Foreign Exposure of Firms and Growth in Developing Countries[¥]

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Abstract

Recent studies have shown that both importers and exporters perform better than firms that serve only domestic markets. Using a detailed plant level dataset from 40 developing countries, this paper shows that there are persistent differences in firm evolution when they are grouped according to their trade orientation as: two-way traders (both importing and exporting), only importers, only exporters, and non-traders. Based on a dynamic framework of firm evolution which incorporates importing and exporting choices, I introduce a reduced form model. I analyze whether globally engaged firms grow faster and innovate more than domestic firms. Analyzing a rich set of measures of growth and innovation, I show that: i) globally engaged firms are larger, more productive, and grow faster than non-traders, ii) two-way traders are the fastest growing and most innovative group who are followed by only-exporters, iii) firms with foreign ownership grow faster but they are less innovative than domestically owned firms iv) estimating export premium without controlling for import status is likely to overestimate the actual value by capturing the import premium. Finally I show the robustness of the findings with providing evidence from the panel data constructed from the original dataset and using additional control variables that are likely to affect firm growth.

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1 Introduction

Since the availability of detailed firm level datasets, a new line of research has emerged that relates openness to trade and firm performance. Both theoretical and empirical findings as reviewed in Bernard et al. (2007) and Lopez (2005), show that firms that are engaged in international trade are larger and more productive than the ones that serve only domestic markets. This paper analyzes whether globally engaged firms differ from domestic firms in their evolution and in their abilities to introduce technological innovations.

In their review of firms in international trade, Bernard et al. (2007) compare the characteristics of exporting and importing firms in US manufacturing census. They show that both types of firms show many similarities in their performance measures. They are more productive, larger, and more capital and skill intensive than firms that don't have any trading relations with other countries. Evidence suggests that firm performance is systematically related to participation in international markets.

In this study, using a detailed dataset from the manufacturing sectors of forty developing countries, I provide evidence on the relation between foreign exposure of firms and their evolution. The analysis has two novel features. First, I provide a complete view of the trading activities of firms by grouping them according to their exposure to foreign markets. I distinguish firms that both import and export (two-way traders), that only export, and that only import. This allows me to compare firms' evolution with different levels of foreign exposure. Second, such detailed analysis is scarce for developing countries. As a result of globalization, firms in developing countries get more engaged with the rest of the world and determining how this engagement affects their evolution is important for making the right trade policies.

In analyzing how firms evolve, I introduce a theoretical model that incorporates foreign exposure of firms with their evolution. Since the seminal works of Grossman and Helpman (1991), Aghion and Howitt (1992), and Romer (1990) many studies in endogenous growth literature have found technological innovation to be the main determinant of growth. Following these studies, Klette and Kortum (2003) present a highly stylized model of firm and industry evolution. To their framework, I incorporate exporting and importing choice similar to setup in Melitz (2003)[1] and show how firms with different levels of global engagement differ in their evolution.

In determining how firms evolve, I look at growth rates of size measured as sales and employment and growth rate of labor productivity. Furthermore, I analyze whether firms implement technological innovations. I use several variables to measure innovation. I look at the

[1] Melitz (2003) only considers exporting choice of firm.

probabilities of introducing a new product, improving any existing process, having any internationally recognized quality certificate, and using foreign-licensed technologies. The availability of these different measures of firm evolution increases the robustness of the findings on the relation between firm evolution and trade.

Only a few studies that use micro level data explore the links between technological innovation and trade in developing countries. Among these are the studies by Almeida and Fernandes (2008) and Alvarez and Robertson (2004). This is a crucial question because the most significant source of technological progress in developing countries is related to their abilities to absorb the technology created in developed countries.

I analyze the relation between global engagement and growth in a reduced form model based the analytical framework explained above. In the analysis, I show that: i) globally engaged firms are larger, more productive, more capital intensive, and pay higher wages than purely domestic firms, ii) among exporters, firms that import intermediate products are more productive and grow faster, iii) firms that only import intermediate products are more productive and grow faster than non-traders, however the distinction between exporters and non-traders is more significant, iv) firms with foreign ownership grow faster but they are less innovative than domestically owned firms.

Importing and exporting can lead to higher performance in different ways. Higher use of foreign inputs can increase firm productivity due to access to more variety of inputs or directly due to their higher qualities. On the other hand, exporting increases the market size of the firm which increases future return of R&D investments. Eventually both activities decrease cost of implementing technological innovations and lead to better performance.

There have been recent studies that incorporate R&D decision into the analysis of firm evolution and foreign exposure. Using data from Taiwanese manufacturers, Aw, Roberts, and Winston (2007) find a significant role of R&D investments in explaining firms' export patterns, as well as interaction effects between R&D investments and export choices in explaining productivity changes. Moreover, Constantini and Melitz (2007) and Lileeva and Trefler (2007) explore the linkages between investments in innovation, productivity, and decision to export under trade liberalization. To explore these linkages, I introduce a simple analysis of interaction between R&D and trade and show how that is related to firm performance. Introducing three interaction terms of R&D with two-way traders, only importers, and only exporters, I show that contribution of R&D to firm evolution is significantly higher for two-way traders than the rest of the firms.

The rest of the paper is constructed as follows. In section 2, I explain the analytical framework that will be used as the basis for the reduced form model. Following that I introduce the dataset and variables of interest. Then in section 4, I perform a descriptive analysis that relates firm performance with its trade orientation. In section 5, I elaborate on the relation between evolution of firm and its trade orientation controlling for factors that can potentially affect firm evolution. In section 6, I analyze the interaction of firm's trade orientation with its R&D investment. Finally I provide sensitivity analysis to check the robustness of the findings and finish with some concluding remarks.

2 Theoretical Model

The existing literature on trade and firm heterogeneity has mostly evolved around exporting behavior of the firms. Many studies since Bernard and Jensen (1995) have shown that exporters outperform non-exporters in many dimensions. Different explanations have been proposed for these persistent differences across firms. The most acknowledged explanation is the self selection of most productive performers into the foreign markets. Exporting requires extra sunk costs and only the most productive firms can compensate these costs. Clerides et al. (1998), Bernard and Jensen (1999), and Aw et al. (1998) provide empirical evidence for the self-selection hypothesis and theoretical models like Melitz (2003) and Bernard et al. (2003) build this stylized fact into general equilibrium trade models.

Another activity that can be equally crucial as exporting for firms' performance is importing. In his survey on technology diffusion, Keller (2004) summarizes theoretical and empirical literature on how imports provide knowledge and technology transfer in a macro perspective. In studies like Romer (1990), Grossman and Helpman (1991), Kortum (1997), Eaton and Kortum (1999, 2002), the use of imported foreign intermediate goods implicitly involves the use of technology and knowledge embodied in them.

Recently, using micro level data, some empirical studies have shown that importers show similar characteristics as exporters. Bernard et al. (2007), Muuls and Pisu (2007), and Andersson et al. (2007) among few others show a positive relationship between importing intermediate goods and productivity. Using plant level data from Hungary, Halpern et al. (2005) analyze two channels by which imported products cause productivity improvements: their higher quality and imperfect substitution of foreign and domestic inputs. They show that two third of productivity increase caused by importing is attributable to an increase in the variety of intermediates used and the rest is due to an increase in quality. In another study, Amiti and Konings (2007) using data from Indonesia show that reducing input tariffs increase productivity three times more than a reduction in output tariffs. All this evidence shows that to be able to implement the right trade policies, how importing relates to firm performance must be well understood.

