frac{\partial c_X}{\partial \lambda_s} > 0$.

Table 1: *Argentina's Input tariffs at the 4-industry level in 1995.*

4-digit	Industry name	τ_m	4-digit	Industry name	τ_m
1511	Processing of meat	27,3	2610	Glass products	3
1512	Processing of fish	2,6	2691	Pottery	14,1
1513	Processing of fruits	19,3	2692	Refractory ceramics	8,2
1514	Vegetable/animal oils	2,9	2693	Non-refractory clay	6,7
1520	Dairy products	30,5	2694	Cement and plaster	3,6
1531	Grain mill products	2,6	2695	Articles of cement and plaster	16
1532	Starch products	33,9	2696	Cutting-finishing of stone	17,3
1533	Prepared animal feeds	19,9	2699	Other non-metallic mineral prod	28,3
1541	Bakery products	33,2	2710	Basic iron and steel	35,8
1542	Sugar	3,9	2720	Basic and non-ferrous metals	5
1543	Cocoa	34	2731	Casting of iron and steel	6,5
1544	Macaroni, noodles	8	2811	Structural metal products	6,7
1549	Other food products, n.e.c.	33,6	2812	Tanks and containers of metal	5,3
1551	Distilling	5,9	2813	Steam generators	8
1552	Wines	29,7	2891	Metal forging	5,1
1553	Malt liquors and malt	17	2893	Cutlery	7,9
1554	Soft drinks, mineral waters	48,9	2899	Other fabricated metal prod	16
1600	Tobacco products	22,6	2911	Engines and turbines	6,8
1711	Textile fibre preparation	51,9	2912	Pumps, compressors	10,1
1721	Made-up textile articles	5,1	2913	Bearings, gears elements	28,9
1722	Carpets and rugs	21,3	2914	Ovens and furnace burners	24,1
1723	Cordage, rope and netting	16,9	2915	Lifting equipment	22,8
1729	Other textiles	9,9	2919	Other general machinery	22,8
1730	Knitted fabrics and articles.	18,9	2921	Agricultural machinery	22,8
1911	Tanning and dressing of leather	2,4	2922	Machine tools	18,3
1912	Luggage, handbags	7,4	2923	Machinery for metallurgy	19,4
1920	Footwear	49,7	2924	Machinery for construction	13,7
2010	Sawmilling and planing of wood	2,1	2925	Food/beverage machinery	17,5
2021	Veneer sheets, etc.	7,6	2926	Machinery for textile	11,8
2022	Builders' carpentry and joinery	23,2	2927	Weapons and ammunition	23,5
2023	Wooden containers	12,6	2929	Other special purpose machinery	16
2029	Other wood products	15,8	2930	Domestic appliances, n.e.c.	53,1
2101	Pulp, paper and paperboard	5,6	3000	Office and computing machinery	5,2
2102	Corrugated paper	28,5	3110	Electric motors and transformers	8,5
2109	Other articles of paper	9,5	3120	Electricity distribution	9
2211	Publishing of books	1	3130	Insulated wire and cable	8,5
2212	Publishing of newspapers, etc.	0	3140	Accumulators, and batteries	4,3
2213	Other publishing	8,9	3150	Lighting equipment	19,4
2221	Printing	43,6	3190	Other electrical equipment	8,4
2222	Service act. (printing)	58,9	3210	Electronic valves, tubes, etc.	10,2
2310	Coke oven products	0	3220	TV/radio transmitters	13,8
2320	Refined petroleum products	0,4	3230	TV and radio receivers	22,5
2330	Processing of nuclear fuel	9,3	3311	Medical equipment	27,2
2411	Basic chemicals, except fertilizers	9,3	3312	Measuring appliances, etc.	37,5
2413	Plastics in primary forms	6,5	3320	Optical instruments	43,3
2421	Pesticides	10,1	3420	Automobile bodies, trailers	7,5
2422	Paints, varnishes	5,7	3430	Parts/accessories for automobiles	24,5
2423	Pharmaceuticals	8,1	3511	Building and repairing of ships	27,7
2424	Soap, cleaning	18,7	3512	Building/repairing boats	67,1
2429	Other chemical products	5,4	3530	Aircraft and spacecraft	5
2430	Man-made fibres	3,4	3591	Motorcycles	23,1
2511	Rubber tyres and tubes	6,2	3592	Bicycles and invalid carriages	15,1
2519	Other rubber products	4,5	3599	Other transport equipment	60,9
2520	Plastic products	26,6	3610	Furniture	17,9
			3699	Other manufacturing	14,9

Notes: Author's calculations. Input tariffs are computed at the 4-digit industry level by running the output tariffs through Argentina's input-output matrix. For each 4-digit industry, we generate an input tariff as the weighted average of tariffs on the intermediate goods used in the production of final goods of that 4-digit industry, where the weights are built by the input industry's share of the output industry's total output share. See section 5 for the formal construction of input tariffs.

Table 2: *Imported input intensity at the industry level*

Chile: 1989-1991			
High imported input intensity		Low imported input intensity	
Production of petroleum	0.211	Wearing apparel	0.050
Other chemicals	0.162	Printing	0.049
Textiles	0.148	Food and Beverage	0.044
Plastic	0.137	Non-metallic mineral products	0.036
Metal products	0.128	Tobacco	0.030
Iron and Steel	0.120	Beverage	0.021
Furniture	0.117	Petroleum	0.013
Glass	0.117	Wood	0.013
Machinery	0.108	Basic metal	0.010
Food	0.099		
Rubber	0.096		
Leather	0.076		
Footwear	0.064		
Chemical	0.062		
Paper	0.059		
Pottery	0.058		
Argentina: 1992			
High imported input intensity		Low imported input intensity	
Tubes	0.676	Metals	0.040
Radio, TV and Video	0.378	Other iron and metals	0.038
Iron and steel	0.256	Fuel	0.037
metal products	0.239	Fabric products	0.037
Cables	0.214	Food	0.036
Parts for vehicles	0.179	Electrical energy	0.034
Edition	0.156	Textil products	0.034
Chemical products	0.136	Other textiles	0.029
Rubber	0.104	Leather	0.027
Pesticide	0.101	Iron and steel	0.024
Fabrication of battery	0.094	Paper	0.023
Machinery for general use	0.092	Other vehicles	0.022
Rubber products	0.092	Machinery	0.022
Tobacco	0.078	Musical instruments	0.017
Dairy product	0.077	Shoes	0.015
Fibres	0.053	Bicycle and motorcycle	0.013
Bread products	0.050	Non metallic minerals	0.012
Printing	0.046	Ectric artefacts	0.009
Cereal and wheat	0.043	Vehicles	0.003
Cloths	0.042	Wood	0.000
Glass products	0.042	Medical instruments	0.000
Beverage	0.041	Craft, boats	0.000

Notes: Imported input intensity is calculated as the ratio of foreign intermediate goods to total production at the 3-digit industry level. The median of this measure is then calculated for each of the 3-digit ISIC industries in our sample. We then split the sample into high- and low-imported input intensity industries, according to whether firms belong to an industry with a level of imported input intensity above or below the median across 3-digit industries.

Table 3: *Variation of imported input intensity*

Variation	Chile	Argentina
Industries 3-digit	1989-1999	1992-2001
Within industry variation	0,085	0,004
Between industry variation	0,292	0,135
Total variation	0,379	0,138

Notes: This table shows the decomposition of the variation in imported input intensity during the period in between-industry and within-industry variations for both countries.

Table 4: *Descriptive evidence on industries with above and below the median input tariffs cut: Argentina (1992-1996)*

Variable Mean values	Above the median tariffs cut	Below the median tariffs cut
Labor productivity	133806	112243
Total employment	230	194
Export sales	12900000	6785117
Percentage of exporters in the industry type (above/below tariffs cut)	58	43

Notes: Above the median tariffs cut is a dummy equal to one if the firm belongs to 4-digit SIC industry with input tariff cuts above the median, and zero otherwise. Below the median tariffs cut is a dummy equal to one if the firm belongs to an industry with input tariff cuts below the median, and zero otherwise. The percentage of exporters is measured by the total number of firms selling in the foreign market over the total number of firms in the industries above (below) the median tariffs cuts.

Table 5: *Descriptive evidence on high and low imported intensive industries: Argentina (1992-2001) and Chile (1991-1999)*

Mean values	Chile	(1991-1999)	Argentina	(1992-2001)
Variable	High	Low	High	Low
Labor productivity	7469	6472	442329	291473
Total employment	83	77	275	262
Export sales	421740	242427	8004957	7217290
Percentage of exporters in the industry type (High/Low input intensity)	25	18	75	32

Notes: *High* (*Low*) corresponds to firms belonging to an industry with a level of imported input intensity above (below) the median across 3-digit industries. Imported input intensity is calculated as the ratio of foreign intermediate goods to total production at the 3-digit industry level. The median of this measure is then calculated for each of the 3-digit ISIC industries in our sample. Labor productivity is the ratio of value added over total labor and the percentage of exporters is the ratio between the number of exporters over the total number of firms in the sample. The percentage of exporters is measured by the total number of firms selling in the foreign market over the total number of firms in the industries with high (low) imported input intensity.