Based on this motivation, next I present an analytical framework that shows how global engagement of firms can be related to firm performance. More specifically, I analyze whether importing and/or exporting activities lead to higher innovation and growth. The static trading choices of firms are modeled as in Melitz (2003) setup. Firms choose whether to import intermediate products and export their output facing fixed sunk costs for both markets. Sole factor determining firms' participation in international markets is their efficiency levels which is exogenously assigned to them. Then I incorporate the solution of the firm's trading problem in a dynamic framework of firm evolution that allows firms to grow by innovation. This part of the model follows from Klette and Kortum (2003). Firms invest in R&D which results in innovations of new products.

I assume that there are *N+1* identical countries and in each country there are two sectors formed of final good producers and intermediate goods producers. In each country, a composite good *Y* is produced by a large group of monopolistically competitive final goods producers who produce multiple products (different varieties). Consumption of the composite good *Y* is determined by the CES production function given in equation 1 $Y = \left(\int_{j \in J} y(j)^{\frac{\sigma-1}{\sigma}} dj \right)^{\frac{\sigma}{\sigma-1}}$, as

$$Y = \left(\int_{j \in J} y(j)^{\frac{\sigma-1}{\sigma}} dj \right)^{\frac{\sigma}{\sigma-1}}, \tag{1}$$

where *j* is an index over varieties chosen from set *J* and $\sigma > 1$ is the elasticity of substitution between different varieties. Producers are distinguished only by their efficiency levels, indexed by $\varphi > 0$. Under monopolistic competition, producers with same efficiency levels charge the same price and make the same profit for each product they produce. The static profit maximization problem for production of any product, for given wage rate *w*, yields revenue and profit

$$r(\varphi) = \left(\frac{p(\varphi)}{P} \right)^{1-\sigma} E \text{ and } \pi(\varphi) = \frac{r(\varphi)}{\sigma} \tag{2}$$

where $p(\varphi)$ is the price charged by the firm, P is aggregate price index and E is aggregate expenditure of the composite good (E=PY).

In production of the final goods, firms employ labor, domestically produced intermediate goods and choose whether or not to use imported intermediate goods. To be able to import the intermediate goods, firms incur sunk cost f_i . This sunk cost determines a threshold value for efficiency $\overline{\varphi}$ such that firms with efficiency levels below $\overline{\varphi}$ can only use domestic intermediate goods in production. Their production function labeled as y^d is given in equation 3

$$y^d(\varphi) = \varphi l^\alpha \left[\int_0^1 x_d(j)^{\frac{\gamma-1}{\gamma}} dj \right]^{\frac{(1-\alpha)\gamma}{\gamma-1}}. \tag{3}$$

Here, l measures amount of labor, x_d measures domestic intermediate goods used in production, α is the measure of labor share ($0 < \alpha < 1$) and $\gamma > 1$ is the elasticity of substitution between any two intermediate inputs. In the intermediate goods sector, there is a continuum of firms producing differentiated goods and they have access to the same linear production technology with $x_d = l$.

Solving the profit maximization problem of the final goods producer in a symmetric equilibrium, we get $x_d(j) = x_d$ for all j. Total revenue for each product of a φ-type producer participating in only domestic market is

$$r^d(\varphi) = \left(\frac{w}{\alpha^\alpha (1-\alpha)^{1-\alpha} P\varphi} \frac{\sigma}{\sigma - 1} \right)^{(1-\sigma)} E. \tag{4}$$

On the other hand, firms with efficiency levels higher than $\overline{\varphi}$ will be able to import intermediate products using the production function in equation 5

$$y^{imp}(\varphi) = \varphi l^\alpha \left[\int_0^1 x_d(j)^{\frac{\gamma-1}{\gamma}} dj + \int_0^N x_i(j)^{\frac{\gamma-1}{\gamma}} dj \right]^{\frac{(1-\alpha)\gamma}{\gamma-1}}, \tag{5}$$

where x_i measures imported intermediates used in production[2]. In this specification of the production function, firms that import intermediate goods gain access to wider range of intermediates than firms using only domestic intermediates. This will lead them to have higher productivities. An alternative approach can be allowing imported intermediates to embody higher quality levels than the domestic intermediates. Then importers will benefit from using higher quality inputs which will allow them to generate more output[3]. Solution to the profit maximization problem of an importing firm gives $x_i(j) = x_i$ for all j and $x_i = x_d$ [4]. Following this, total revenue from each product for a φ-type producer who only imports can be written as

$$r^{impO}(\varphi) = (1+N)^{\frac{(1-\alpha)(\sigma-1)}{\gamma-1}} r^d(\varphi) \text{ with } (1+N)^{\frac{(1-\alpha)(\sigma-1)}{\gamma-1}} > 1. \tag{6}$$

In order to export, firms have to incur another sunk cost f_x. Similar to the choice of importing only firms with efficiency levels above a threshold level $\overline{\overline{\varphi}}$ will be able to export. In a

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[2] Kasahara and Lapham (2007) using the same production function.
[3] This interpretation for imported intermediates is used in Halpern, Koren, and Szeidl (2006).
[4] For simplicity I didn't include any iceberg transportation cost in the mode.

symmetric equilibrium, total revenue gained by a firm who exports to *N* countries but does not import will be $r^{\exp O}(\varphi)=\left(1+N\right)r^{d}(\varphi)\big)$ and the revenue gained by a firm who both imports and exports will be $r^{\exp/imp}(\varphi)=\left(1+N\right)r^{impO}(\varphi)\big)$.

I can compare the profit levels that would be gained from different levels of trade engagement. After adjusting the optimal profit level from equation 2 with the relevant fixed cost of trading, we get $\pi^{\exp/imp} > \left\{\pi^{\exp O}, \pi^{impO}\right\} > \pi^{d}$. The comparison shows that two-way traders generate the highest profit, which are followed by firms doing some trade and the domestic firms generate the lowest amount of profit.

Having solved the static trading problem of a firm, next I present the dynamic framework that allows firm to grow through introducing new varieties to the economy. Firms innovate new products at rate *I* which depends on both their R&D investment *R* and the existing stock of knowledge capital. The knowledge capital stands for all skills, techniques, and know-how that firms use in their attempts to innovate. Knowledge capital of a firm can be measured by the number of products that it currently produces *n*. Then innovation function can be written as

$$\mathrm{I} = \mathrm{F}(\mathrm{R}, \mathrm{n}).$$

This function is strictly increasing and homogeneous of degree one in both R and n. Under these assumptions, R&D cost can be written as a function of *I* and *n* as R=c(I/n)n. Here I/n determines innovation intensity which I denote as λ.

The dynamics of firm evolution is modeled as follows. A firm of efficiency type φ, with a current flow of profits $\pi(\varphi)\mathrm{n}$ faces a Poisson hazard μn of losing a product. By spending in R&D it influences the Poisson hazard *I* of becoming a firm with n+1 products. The firm chooses optimal amount of R&D to maximize its expected present value $V_{\varphi}(n)$. Bellman equation for firm's problem is

$$rV_{\varphi}(n)=\max_{\lambda>0}\left(\pi(\varphi)n - wc(\lambda)n + \lambda n\left[V_{\varphi}(n+1)-V_{\varphi}(n)\right] - \mu n\left[V_{\varphi}(n)-V_{\varphi}(n-1)\right]\right)$$

where *r* is the interest rate and *w* is the wage rate. The value function is linear in n which allows a simple solution to the problem. Solution of the problem is given in equation 7. It shows that optimal amount of innovation intensity λ is determined by setting marginal cost of innovation equal to marginal benefit[5]

$$c'(\lambda)=\frac{\pi(\varphi)-wc(\lambda)}{r+\mu-\lambda}. \tag{7}$$

[5] Details of solution of the Bellman equation under heterogeneous firm types are given in Lentz and Mortensen (2008).