Table 6: TFP estimates at 3 digit industry level for Chile

ISIC 3	Industry	TFP LP	s.d.
311	Food	7.61	(1.03)
312	Other food	5.25	(0.93)
313	Beverage	6.30	(0.95)
314	Tobacco	16.98	(3.35)
321	Textiles	6.04	(0.72)
322	Wearing apparel	6.52	(0.73)
323	Leather	7.19	(0.76)
324	Footwear	6.56	(0.67)
331	Wood	6.99	(0.85)
332	Furniture	3.75	(0.82)
341	Paper	5.92	(0.80)
342	Printing	6.10	(0.64)
351	Chemical	9.62	(1.13)
352	Other chemicals	6.03	(0.74)
353	Petroleum refinery	4.87	(1.15)
354	Miscellaneous (petroleum)	9.65	(1.32)
355	Rubber	5.72	(0.64)
356	Plastic	6.19	(0.77)
361	Pottery	4.82	(0.75)
362	Glass	10.59	(1.24)
369	Non-metallic	6.92	(0.94)
371	Iron and Steel	5.72	(0.90)
372	Basic metal	10.30	(1.99)
381	Metal products	6.33	(0.72)
383	Machinery	7.80	(0.88)
384	Machinery apparatus	5.55	(0.82)
385	Transport equipement	10.06	(0.67)

Notes: The TFP is estimated at the 3-digit industry level using the Levinsohn and Petrin (2003) methodology from Bas and Ledezma (2008). This table reports the average TFP at 3-digit industry level.

Table 7: Descriptive Statistics from Chile and Argentina

	(1) Firms %	(2) Size	(3) VA over labor	(4) Technology	(5) Skill int.	(6) Imports %	(7) Exports %
CHILE (1990-1999)							
All firms	100 (3860)	80	6950	3496	0,28		
Domestic firms	97	77	6546	2426	0,27	85	
Multinationals	3	151	18178	33233	0,25	15	
Exporters only	10	138	11515	3476	0,26		43
Importers only	11	98	9723	4862	0,34	28	
Exporters and Importers	11	237	15531	20555	0,35	72	57
ARGENTINA (1992-2001)							
All firms	100 (636)	271	393315	1225	0,27		
Domestic firms	88	227	215637	993	0,24	62	
Multinationals	12	604	1752438	2890	0,48	38	
Exporters only	18	456	373011	1165	0,27		26
Importers only	14	355	386859	1066	0,25	11	
Exporters and Importers	38	975	465907	1938	0,33	89	74

Notes: Mean values over years reported. Size is measured by total employment, VA over labor measures labor productivity as value added over total employment, technology indicates foreign technology spending and skill intensity is calculated as the ratio of production over non production workers. Multinational firms are classified as firms that have more than 50% of foreign capital. In Argentina we have only 636 firms that answered the two surveys and that are present in the whole period (1992-2002), when we consider only the period 1992-1996 the total number of firms is 1639.

Table 8: OLS and First Difference Estimations. Exporter Importer Premia: Chile and Argentina

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**VA**	**Size**	**Tech.**	ΔVA	$\Delta Size$	$\Delta Tech.$
CHILE (1990-1999)						
Importer only	1.435***	0.740***	3.554***	0.043***	0.028***	2.560***
	(0.022)	(0.016)	(0.090)	(0.012)	(0.007)	(0.223)
Exporter only	1.529***	1.034***	1.358***	0.042***	0.040***	0.134
	(0.026)	(0.018)	(0.144)	(0.016)	(0.010)	(0.310)
Exporter and Importer	2.528***	1.594***	4.583***	0.080***	0.064***	2.657***
	(0.025)	(0.018)	(0.090)	(0.016)	(0.011)	(0.221)
Multinational	2.012***	1.127***	4.981***	0.012	0.051***	2.533***
	(0.049)	(0.031)	(0.109)	(0.027)	(0.014)	(0.231)
Number of Obs	38607	38607	9500	26523	26523	5401
Adjusted R-Sq.	0.398	0.314	0.320	0.001	0.002	0.162
ARGENTINA (1992-2001)						
Importer only	1.172***	0.792***	0.684***	0.342***	0.198***	0.119
	(0.083)	(0.063)	(0.193)	(0.098)	(0.070)	(0.102)
Exporter only	1.126***	0.811***	0.694***	0.378***	0.318***	-0.128
	(0.082)	(0.064)	(0.186)	(0.095)	(0.076)	(0.124)
Exporter and Importer	1.940***	1.522***	1.432***	0.580***	0.413***	0.249**
	(0.069)	(0.054)	(0.158)	(0.084)	(0.073)	(0.114)
Multinational	2.683***	1.837***	1.909***			
	(0.099)	(0.076)	(0.192)			
Number of Obs	2696	2696	1151	674	661	674
Adjusted R-Sq.	0.403	0.342	0.250	0.067	0.054	0.012

Notes: Size is measured by total employment, VA is value added, technology indicates foreign technology spending. Multinational firms are classified as firms that have more than 50% of foreign capital. Δ stands for first differences. In parentheses we report heteroskedasticity-robust standards errors. All regressions include 3-digit industry fixed effects and year fixed effects.

Table 9: Input tariffs and the intensive margin of exportrs. Argentina (1992-1996)

Dependent variable:	Log $X_{isk(96)}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Input tariffs(s) τ_{ms} (95)	-0.297**	-0.302**	-0.339**	-0.278*			
	(0.146)	(0.149)	(0.144)	(0.154)			
Output tariffs(s) τ_s (95)				-0.222			
				(0.376)			
Productivity(i)(92)	0.346***	0.385***	0.384***	0.386***	0.373***		
	(0.065)	(0.079)	(0.078)	(0.078)	(0.079)		
Size(i)(92)	1.075***	1.042***	0.996***	0.993***	0.981***	0.933***	0.895***
	(0.085)	(0.089)	(0.092)	(0.091)	(0.091)	(0.083)	(0.080)
Skill intensity(i) (92)		0.417***	0.435***	0.433***	0.440***	0.585***	0.546***
		(0.090)	(0.094)	(0.094)	(0.092)	(0.094)	(0.103)
Capital intensity(i)(92)		0.190***	0.190***	0.190***	0.181***	0.055	0.047
		(0.044)	(0.044)	(0.045)	(0.045)	(0.044)	(0.046)
Multinational(i)(92)		0.427*	0.452*	0.466**	0.480**	0.480*	0.481*
		(0.238)	(0.233)	(0.230)	(0.232)	(0.264)	(0.257)
Input tariffs(s) τ_{ms} (94)					-0.286*		
					(0.158)		
Output tariffs(s) τ_s (94)					-0.109		0.058
					(0.301)		(0.347)
Highτ_{ms} × Productivity(i)						0.011	0.013
						(0.028)	(0.032)
Lowτ_{ms} × Productivity(i)						0.078**	0.085**
						(0.038)	(0.040)
4-digit industry controls	No	No	Yes	Yes	Yes	No	Yes
Size(s)							
Skill intensity(s)							
Imported input intensity(s)							
2-digit ind. F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	685	585	585	585	581	602	591
R^2	0.365	0.389	0.392	0.393	0.389	0.441	0.445

Notes: The regressions are OLS estimations of Equation I (columns (1) to (5)) and Equation II (columns (6) and (7)) . The dependent variable, $LogX_{isk\ (96)}$, is the logarithm of export sales of firm i producing in 4-digit SIC industry s, belonging to 2-digit SIC industry k, in year 1996. All explanatory variables are expressed in logarithm and they are lagged of one period (1992 or 1995) to control for potential endogeneity issues. Firms' labor productivity is the ratio of value added over total employment and firms' size measures total employment. Skill intensity is the ratio of production over non production workers and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. $High\tau_{ms} = 1$ if the firm belongs to 4-digit SIC industry with a level of input tariffs above the median, and zero otherwise. $Low\tau_{ms} = 1$ if the firm belongs to an industry with input tariffs below the median, and zero otherwise. $High\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the high input tariffs dummy. $Low\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the low input tariffs dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances in columns (1) to (5) are corrected for clustering at the 4-digit industry level. In columns (6) to (7) disturbances are corrected for clustering at the firm and 4-digit industry level since the variable of interest is an interaction term between a firm variable and a 4-digit industry variable. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 10: Input tariffs and the intensive margin of exportrs. Argentina (1992-1996)

Dependent variable:	$\Delta LogX_{isk\,(92-96)}$				
	(1)	(2)	(3)	(4)	(5)
Change in input tariffs $\Delta\tau_{ms}$ (92-95)	-0.476*	-0.458*	-0.458*		
	(0.260)	(0.259)	(0.259)		
Change in output tariffs $\Delta\tau_s$ (92-95)			0.000		
			(0.000)		
Productivity(i)(92)	0.064	0.076	0.076		
	(0.061)	(0.061)	(0.061)		
Size(i)(92)	0.003	0.010	0.010	0.004	-0.037
	(0.074)	(0.075)	(0.075)	(0.064)	(0.069)
Skill intensity(i) (92)	-0.119*	-0.116	-0.116	-0.165*	-0.106
	(0.072)	(0.072)	(0.072)	(0.089)	(0.087)
Capital intensity(i)(92)	-0.029	-0.018	-0.018	0.017	0.015
	(0.043)	(0.046)	(0.046)	(0.045)	(0.045)
Multinational(i)(92)	0.311	0.320	0.320	0.444*	0.482**
	(0.224)	(0.223)	(0.223)	(0.231)	(0.226)
Above $\Delta\tau_{ms}$ × Productivity(i)				0.105*	0.108*
				(0.063)	(0.062)
Below $\Delta\tau_{ms}$ × Productivity(i)				0.090	0.078
				(0.061)	(0.060)
4-digit industry controls	No	Yes	Yes	No	Yes
Size(s)					
Skill intensity(s)					
Imported input intensity(s)					
2-digit ind. F.E.	Yes	Yes	Yes	Yes	Yes
Observations	410	410	410	423	423
R^2	0.090	0.094	0.094	0.213	0.224