Firms with higher values of λ introduce new products at a faster speed and grow faster. Equation 7 shows that higher profit level shifts up marginal benefit of innovation and leads to higher innovation (increases λ)[6]. Similarly, higher investment in R&D also increases innovation.

2.1 Discussion of the Model

Based on the analytical framework presented above, it is easy to see how engagement in global markets spurs growth. As was shown above $\pi^{\exp/imp} > \{\pi^{\exp O}, \pi^{impO}\} > \pi^{d}$ and higher profit leads to faster growth. Exports contribute to technological innovation through increasing firm market size and profits which in return increases potential gains of a successful innovation. This idea is also used in the theoretical models of Constantini and Melitz (2007) and Lileeva and Trefler (2007).

There has been studies that provide empirical evidence on the correlation between exporting and technology adoption or R&D investment such as Aw, Roberts, and Xu (2008), Aw, Roberts, and Winston (2007), and Bernard and Jensen (1997). In the model, more efficient firms self-select themselves into export market and make higher profits than domestic firms. More efficient firms also invest more in R&D. This explains the correlation between exporting and R&D.

On the other hand, imports contribute to innovation through access to more varieties (or possibly better quality inputs) to produce output. This increases their productivity and results in higher profit. Using data from Indian firms, Goldberg et al. (2008) provide empirical evidence for this relation. They show that imported intermediate goods increase new product innovation in the economy.

Since both exports and imports are likely to lead to more innovation and growth, firms that perform both activities are more likely to perform better than the ones who perform only one of the activities. In the reduced form analysis introduced in the empirical section, I will test the hypothesis whether firms that are engaged in global markets either through importing or exporting grow faster and innovate more than the firms who participate only in the domestic markets.

3 Data

For the analysis, I use plant[7] level data collected through the World Bank's Enterprise Surveys[8]. The surveys cover a rich set of developing countries from different regions of the world. In the

[6] A formal proof of this relation is given in Klette and Kortum (2003).

[7] Although, in the data unit of observation is plant, I will use firm in the rest of the paper. In the survey implemented in Latin American and Caribbean region countries there's a question asking whether the firm is a part of a larger firm. 89% of 6223 firms who answered to this question own a single plant.

survey of each country, a random sample of firms is selected that is representative of the manufacturing industry. A total of 17,875 firms from the manufacturing industries of 40 developing countries are used in the analysis. The surveys conducted in 2002 and 2005 cover Eastern European and Central Asian countries (BEEPS surveys). The 2006 survey covers the Latin American and Caribbean countries (LAC survey). Table 1 shows the number of firms included in each survey. Details of the observations from countries are given in Table 12 in Appendix[9]. In addition to the cross-sectional data, there are 1,769 firms from 30 countries that were surveyed twice in three years. The number of firms included in this panel is given in Table 2.

Table 1 Survey Summary

	Percent
BEEPS 2002	27
BEEPS 2005	38
LAC 2006	35
Total	17,875

Table 2 Survey Summary- Panel Firms

Panel Years	Percent
BEEPS 2002-2005	65
BEEPS 2005-2008	7
LAC 2003-2006	27
Total	1,769

3.1 Industry Summaries

The manufacturing industries that are included in the analysis are listed in Table 3. The classification of the industries is made according to ISIC revision 3.1. I divide firms into four groups according to their trade orientation: two-way traders, only importers, only exporters and non-traders. Table 3 shows the fraction of firms in each trade group. In almost all industries, non-traders make the largest share. Among the firms that trade, only importers make the largest share except textile industry. The high ratio of importers might show the imperfect substitutability between foreign and domestic inputs. It might show that sunk cost of importing is less than the sunk cost of exporting.

To see how engaged firms are with foreign markets, in Table 4, I show percentage of intermediate goods that are imported by importing firms and percentage of output that is exported

[8] See www.enterprisesurveys.org for the detailed description of the data and methodology.
[9] In dealing with the outliers, I excluded the firms with revenue growth rates that are more than four standard deviation higher than the average growth rate of all firms. There were 74 firms that were excluded.

by exporting firms[10]. The table shows that firms that have foreign exposure are quite involved with their foreign partners. Amount of imported intermediate goods make 54% of total intermediate goods used for production and amount of exported goods make 39% of total revenues. The median values are close to the mean values which supports the significance of participation in foreign markets.

Table 3 Manufacturing Industries – Trade Orientation of Firms

		Trade Shares in Industries (in %)				Total
ISIC	Industry	Export/ Import	Import Only	Export Only	None	(%)
15	Food	21.5	37.6	6.0	34.9	8.9
18	Garments	17.6	38.0	4.9	39.5	13.1
17	Textiles	33.4	25.9	9.0	31.6	25.7
29	Machinery & Equipment	24.7	25.6	13.2	36.4	6.7
24	Chemicals	17.4	43.5	3.5	35.5	22.6
31	Electronics	11.8	18.8	9.2	60.2	6.3
26	Non-metallic Minerals	8.4	21.4	7.0	63.2	5.5
	Other Manufacturing	15.8	38.7	9.8	35.7	11.2
	Total	3814	5929	1294	6806	17,875

Table 4 Percentage of Goods Traded

	% Imported		% Exported	
	Mean	Median	Mean	Median
Export/Import	54	50	39	30
Import Only	55	50	-	-
Export Only	-	-	40	30

3.2 Variables of Interest

The broad scope of the dataset allows me to observe a rich set of variables to analyze the underlying factors of firm evolution. The main focus of this study is to analyze the relation between firm evolution and its trade orientation. I use various variables to measure firm evolution. As direct measures of growth, I look at evolution of size measured as employment and sales and evolution of labor productivity. I also analyze different measures of technological innovation. These measures are product and process innovation, use of quality certificates and foreign licenses. In examining the relation between firm evolution and trade, I control for firm characteristics such as age, ownership type, investment, human capital, possibility of access to external finance, capacity utilization, and being part of a multi-plant firm. In addition to these variables, I also control for the level of competition in the market, 2-digit industry, and country characteristics. These variables are

[10] I have done this table separately for each survey year and the percentages do not change much across region or over time.

likely to affect firm evolution and without controlling for them, it is impossible to identify the exact relation between trade and growth. A complete list of variables used in the analysis is given in Table 5.