Notes: The regressions are OLS estimations of Equation DI (columns (1) to (3)) and Equation DII (columns (4) and (5)). The dependent variable, $\Delta LogX_{isk\ (92\text{-}96)}$, is the change in the logarithm of export sales of firm i producing in 4-digit SIC industry s, belonging to 2-digit SIC industry k, between 1992 and 1996. All explanatory variables are expressed in logarithm and they are lagged of one period (1992 or 1995) to control for potential endogeneity issues. Firms' labor productivity is the ratio of value added over total employment and firms' size measures total employment. Skill intensity is the ratio of production over non production workers and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. $Above\Delta\tau_{ms} = 1$ if the firm belongs to 4-digit SIC industry with input tariff cuts above the median, and zero otherwise. $Below\Delta\tau_{ms} = 1$ if the firm belongs to an industry with input tariff cuts below the median, and zero otherwise. $Above\Delta\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the above input tariff cuts dummy. $Below\Delta\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the below input tariff cuts dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances in columns (1) to (3) are corrected for clustering at the 4-digit industry level. In columns (4) to (5) disturbances are corrected for clustering at the firm and 4-digit industry level since the variable of interest is an interaction term between a firm variable and a 4-digit industry variable. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 11: Input tariffs and the extensive margin of exportrs. Argentina (1992-1996)

Dependent variable:	$Exporter_{isk(96)}$ is a dummy=1 if the firm$_i$ exports in year 1996						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Input tariffs τ_{ms} (95)	-0.080***	-0.091***	-0.093***	-0.085***			
	(0.021)	(0.022)	(0.026)	(0.028)			
Output tariffs τ_s (95)				-0.028		0.007	0.007
				(0.059)		(0.066)	(0.074)
Productivity(i)(92)	0.024**	0.024*	0.023*	0.023*	0.022		
	(0.011)	(0.013)	(0.013)	(0.013)	(0.014)		
Size(i)(92)	0.181***	0.163***	0.164***	0.164***	0.167***	0.165***	0.166***
	(0.012)	(0.013)	(0.015)	(0.015)	(0.015)	(0.012)	(0.012)
Skill intensity(i) (92)		0.010	0.033	0.032	0.029	0.029	0.024
		(0.035)	(0.029)	(0.028)	(0.028)	(0.021)	(0.023)
Capital intensity(i)(92)		0.009	0.008	0.008	0.007	0.008	0.008
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Multinational(i)(92)		0.075**	0.071**	0.073**	0.067*	0.073*	0.070
		(0.034)	(0.035)	(0.035)	(0.035)	(0.042)	(0.042)
Input tariffs τ_{ms} (94)					-0.074**		
					(0.031)		
Output tariffs τ_s (94)					0.046		
					(0.036)		
High $\tau_{ms}\times$ Productivity						0.024	0.024
						(0.015)	(0.015)
Low $\tau_{ms}\times$ Productivity						0.027*	0.028*
						(0.014)	(0.014)
4-digit industry controls	No	No	Yes	Yes	Yes	No	Yes
Size(s)							
Skill intensity(s)							
Imported input intensity(s)							
2-digit ind. F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	685	585	585	585	581	602	591
R^2	0.365	0.389	0.392	0.393	0.389	0.441	0.445

Notes: The regressions are OLS estimations of Equation III (columns (1) to (5)) and Equation IV (columns (6) and (7)). The dependent variable, $Exporter_{isk\ (96)} = 1$ if firm i producing in 4-digit SIC industry s, belonging to 2-digit SIC industry k, has positive export sales in year 1996. All explanatory variables are expressed in logarithm and they are lagged of one period (1992 or 1995) to control for potential endogeneity issues. Firms' labor productivity is the ratio of value added over total employment and firms' size measures total employment. Skill intensity is the ratio of production over non production workers and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. $High\tau_{ms} = 1$ if the firm belongs to 4-digit SIC industry with a level of input tariffs above the median, and zero otherwise. $Low\tau_{ms} = 1$ if the firm belongs to an industry with input tariffs below the median, and zero otherwise. $High\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the high input tariffs dummy. $Low\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the low input tariffs dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances in columns (1) to (5) are corrected for clustering at the 4-digit industry level. In columns (6) to (7) disturbances are corrected for clustering at the firm and 4-digit industry level since the variable of interest is an interaction term between a firm variable and a 4-digit industry variable. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 12: Input tariffs and the extensive margin of exportrs. Argentina (1992-1996)

Dependent variable:	$\Delta Exporter_{isk(92-96)}$				
	(1)	(2)	(3)	(4)	(5)
Change in input tariffs $\Delta\tau_{ms}$ (92-95)	-0.060***	-0.065***	-0.059***		
	(0.018)	(0.021)	(0.022)		
Change in output tariffs $\Delta\tau_s$ (92-95)			0.000	-0.062***	-0.056***
			(0.000)	(0.020)	(0.021)
Productivity(i)(92)	0.017**	0.015	0.015		
	(0.008)	(0.011)	(0.011)		
Size(i)(92)	0.085***	0.078***	0.085***	0.079***	0.089***
	(0.009)	(0.011)	(0.012)	(0.010)	(0.012)
Capital intensity(i)(92)		0.006	0.005	0.007	0.006
		(0.007)	(0.007)	(0.007)	(0.007)
Skill intensity(i) (92)		0.000	0.023	-0.003	0.021
		(0.023)	(0.020)	(0.023)	(0.020)
Multinational(i)(92)		0.014	0.010	0.009	0.006
		(0.031)	(0.032)	(0.031)	(0.031)
Above $\Delta\tau_{ms}$ × Productivity(i)				0.020*	0.020*
				(0.011)	(0.011)
Below $\Delta\tau_{ms}$ × Productivity(i)				0.014	0.013
				(0.008)	(0.011)
4-digit industry controls	No	Yes	Yes	No	Yes
Size(s)					
Skill intensity(s)					
Imported input intensity(s)					
2-digit ind. F.E.	Yes	Yes	Yes	Yes	Yes
Observations	1194	896	896	926	926
R^2	0.228	0.271	0.276	0.268	0.274

Notes: The regressions are OLS estimations of Equation D.III (columns (1) to (4)) and Equation D.IV (columns (5) and (6)). The dependent variable, $Exporter_{isk\ (96)} = 1$ if firm i producing in 4-digit SIC industry s, belonging to 2-digit SIC industry k, has positive export sales in year 1996. All explanatory variables are expressed in logarithm and they are lagged of one period (1992 or 1995) to control for potential endogeneity issues. Firms' labor productivity is the ratio of value added over total employment and firms' size measures total employment. Skill intensity is the ratio of production over non production workers and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. $Above\Delta\tau_{ms} = 1$ if the firm belongs to 4-digit SIC industry with input tariff cuts above the median, and zero otherwise. $Below\Delta\tau_{ms} = 1$ if the firm belongs to an industry with input tariff cuts below the median, and zero otherwise. $Above\Delta\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the above input tariff cuts dummy. $Below\Delta\tau_{ms} \times Productivity(i)$ is an interaction term between firm productivity and the below input tariff cuts dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances in columns (1) to (3) are corrected for clustering at the 4-digit industry level. In columns (4) and (5) disturbances are corrected for clustering at the firm and 4-digit industry level since the variable of interest is an interaction term between a firm variable and a 4-digit industry variable. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 13: Imported input intensity and the intensive margin of trade. Chile (1991-1999)

Dependent variable:	Log(X_{ist})			
	(1)	(2)	(3)	(4)
TFP(i)(t-1)	0.160**			0.195***
	(0.064)			(0.066)
High λ_s × TFP(i)(t-1)		0.228**	0.228**	
		(0.103)	(0.103)	
Low λ_s × TFP(i)(t-1)		0.172**	0.172**	
		(0.078)	(0.078)	
Size(i)(t-1)	0.593***	0.696***	0.696***	0.695***
	(0.086)	(0.102)	(0.104)	(0.104)
Multinational(i)(t-1)			-0.014	-0.016
			(0.110)	(0.111)
Capital intensity(i)(t-1)			0.129**	0.126**
			(0.053)	(0.053)
Financial(i)(t-1)			-0.017	-0.019
			(0.089)	(0.089)
Skill intensity(i)(t-1)			-0.001	0.004
			(0.195)	(0.194)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	3440	3440	3440	3440
R^2	0.053	0.056	0.056	0.056

Notes: The regressions are OLS estimations of Equation V. The dependent variable, $Log(X_{ist})$, is the logarithm of total export sales of firm i in year t. All explanatory variables are lag of one period to control for potential endogeneity issues. The TFP is estimated at the 3-digit industry level using the Levinsohn and Petrin (2003) methodology. Firms' size measures the logarithm of total employment and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. The financial indicator is a dummy variable equal to one when the firm reports having paid a tax on credit. $High\lambda_s$ ($Low\lambda_s$) is a dummy equal one when the firm belongs to an industry with a level of imported input intensity above (below) the median across 3-digit industries in the pre-sample period 1989-1991. Imported input intensity of a 3-digit industry is calculated as the ratio of imported intermediate goods to production for all firms with available information. $High\lambda_s \times TFP_{i(t-1)}$ is an interaction term between firm total factor productivity in the previous year and the high imported input intensity dummy, and $Low\lambda_s \times TFP_{i(t-1)}$ is an interaction term with the low imported input intensity dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances are corrected for clustering at the firm level.***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 14: Imported input intensity and the intensive margin of trade. Argentina (1996-2001)

Dependent variable:	Log(X_{ist})			
	(1)	(2)	(3)	(4)
Productivity(i)(t-1)	0.120*			0.184**
	(0.066)			(0.079)
High λ_s × Productivity(i)(t-1)		0.131*	0.204**	
		(0.076)	(0.086)	
Low λ_s × Productivity(i)(t-1)		0.090	0.141	
		(0.088)	(0.103)	
Size(i)(t-1)	0.162	0.155	0.255**	0.263**
	(0.120)	(0.119)	(0.127)	(0.127)
Multinational(i)(t-1)			0.332*	0.327*
			(0.180)	(0.178)
Capital intensity(i)(t-1)			0.202**	0.200**
			(0.091)	(0.091)
Skill intensity(i) (t-1)			-0.021	-0.019
			(0.026)	(0.025)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	1191	1191	1186	1186
R^2	0.020	0.020	0.034	0.033