Table 5 Variable Descriptions

Variable	Definition
Export/Import	Dummy variable equal to one if the firm exported any output and imported any intermediate good.
Import Only	Dummy variable equal to one if the firm only imported any intermediate good.
Export Only	Dummy variable equal to one if the firm only exported any output.
None	Dummy variable equal to one if the firm neither imported nor exported any good.
Foreign (≥ %10)	Dummy variable equal to one if more than 10% of the firm is owned by private foreign individuals, companies or organizations.
Foreign (≥ %50)	Dummy variable equal to one if more than 50% of the firm is owned by private foreign individuals, companies or organizations.
Foreign (≤ %50)	Dummy variable equal to one if less than 50% of the firm is owned by private foreign individuals, companies or organizations.
Sales	Total annual sales.
Employment	Number of full time workers.
Product Innovation	Dummy variable equal to one if the firm introduced onto the market any new or significantly improved products.
Process Innovation*	Dummy variable equal to one if the firm introduced any new or significantly improved production processes including methods of supplying services and ways of delivering products.
Foreign License*	Dummy variable equal to one if the firm uses technology licensed from a foreign-owned company.
Quality Certificate	Dummy variable equal to one if the firm has an internationally-recognized quality certification.
R&D Ind	Dummy variable equal to one if the firm spent on research and development activities, within the establishment or other companies contracted.
Wage	Total annual cost of labor (including wages, salaries, bonuses, social payments).
Investment	Total annual expenditure for purchases of machine, equipment, and building.
NonProd Worker Share	The share of non-production workers (e.g., managers, administration, sales) in all workers.
Training	Dummy variable equal to one if the firm runs formal training programs for its employees.
Age	Survey year minus year the firm started operation
Total Hrs/Week	Total number of hours per week that the establishment normally operates
Access to Finance	Dummy variable equal to one if the firm uses banks or other financial institutions to finance its investments.
Capacity Utilization	Firm's current output in comparison with the maximum output possible using its facilities at the time.
Multi-plant Firm*	Dummy variable equal to one if the firm is part of a larger firm.
Competition (0, 1-3, ≥ 4)†	Dummy variables equal to one if the number of competitors that the firm faces in the national market for its main product line is 0, 1-3, or ≥ 4.
Log(Markup)†	Amount the sales price exceeds operating costs (i.e. the cost material inputs plus wage costs but not overheads and depreciation).

All data is from Enterprise Surveys. * These variables are only available for 2006 survey.
† Number of competitors and markup information for 2002 and 2005 surveys are used.

Data for BEEPS 2002 and 2005 are given in US Dollars but 2006 LAC data was in local currencies. Nominal values are deflated using GDP deflator from World Bank Development

Indicators database. All values are presented in 2000 constant US dollars and the exchange rate is taken from International Financial Statistics database.

Table 6 shows the summary statistics for technological innovation according to industries and firms' trade orientations. The variation across industries in different measures of innovation is relatively small. Looking at technology innovation according to firms' trade orientation, we see that firms with some foreign exposure are more innovative than non-traders. Among traders two-way traders are the most innovative group in all five measures.

Table 6 Fraction of Firms in Industries with Technological Innovation

Industries	New Product	Process Imp	Foreign License	Quality Certificate	R&D Indic
Food	0.55	0.61	0.15	0.19	0.41
Garments	0.42	0.59	0.12	0.13	0.49
Textiles	0.49	0.59	0.11	0.18	0.55
Machinery &Equipment	0.40	0.54	0.18	0.17	0.55
Chemicals	0.38	0.68	0.16	0.13	0.55
Electronics	0.30	0.39	0.16	0.14	0.57
Non-metallic Minerals	0.32	0.44	0.09	0.10	0.42
Other Manufacturing	0.49	0.63	0.13	0.14	0.40
Trade Orientation					
Export/Import	0.61	0.75	0.25	0.30	0.66
Import Only	0.49	0.63	0.12	0.12	0.49
Export Only	0.45	0.67	0.16	0.22	0.57
None	0.28	0.40	0.05	0.08	0.43

4 Descriptive Analysis of Trade Orientation and Firm Characteristics

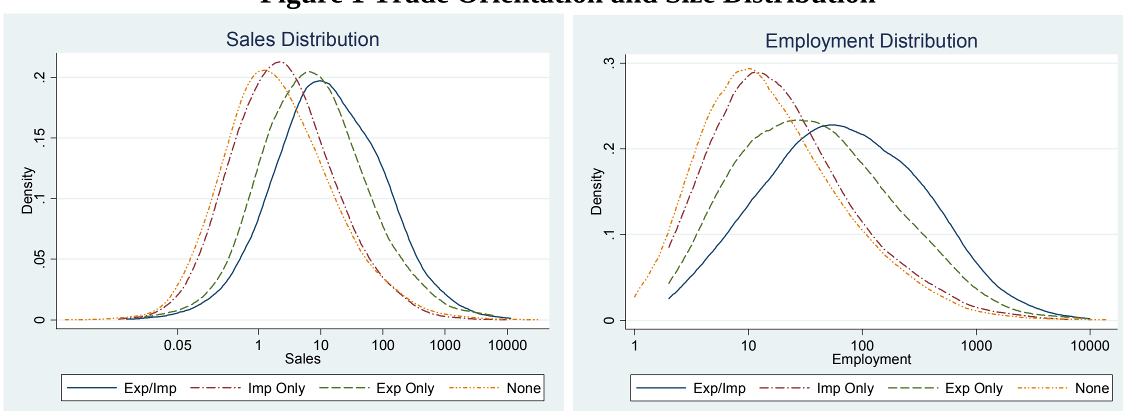
Before introducing the reduced form model following from the analytical framework introduced above, I provide a descriptive analysis of the relation between foreign exposure and certain measures of firm performance. First, I look at size distribution. Dividing firms into four groups according to their trade orientation, in Figure 1, I show the distribution of sales and employment. Two-way traders (Exp/Imp) outperform other groups in both measures. They are followed by only exporters (ExpOnly) who are followed by only importers (ImpOly).

To investigate the differences among firms further, I estimate the premium in several performance measures according to firms' trade orientation. I run the descriptive regression given in equation 8

$$y_{ijc} = \beta_0 + \beta_1 d^{xm}{}_{ijc} + \beta_2 d^{m}{}_{ijc} + \beta_3 d^{x}{}_{ijc} + \gamma X_{ijc} + \delta I_j + \lambda I_c + \mu I_t + \varepsilon_{ijc} \,. \qquad (8)$$

Here y_{ijc} refers to a vector of attributes of firm *i* in industry *j* in country *c* such as sales, labor productivity (measured as sales per worker), wage, investment per worker, ratio of non-production workers to all workers, and growth rates[11]. The survey includes information about firms' employments and revenues three years before the survey was conducted. Using this information, annualized growth rates can be calculated. On the right hand side of the equation three dummy variables d^{xm}_{ijc}, d^{m}_{ijc}, and d^{x}_{ijc} represent two-way traders, only importers, and only exporters in respective order. X_{ijc} represents total employment to control for current size. In addition, there is a vector of variables to control for 2-digit industry, country, and survey year effects listed in respective order I_j, I_c , and I_t. Controlling for country fixed effects allows me to isolate the potential differences in macro policies that may affect the evolution of firms. Similarly industry fixed effects account for differences in the level of competition, technology use and other factors that can create heterogeneity across industries. For the growth rate regressions, instead of current size, I use past values of employment, sales, and productivity as controls. Since most of the performance measures are in log scale, coefficients measure the percentage differences between traders and non-traders. All standard errors are clustered to allow for possible correlations in performance measures across firms within the same country and industry.

Figure 1 Trade Orientation and Size Distribution



[11] Although most of the countries were surveyed twice in three years, there's no information about the exiting firms. Hence the growth rates (and innovation variables in the following sections) are all measured conditional on the survival.

Table 7 Descriptive Regression (Pooled Cross-sectional Ordinary Least Squares)

Dependent Variable	Log Sales	Log Employment	Log Productivity	Sales Growth	Prod Growth	Employ Growth	Log Wage	Log Invest/Worker	NonProd/ Prod
Export/Import	1.995	1.55	0.397	0.219	0.065	0.083	0.279	0.32	0.062
	(0.068)***	(0.057)***	(0.041)***	(0.018)***	(0.006)***	(0.006)***	(0.030)***	(0.054)***	(0.009)***
Import Only	0.526	0.353	0.161	0.106	0.023	0.032	0.082	0.089	0.029
	(0.045)***	(0.033)***	(0.024)***	(0.014)***	(0.004)***	(0.004)***	(0.021)***	(0.044)**	(0.005)***
Export Only	1.254	0.906	0.315	0.164	0.037	0.056	0.184	0.247	0.038
	(0.084)***	(0.063)***	(0.044)***	(0.019)***	(0.007)***	(0.007)***	(0.032)***	(0.063)***	(0.01)***
Log(Labor)_t			0.033				1.032	-0.186	-0.036
			(0.009)***				(0.007)***	(0.014)***	(0.002)***
Log(Sales)_{t-3}				-0.043					
				(0.003)***					
$\text{Log(Productivity)}_{t-3}$					-0.114				
					(0.004)***				
Log(Labor)_{t-3}						-0.039			
						(0.002)***			
Observations	17843	17822	17822	16348	16091	17289	12103	10078	17292
R-squared	0.31	0.21	0.49	0.09	0.26	0.10	0.86	0.29	0.22

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 7 shows the regression results for equation 8. The coefficients on all performance measures are significant at 1% level. As expected, traders are better performers than non-traders. In addition to being larger and more productive, they pay higher wages, invest more, and grow faster than non-traders. Among traders, two-way traders are the best performers. This evidence is in accordance with the results of the analytical framework introduced above. Efficient producers self select themselves into foreign markets and among those only the most efficient ones can enter in both markets. Because, only the most efficient firms can overcome the sunk costs of entry. An important result of this estimation is that estimating export premium without controlling for import status is likely to overestimate the actual value by capturing the import premium.

In their performance rankings, two-way traders are followed by only-exporters. The lowest premium is observed in only-importers. This difference in the premiums might be due to higher sunk costs of exporting relative to importing. Hence the threshold productivity level is higher for exporting. Another explanation is the low substitutability of foreign intermediate inputs with domestic inputs. Although it is difficult to determine what derives higher performance of trading firms from this descriptive analysis, the results are similar to several recent studies. In two recent studies that use the same grouping of firms with respect to their foreign exposure, Vogel and Wagner (2008) derive a similar conclusion as here for West and East Germany manufacturers. Using data from Belgium manufacturers, Muuls and Pisu (2007) also find similar results except only importers rank higher than only exporters in their analysis.

I also perform this descriptive analysis using the panel data. For the panel dataset I use random effect regressions which are presented in Table 13 in Appendix. The results of the panel regressions support the results presented in Table 7. Although the coefficients have lower values than the cross-section regressions they are highly significant except the coefficient of only exporters in the regression for investment per worker. Applying the Breusch and Pagan Lagrange Multiplier test for the existence of random effect, I show that in all regressions except productivity growth and investment per worker random effects exist[12].

5 Empirical Model

Based on the theoretical model presented above, in this section I provide a reduced form analysis of whether participating in international markets is related to the heterogeneity in firm evolution. To identify this relation, I use alternative measures of firm evolution and I benefit from a rich set of control variables.

[12] I still presented them for completeness.

To measure firm evolution, I look at growth rates of size measured in employment and sales and growth rate of labor productivity. In addition to these, I look at variables that proxy for technological innovations. Enterprise surveys provide information on the probabilities of introducing new products, improving existing processes, and using various quality certificates such as ISO 9000 or 9002. Since the seminal works of Grossman and Helpman (1991) and Aghion and Howitt (1992), it has been argued that firms grow as a result of innovation and technology adoption. These measures of innovation would be interpreted as firms' adoption of production technologies, methods, or knowledge that are not available to them. This interpretation of innovation is preferable than the interpretation we would expect for the developed countries. In other words, in developing countries firms' innovations should be interpreted as approaching the frontiers of technology or production methods rather than extending the frontiers.

As was shown in the theoretical model, innovations are the main drivers of growth. Since firm level output prices are not available, measured values of productivity and revenues can be affected by both output and input price movements. Hence, these movements can affect the growth rates of size and productivity. On the other hand, the measures of innovation as well as employment growth are not affected from these movements. The use of various measures of firm evolution: growth rates and technological innovation rates improves the reliability of the results[13].

The data shows that measures of technological innovation are positively and significantly related to firm growth. Table 8 shows the results of regressing growth rates of size and log of productivity on the proxy measures of technological innovation. Each coefficient in the table results from regressing the dependent variable on one of the innovation measures. In the regressions, I control for 2-digit industry, survey year, and country fixed effects. Regressing employment growth on product innovation shows that firms that introduce new products over the past three years grew 4.4% faster than the firms that did not. Similarly these firms are 13.2% more productive than the firms that do not introduce a new product. The table clearly shows the positive relation between the innovation measures, productivity and growth rates as expected.

Following from the theoretical model introduced in section 2 and using the indicators representing innovative activity of firms, I estimate a reduced form probit model. The dependent variables measure whether the firm is engaged in technological innovation. In particular the model I estimate is as follows:

[13] One should note that the term innovation could be understood differently among the firms which could cause some measurement errors. I try to control this with inclusion of industry dummies as the understanding of innovation is more likely to be homogeneous within an industry.

$$\Pr(z_{ijc} = 1) = \Pr(\beta_1 d^{xm}{}_{ijc} + \beta_2 d^{m}{}_{ijc} + \beta_3 d^{x}{}_{ijc} + \gamma X_{ijc} + \delta I_j + \lambda I_c + \mu I_t + \varepsilon_{ijc} > 0) \quad (9)$$

where z_{ijc} is a discrete random variable equal to one if the *i*th firm in industry *j* in country *c* carries out a technological innovation. As in equation 8, in the right hand side of the equation there are three dummy variables d^{xm}_{ijc}, d^{m}_{ijc}, and d^{x}_{ijc} that represent two-way traders, only importers, and only exporters in respective order. In addition, there is a vector of control variables representing firm, 2-digit industry, country, and survey year listed in respective order X_{ijc}, I_j, I_c and I_t. Inclusion of industry fixed effects here can control for the possible differences across industries in the interpretation of technological innovations.

Table 8 Firm Evolution and Technological Innovation

	Employ Growth	Sales Growth	Log(Productivity)
Prod Innov	0.044	0.118	0.132
	(0.004)***	(0.01)***	(0.017)***
Proc Innov	0.038	0.017	0.22
	(0.006)***	0.011	(0.034)***
Quality Cert	0.007	0.073	0.394
	0.005	(0.012)***	(0.031)***

Robust standard errors clustered by country and industry. I control for 2-digit industry, survey year, and country fixed effects. ***p<0.01,** p<0.05, *p<0.1

In addition to reporting technological innovation variables, I also report employment, sales, and labor productivity growth using ordinary least squares method. The equation for this estimation is given in equation 10

$$\dot{y}_{ijc} = \beta_0 + \beta_1 d^{xm}{}_{ijc} + \beta_2 d^{m}{}_{ijc} + \beta_3 d^{x}{}_{ijc} + \gamma X_{ijc} + \delta I_j + \lambda I_c + \mu I_t + \varepsilon_{ijc}, \quad (10)$$

where $\dot{y}_{ijc}$ is the growth rate for the *i*th firm in industry *j* in country *c* and the right hand side variables are same as the ones used in equation 9.