Notes: The regressions are OLS estimations of Equation V. The dependent variable, $Log(X_{ist})$, is the logarithm of total export sales of firm i in year t. All explanatory variables are lag of one period to control for potential endogeneity issues. Productivity measures the logarithm of labor productivity (value added over total employment). Firms' size measures the logarithm of total employment and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. $High\lambda_s$ ($Low\lambda_s$) is a dummy equal one when the firm belongs to an industry with a level of imported input intensity above (below) the median across 4-digit industries in 1992. Imported input intensity of a 4-digit industry is calculated as the ratio of imported intermediate goods to production for all firms with available information. $High\lambda_s \times Productivity_{i(t-1)}$ is an interaction term between firm productivity in the previous year and the high imported input intensity dummy, and $Low\lambda_s \times Productivity_{i(t-1)}$ is an interaction term with the low imported input intensity dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances are corrected for clustering at the firm level. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 15: Imported input intensity and the extensive margin of trade. Chile (1991-1999)

Dependent variable:	$Exporter_{is(t)}$ is a dummy=1 if the firm$_i$ exports in year t			
	(1)	(2)	(3)	(4)
TFP(i)(t-1)	0.015**			0.019***
	(0.006)			(0.006)
High λ_s * TFP(i)(t-1)		0.024**	0.025**	
		(0.011)	(0.011)	
Low λ_s * TFP(i)(t-1)		0.014**	0.014**	
		(0.007)	(0.007)	
Size(i)(t-1)	0.053***	0.060***	0.059***	0.059***
	(0.011)	(0.012)	(0.012)	(0.012)
Skill intensity(i)(t-1)			-0.014	-0.014
			(0.018)	(0.018)
Multinational(i)(t-1)			0.018	0.017
			(0.017)	(0.017)
Capital intensity(i)(t-1)		0.010*	0.010*	0.010*
		(0.005)	(0.005)	(0.005)
Financial(i)(t-1)			0.008	0.008
			(0.009)	(0.009)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	17488	17488	17488	17488
R^2	0.011	0.011	0.012	0.012

Notes: The regressions are OLS estimations of Equation VI. The dependent variable is a dummy equal to one if the firm i is active in the foreign market in t. All explanatory variables are lag of one period to control for potential endogeneity issues. The TFP is estimated at the 3-digit industry level using the Levinsohn and Petrin (2003) methodology from Bas and Ledezma (2008). Firms' size measures the logarithm of total employment and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. The financial indicator is a dummy variable equal to one when the firm reports having paid a tax on credit. $High\lambda_s$ ($Low\lambda_s$) is a dummy equal one when the firm belongs to an industry with a level of imported input intensity above (below) the median across 3-digit industries in the pre-sample period 1989-1991. Imported input intensity of a 3-digit industry is calculated as the ratio of imported intermediate goods to production for all firms with available information. $High\lambda_s \times TFP_{i(t-1)}$ is an interaction term between firm total factor productivity in the previous year and the high imported input intensity dummy, and $Low\lambda_s \times TFP_{i(t-1)}$ is an interaction term with the low imported input intensity dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances are corrected for clustering at the firm level. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 16: Imported input intensity and the extensive margin of trade. Argentina (1996-2001)

Dependent variable:	$Exporter_{is(t)}$ is a dummy=1 if the firm$_i$ exports in year t			
	(1)	(2)	(3)	(4)
Productivity(i)(t-1)	0.033***			0.046***
	(0.012)			(0.015)
High λ_s × Productivity(i)(t-1)		0.039***	0.052***	
		(0.014)	(0.016)	
Low λ_s × Productivity(i)(t-1)		0.015	0.027	
		(0.021)	(0.022)	
Size(i)(t-1)	0.030	0.028	0.042	0.045*
	(0.023)	(0.023)	(0.026)	(0.026)
Multinational(i)(t-1)			0.027	0.025
			(0.030)	(0.030)
Capital intensity(i)(t-1)			0.030*	0.030*
			(0.016)	(0.016)
Skill intensity(i) (t-1)			-0.000***	-0.000**
			(0.000)	(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2000	2000	1992	1992
R^2	0.036	0.036	0.039	0.038

Notes: The regressions are OLS estimations of Equation VI. The dependent variable is a dummy equal to one if the firm i is active in the foreign market in t. All explanatory variables are lag of one period to control for potential endogeneity issues. Productivity measures the logarithm of labor productivity (value added over total employment). Firms' size measures the logarithm of total employment and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital.$High\lambda_s$ ($Low\lambda_s$) is a dummy equal one when the firm belongs to an industry with a level of imported input intensity above (below) the median across 4-digit industries in 1992. Imported input intensity of a 4-digit industry is calculated as the ratio of imported intermediate goods to production for all firms with available information. $High\lambda_s \times Productivity_{i(t-1)}$ is an interaction term between firm productivity in the previous year and the high imported input intensity dummy, and $Low\lambda_s \times Productivity_{i(t-1)}$ is an interaction term with the low imported input intensity dummy. In parentheses we report heteroskedasticity-robust standards errors. Disturbances are corrected for clustering at the firm level. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 17: Alternative specifications. The extensive margin of trade. Chile (1991-1999)