The survey allows using a rich set of variables to control for firm characteristics that would affect its evolution. Both the theoretical and the empirical literature suggests that attributes like physical capital, human capital, size, age, and ownership structure are likely to affect firm evolution. Based on the analytical framework introduced in section 2, size reflects the built-in knowledge capital of the firm as well as firm's efficiency level. Size is measured using log of total full time employees. Second, I include a dummy variable showing whether the firm conducts R&D. Including R&D in the estimation allows to isolate the relation between trade and technological innovation. To control for other unobservable factors like the level of human capital, I use the amount of training that the employees get and the ratio of non-production workers to production workers in the firm. The level of physical capital was excluded from the analytical model for simplicity but it is a crucial determinant of growth. As a proxy for that, I use log of aggregate investment per employee. Finally, I control for the share of foreign ownership in the firm which has been analyzed in many studies such as Criscuolo, Haskel, and Slaughter (2005) and Almeida and Fernandes (2008). Foreign ownership can facilitate the transfer of better technology to the firm which reduces the cost of R&D and spurs growth. For the ownership structure, I set a dummy variable equal to one for firms with more than 10% of foreign ownership. This level is used by statistical agencies in many countries (e.g., the U.S. Bureau of Economic Analysis) and it is the amount defined in IMF's Balance of Payment Manual (1993).

Table 9 shows the estimation results. The first three columns show the growth rates of employment, sales, and productivity. The fourth column shows the log productivity and the fifth to eight columns show the measures of technological innovation: product innovation, process innovation, and use of quality certificate in respective order. The final column shows the use technology licensed from a foreign-owned company. Although this variable is not significantly correlated with the growth rates, it can reflects the adoption of better technology and firms with foreign exposure might be more inclined to get their technologies licensed. The coefficients in the probit regressions show the marginal effects at the mean values and all standard errors are clustered at industry and country level.

The estimation results show that firms with some level of foreign exposure perform better than non-traders which is in accordance with the theoretical results of section 2. They grow faster and they are more innovative. Coefficients of the variables measuring foreign exposure are highly significant for both growth rate and innovation measures. This increases robustness of the results. Estimation results reveal the same rankings of firms as in the descriptive regressions. Two-way traders perform better than only exporters who perform better than only importers in almost all measures of interest. The coefficients identifying foreign exposure are highly significant despite of the large set of variables that control firm characteristics. For the employment growth, two-way traders grow 8% faster than the non-traders and only exporters grow 4.5% faster. The growth premium is smallest for the only importers. This persistent ranking in all growth rates and indicators of technology adoption shows two results: i-) existence of a positive and significant relation between trade orientation of firms and their evolution ii-) complementarity between importing and exporting in generating this heterogeneity in evolution. The ranking of firms according to their trade orientation changes in process innovation and foreign license usage. One reason of this can be small sample bias. These two measures are only available for the LAC 2006 countries and among the firms in this region, there are relatively few firms in the only export category.

The coefficient of ownership in the estimation differs for growth rates and indicators of technology adoption. Although firms with foreign ownership grow faster than domestic firms, they do not significantly differ from domestic firms in product innovation and they show less process innovation than domestic firms. However they get more quality certificates and foreign licenses. Faster growth and lower or similar innovation might be interpreted as follows. Firms with foreign ownership use technology that is closer to frontier and apply methods that are more productive than the technology and methods used by domestic firms. Hence, they grow faster and feel less need to improve their products and processes.

Another result of the estimation is that large firms are more innovative. This is in accordance with the empirical evidence presented by Cohen and Klepper (1996). Also in the innovation function, size reflected knowledge capital stock of the firm that accumulated through its past innovations and more knowledge leads to more innovation. The other determinant of innovation function, R&D investment is also significantly related to firm growth and innovation. On the relation between the growth rates and size, we see the mean reverting behavior. Conditional on survival, smaller firms grow faster than large firms. This negative relation between growth rate and size has been shown in many studies. Two recent examples are Rossi-Hansberg and Wright (2007) and Lentz and Mortensen (2008). Similar inferences are driven for revenue and productivity growth. The variables that are used to control for human capital like training is significantly correlated with firm growth and technology adoption. On the other hand, share of non-production workers is negatively related to size growth but positively related to productivity growth and product innovation. The measure of physical capital, investment per worker is positively related to all variables except employment growth. Finally younger firms grow faster than older firms in size and they innovate more. However the effect of age seems to be quite small.

Overall, the estimation results show that despite a large set of firm, industry, and country level controls the relation between trade orientation of firms and their evolution is strong. Firms integrated with global markets grow faster and are more likely to adapt better technologies than the firms serving only domestic markets.

Table 9 Trade Orientation and Firm Evolution

	Employ Growth	Sales Growth	Proy Growth	Log(Proy)	Prod Innov	Proc Innov	Quality Cert	Foreign Lic
Export/Import	0.077	0.189	0.042	0.206	0.19	0.99	0.085	0.99
	(0.009)***	(0.023)***	(0.009)***	(0.043)***	(0.016)***	(0.024)***	(0.015)***	(0.035)***
Import Only	0.027	0.092	0.020	0.121	0.124	0.052	0.003	0.067
	(0.007)***	(0.019)***	(0.006)***	(0.028)***	(0.014)***	(0.022)**	0.011	(0.029)**
Export Only	0.045	0.175	0.026	0.134	0.153	0.992	0.058	0.109
	(0.010)***	(0.033)***	(0.009)***	(0.041)***	(0.024)***	(0.025)***	(0.025)**	(0.055)**
Foreign (≥%10)	0.046	0.12	0.043	0.165	-0.017	-0.062	0.034	0.127
	(0.007)***	(0.02)***	(0.008)***	(0.029)***	0.017	(0.035)*	(0.013)***	(0.032)***
Log(Invest/Worker)	-0.009	0.017	0.035	0.262	0.010	0.002	0.019	0.0023
	(0.002)***	(0.004)***	(0.002)***	(0.011)***	(0.005)**	0.007	(0.003)***	0.0045
NonProd Worker Share	-0.059	-0.004	0.05	0.375	0.145	-0.091	0.041	0.111
	(0.012)***	0.029	(0.011)***	(0.042)***	(0.028)***	(0.053)*	(0.018)**	(0.027)***
R&D Ind	0.033	0.04	0.017	0.164	0.135	0.209	0.049	0.037
	(0.006)***	(0.014)***	(0.006)***	(0.025)***	(0.02)***	(0.020)***	(0.010)***	(0.016)**
Training	0.045	0.094	0.023	0.106	0.11	0.145	0.112	0.042
	(0.005)***	(0.012)***	(0.005)***	(0.019)***	(0.014)***	(0.019)***	(0.009)***	(0.013)***
Age	-0.001	-0.001	0.0004	0.0002	-0.001	9.57E-05	0.0007	-0.0001
	(0.001)***	(0.001)*	(0.000)***	0.0007	(0.0004)*	0.0005	(0.000)**	0.0003
$Log(Labor)_{t-3}$	-0.058			0.07	0.0135	0.0004	0.044	0.035
	(0.003)***			(0.009)***	(0.009)***	0.009	(0.004)***	(0.006)***
$Log(Sales)_{t-3}$		-0.067						
		(0.005)***						
$Log(Productivity)_{t-3}$			-0.137					
			(0.006)***					
Observations	8073	7674	7587	8073	8065	2729	7973	2722
R2 /Pseudo R2	0.159	0.126	0.31	0.617	0.156	0.15	0.183	0.142

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects.

*** p<0.01, ** p<0.05, * p<0.1

6 Trade Orientation and R&D Relation

A number of studies following from Cohen and Levinthal (1989) have argued that R&D investment has two roles in firm performance: directly leading to higher innovation and allowing firms to assimilate knowledge or expertise from external sources (spillover effect). The first link is captured by the innovation function introduced in section 2. To see how important the second link is, I introduce an interaction term between R&D investment and trade orientation of firm. In the analysis, I include all the controls that are used in the main regression presented in Table 9 but I did not present them for brevity. I only performed this analysis for the variables with the largest number of observations available which were size growth and product innovation.

Table 10 Trade Orientation and R&D Interaction

	Employ Growth	Sales Growth	Prod Innov
Export/Import	0.060	0.146	0.17
	(0.012)***	(0.027)***	(0.026)***
Import Only	0.021	0.082	0.116
	(0.009)**	(0.021)***	(0.019)***
Export Only	0.048	0.118	0.132
	(0.016)***	(0.032)***	(0.040)***
Export/Import*R&D	0.028	0.076	0.038
	(0.014)**	(0.033)**	0.039
Import Only*R&D	0.012	0.023	0.016
	0.010	0.025	0.029
Export Only*R&D	-0.002	0.108	0.044
	0.019	(0.058)*	0.054
R&D Inv Indicator	0.020	0.003	0.116
	(0.010)**	0.021	(0.028)***
Foreign (≥%10)	0.045	0.118	-0.018
	(0.007)***	(0.020)***	0.017
Observations	8073	7674	8065
R2 /Pseudo R2	0.16	0.127	0.156

Robust standard errors clustered by country and industry are in parentheses.
I control for 2-digit industry, survey year, and country fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

The results are given in Table 10. For both employment and sales growth, positive relation between R&D and firm growth is significantly higher for two-way traders than the other groups[14]. Hence R&D is most contributive to growth for two-way traders. For sales growth, the interaction term for only exporters is also positive and this group is significantly different from only importers as well as non-traders[15]. These results are in accordance with Aw, Roberts and Winston (2007). In their study, they analyze the determinants of future profitability and find positive and significant

[14] For both employment and sales growth regressions, I compare the coefficients of two-way traders with only exporters and only importers including the interaction terms. Test results show that they are different at 1% significance level.
[15] Testing differences in coefficients show that only-exporters differ from only-importers at 5% significance level.

coefficient on the interaction term between R&D and export variable. For the regression on product innovation, although the interaction terms between R&D and trade orientation are positive, they are not statistically significant.

7 Sensitivity Analysis with Additional Controls

In this section I analyze the robustness of the main estimation results. The estimation results in Table 9 show strong correlation between trade orientation of firms and their evolution. Although it is rather difficult to make a causal inference due to lack of strong instruments or a panel dataset, I deal with this problem with controlling various firm characteristics, industry, country, and year fixed effects. In this section I check the robustness of main estimation results by introducing further controls that can affect the observed relation between trade and firm evolution. Firm characteristics such as different levels of foreign ownership, access to finance, capacity utilization, and being a multi-plant firm or other factors like the number of competing firms in the industry can be simultaneously correlated with firm evolution and openness of the firm. I will analyze whether the relation between trade and firm evolution persists under these additional controls. Although all variables included in the main regression are also included in these regressions, for brevity, I only present the coefficients of trade orientation of firms, foreign ownership, R&D indicator and the additional control variable included for the robustness analysis. The estimation results with these additional control variables are deferred to the Appendix.

In the first estimation, I elaborate on the definition of foreign ownership. Instead of using a dummy variable representing all firms with more than 10% foreign ownership, I use two dummy variables with more than 50% of foreign ownership representing majority foreign owned and less than 50% representing minority foreign owned firms. The estimation results are given in Table 14. The relation between trade orientation of firms and their evolution is not affected by this additional control. Firms' growth rates increase as foreign ownership increases. On the other hand, all foreign owned firms innovate less than the domestic firms but the results are mostly insignificant. The only significant result is that minority foreign owned firms show less process innovation than domestic firms. Majority foreign owned firms have more quality certificates and use more licenses from foreign companies.

As a second control, I add a dummy variable for a firm's access to external sources to finance its investment. Increased access to finance can cause firms to adopt better technologies especially when they are credit constrained. The estimation results in Table 15 show that access to external finance for investments is positively related to growth and product innovation. It is also positively related to the other measures of technology adoption but the results are not significant.

Alternatively, instead of the access to finance dummy variable, I use the amount of total investment that is financed through some financial intermediary[16]. The results are very similar. Inclusion of access to finance as an additional control doesn't to affect the relation between firm's evolution and its foreign exposure.

Next, I add total number of hours worked per week to control for capacity utilization. Becheikh et al. (2006) present evidence that firms that use their resources more efficiently are more likely to innovate and grow. This is especially valid for process innovation. If the firms are producing at a capacity close to their limits, they might be inclined to improve their processes that will lead to more access capacity. Table 16 shows the estimation results[17]. Firms with higher capacity utilization grow faster and are more productive. However the magnitude is small, a 10 hour increase in total hours worked per week leads to 1% increase in employment and sales growth. Alternatively I use capacity utilization measured as the firm's output relative to its maximum possible output. Using this measure also gives similar results and doesn't affect the relation between trade and growth[18].

In their detailed analysis of firm dynamics, Dunne, Roberts, and Samuelson (1988) conclude that multi-plant firms are more likely to survive and grow faster than single plant firms. Although their number is small, in the dataset some of the firms are part of a larger firm. To see whether this relation plays a role in the trade orientation of firms and their evolution, I include a dummy variable for multi plant firms. The results are given in Table 17. With this additional control, the number of observations decreases significantly. Two-way traders perform significantly better than non-traders in all variables of interest. For productivity and technological innovation variables the ranking among firms according to their trade orientation is preserved. Only exporters and only importers grow faster than non-traders in employment, sales and productivity but the differences are significant only for employment growth.

Finally I analyze whether the link between trade and firm evolution is affected by the degree of market competition that the firm faces. The literature on relation between market competition and innovation gives mixed results. On one hand, it is predicted that innovation should decline with competition, because competition reduces monopoly rents that the innovations yield. A classical example is Aghion and Howitt (1992). On the other hand, Shaked and Sutton (1987) argue that innovation increases product differentiation and this should cause it to increase with

[16] This table is available upon request.
[17] I only included firms with total hours/week ≥ 24.
[18] This table is available upon request.

competition. A more recent study by Aghion et al. (2005) introduces a model that combines these two relations and gets a negative- U shaped relation between competition and innovation.

To measure competition, I look at two variables. One is the markup that the firm charges. Second variable is the number of competitors that the firm faces in national market for its main product. For both variables, I use only the BEEPS survey. Table 18 shows the results for markup. In almost all measures of evolution, two-way traders perform better than only exporters who perform better than only importers. As the amount of markup increases (implying less competition in the market), probability of innovating new products increases. The result just captures the decreasing part of the negative-U shape derived in Aghion et al. (2005). On the other hand, as markups increase average productivity decreases.

Robust standard **errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects. *** p<0.01, ** p<0.05, * p<0.1**

Table 19 controls for the number of competitors in the firm's main product market. The relation between competition and firm evolution is similar for both controls of market competition. Although some of the results are not significant, both tables show that higher competition is related with higher productivity, faster employment growth but less innovation and they don't affect the relation between foreign exposure and growth.

8 Sensitivity Analysis Using the Panel Data

In this section, I use the balanced panel dataset constructed from the survey to provide support for the relation between trade orientation of firms and their evolution. For the panel regressions, I use random effects method. Panel regression methods have advantage over standard ordinary least square regressions performed above in making causal inferences. They allow us to control for the unobserved firm fixed effects. However the panel dimension is short and the sample size is small. For this reason, I will only analyze the growth rate of size and product innovation. In the estimation, I include the same controls as in equations 9 and 10. The results are given in Table 11. In the table, marginal effects are presented in the probit regression of product innovation.