Dependent variable:	$Exporter_{is(t)}$ is a dummy=1 if the firm$_i$ exports in year t			
	(1)	(2)	(3)	(4)
	Logit	Logit	Probit	Probit
TFP(i)(t-1)	0.421***		0.083***	
	(0.031)		(0.006)	
High λ_s × TFP(i)(t-1)		0.565***		0.110***
		(0.048)		(0.009)
Low λ_s × TFP(i)(t-1)		0.307***		0.063***
		(0.039)		(0.007)
Size(i)(t-1)	1.084***	1.096***	0.211***	0.214***
	(0.026)	(0.026)	(0.005)	(0.005)
Multinational(i)(t-1)	0.865*	0.850*	0.181*	0.177*
	(0.423)	(0.424)	(0.097)	(0.098)
Capital intensity(i)(t-1)	0.388***	0.400***	0.075***	0.077***
	(0.017)	(0.018)	(0.003)	(0.003)
Financial(i)(t-1)	0.374	0.376	0.073	0.073
	(0.246)	(0.246)	(0.079)	(0.079)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	17488	17488	17488	17488
R^2	0.011	0.011	0.011	0.011

Notes: The regressions are logit and probit estimations of Equation VI. The dependent variable is a dummy equal to one if the firm i is active in the foreign market in t. All explanatory variables are lag of one period to control for potential endogeneity issues. The TFP is estimated at the 3-digit industry level using the Levinsohn and Petrin (2003) methodology from Bas and Ledezma (2008). Firms' size measures the logarithm of total employment and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital. The financial indicator is a dummy variable equal to one when the firm reports having paid a tax on credit. $High\lambda_s$ ($Low\lambda_s$) is a dummy equal one when the firm belongs to an industry with a level of imported input intensity above (below) the median across 3-digit industries in the pre-sample period 1989-1991. Imported input intensity of a 3-digit industry is calculated as the ratio of imported intermediate goods to production for all firms with available information. $High\lambda_s \times TFP_{i(t-1)}$ is an interaction term between firm total factor productivity in the previous year and the high imported input intensity dummy, and $Low\lambda_s \times TFP_{i(t-1)}$ is an interaction term with the low imported input intensity dummy. Columns 3 and 4 report marginal effects of probit estimations. In parentheses we report heteroskedasticity-robust standards errors. Disturbances are corrected for clustering at the firm level. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.

Table 18: Alternative specifications. The extensive margin of trade. Argentina (1996-2001)

Dependent variable:	$Exporter_{is(t)}$ is a dummy=1 if the firm$_i$ exports in year t			
	(1) Logit	(2) Logit	(3) Probit	(4) Probit
Productivity(i)(t-1)	1.031***		0.243***	
	(0.342)		(0.077)	
High λ × Productivity(i)(t-1)		1.441***		0.339***
		(0.332)		(0.074)
Low λ × Productivity(i)(t-1)		0.729*		0.173*
		(0.394)		(0.095)
Size(i)(t-1)	0.877*	0.849*	0.218**	0.212**
	(0.450)	(0.436)	(0.108)	(0.105)
Multinational(i)(t-1)	0.862	0.502	0.218	0.143
	(1.041)	(1.042)	(0.223)	(0.239)
Capital intensity(i)(t-1)	0.680	0.677	0.157	0.156
	(0.441)	(0.433)	(0.100)	(0.099)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Number of firms	674	674	364	310
Observations	2000	2000	2000	2000

Notes: The regressions are logit and probit estimations of Equation VI. The dependent variable is a dummy equal to one if the firm i is active in the foreign market in t. All explanatory variables are lag of one period to control for potential endogeneity issues. Productivity measures the logarithm of labor productivity (value added over total employment). Firms' size measures the logarithm of total employment and capital intensity is the ratio of capital over total employment. Multinational firms are those that have more than 50% of foreign capital.$High\lambda$ ($Low\lambda$) is a dummy equal one when the firm belongs to an industry with a level of imported input intensity above (below) the median across 4-digit industries in 1992. Imported input intensity of a 4-digit industry is calculated as the ratio of imported intermediate goods to production for all firms with available information. $High\lambda \times Productivity_{i(t-1)}$ is an interaction term between firm productivity in the previous year and the high imported input intensity dummy, and $Low\lambda \times Productivity_{i(t-1)}$ is an interaction term with the low imported input intensity dummy. Columns 3 and 4 report marginal effects of probit estimations. In parentheses we report heteroskedasticity-robust standards errors. Disturbances are corrected for clustering at the firm level. ***,**, and *indicate significance at the 1, 5 and 10 percent levels respectively.