The results in Table 11 are in accordance with the results presented in Table 9. Trading firms grow faster than non-trading firms. Two-way traders are the most productive group and they have the highest employment growth. As before, foreign ownership contributes to growth but is negatively related to product innovation. Investing in R&D and training continues to be positively related for growth and innovation. Compared to the main regression results given in Table 9, the coefficient of age changes sign in the panel regression for the estimation of log productivity but it is not significant. For the results on product innovation, coefficients of investment per worker and age are no longer significant. Overall, the panel regression results support the hypothesis that globally engaged firms grow faster. In the bottom of the table, I present Breusch and Pagan (1980)'s likelihood ratio test statistic which tests the existence of random effects in the model. The test strongly rejects the null hypothesis that there are no random effects.

Table 11 Trade Orientation and Firm Evolution: Panel Regressions

	Employ Growth	Sales Growth	Log(Proy)	Prod Innov
Export/Import	0.060	0.163	0.217	0.240
	(0.013)***	(0.049)***	(0.061)***	(0.049)***
Import Only	0.026	0.083	0.074	0.132
	(0.012)**	(0.040)**	(0.044)*	(0.041)***
Export Only	0.037	0.205	0.103	0.271
	(0.019)*	(0.076)***	0.077	(0.057)***
Foreign (≥%10)	0.027	0.139	0.204	-0.043
	(0.011)**	(0.039)***	(0.058)***	0.045
Log(Invest/Worker)	-0.005	0.016	0.25	0.012
	0.003	(0.009)*	(0.020)***	0.011
NonProd Worker Share	-0.052	-0.019	0.385	0.134
	(0.019)***	0.063	(0.073)***	(0.070)*
R&D Ind	0.035	0.044	0.195	0.136
	(0.011)***	-0.036	(0.044)***	(0.041)***
Training	0.040	0.106	0.069	0.186
	(0.010)***	(0.032)***	(0.042)*	(0.037)***
Age	-0.000	-0.001	-0.001	-0.001
	0.001	0.001	0.002	0.001
$Log(Labor)_{t-3}$	-0.051		0.078	0.029
	(0.005)***		(0.021)***	(0.015)*
$Log(Sales)_{t-3}$		-0.067		
		(0.010)***		
Observations	1698	1632	1698	1698
R2 /Pseudo R2	0.158	0.133	0.664	
Likelihood-ratio test of rho=0	0.001	0.062	0.043	0.005

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

9 Conclusion

Recent trade models with heterogeneous firms have shown that exporters are larger, more productive, more capital intensive, and pay higher wages than firms serving only domestic market. However the relation between firm growth and global engagement is less clear. In this study, using a detailed plant level dataset from forty countries, I analyze whether firms with foreign exposure grow faster than domestic firms. In analyzing foreign exposure, in addition to exporting I also analyze importing as several studies show that importers are quite similar to exporters in their evolution. Moreover, quite large shares of exporters are also importers. Hence both activities need to be evaluated carefully in order to answer how trade is related to growth.

I investigate the relation between firm growth and its trade orientation by dividing firms into four distinct groups: two-way traders, only importers, only exporters and non-traders. This classification allows me to see whether importing or exporting is more strongly related to faster firm growth. I use several direct and indirect measures to find growth. As direct measures, I look at growth rates of employment, sales, and productivity. As indirect measures, I look at innovations that firms introduce. More specifically, I look at the probabilities of introducing new varieties, improving existing production processes, using internationally recognized quality certificates, and using foreign licenses. There is vast amount of theoretical and empirical evidence that relates technological innovations to firm growth. Analyzing firm growth with a diverse set of variables increases the reliability of the results.

Based on the analytical framework introduced, I estimate a reduced form model. Several interesting results emerge from the analysis. Two-way traders grow faster and innovate more than any other group of firms. They are followed by only exporters. This result shows that exporters are heterogeneous among themselves and the best performers among them are also importers of intermediate products. There is complementarity between two aspects of trade. In their rankings of performance, two-way traders and only exporters are followed by only importers. Non-traders are the least growing and innovating group of firms.

Another finding is on the relation between foreign ownership and growth. Firms with some level of foreign ownership grow faster than purely domestic firms. However, they are less innovative than domestic firms. This result shows that firms with foreign ownership use technology that is closer to the frontier and hence have less incentive to innovate to be able to grow. For the other variables of interest, in accordance with model introduced in section 2, R&D is positively and significantly related to growth and innovation. Further analysis of the interaction between R&D investment and global engagement shows that R&D is more contributive to growth for two-way traders than all other groups of firms.

To check the robustness of the findings, I include further firm characteristics as control variables such as access to finance, more detailed foreign ownership variable, capacity utilization, and being part of a multi-plant firm which are likely to be correlated with growth, innovation and trade orientation of firm. I also include variables to control for the market competition that the firm faces. The positive relation between trade and growth persists under these additional control variables. As a second robustness check, I use a panel dataset constructed from the original dataset.

Using random effects panel regression model, I find significant positive relation between trade orientation of firms and growth.

The lack of long panel dataset makes it difficult to interpret the relations as causal. However, the strong correlation between direct and indirect measures of growth and trade under a rich set of control variables show the importance of the relation between importing, exporting, and firm evolution. The evidence from the panel data analysis reinforces this conclusion.

10 References

Aghion, Philippe and Peter Howitt (1992), "A Model of Growth through Creative Destruction," Econometrica 60: 323 - 351.

Almeida, Rita and Ana M. Fernandes (2008), "Openness and Technological Innovation in Developing Countries: Evidence from Firm-Level Surveys," Journal of Developing Studies, 44:5, pp 701-727

Alvarez, Roberto and Raymond Robertson (2004), "Exposure to Foreign Markets and Plant-Level Innovation: Evidence from Chile and Mexico," The Journal of International Trade and Economic Development, 13:1 pp 57-87

Amiti, Mary and Jozef Konings (2007), "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia," American Economic Review, vol. 97(5), pg 1611-1638.

Andersson Martin, Sara Johansson, Hans Loof, (2007) "Firm Performance and International Trade: Evidence from a small open Economy", Cesis Working Paper Series No: 99

Aw, Bee Y., S. Chung and M.J. Roberts (1998), "Productivity and the Decision to Export: micro evidence from Taiwan and South Korea", NBER WP Series 6558

Aw, Bee Y., Mark J. Roberts and Tor Winston (2007), "Export Market Participation, Investments in R&D and Worker Training, and the Evolution of Firm Productivity," The World Economy, 14:1, pp. 83-104.

Aw, Bee Y., Mark J. Roberts and Daniel Y. Xu (2008), "R&D Investments, Exporting and the Evolution of Firm Productivity," American Economic Review, Papers and Proceedings, 98:2, pp. 451-456.

Bartelsman, Eric J. and Mark Doms (2000), "Understanding Productivity: Lessons from Longitudinal Microdata," Journal of Economic Literature, 38(3), pp. 569-594.

Becheikh, Nizar, Rejean Landry and Nabil Amara (2006) "Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993-2003," Technovation, 26: 644-664.

Bernard, Andrew B. and J Bradford Jensen (1995), "Exporters, Jobs, and Wages in U.S Manufacturing: 1976-1987," Brookings Papers on Economic Activity, 67-119

_____ (1997), "Exporters, Skill Upgrading, and the Wage Gap," Journal of International Economics, 42, pp. 3-31.

_____ (1999), "Exceptional Exporter Performance: cause, effect or both?", Journal of International Economics, 47, 1-25

Bernard, A.B, J. Eaton, J.B. Jensen and S. Kortum, (2003),"Plants and Productivity in International Trade", American Economic Review, 93, 1268-1290

Bernard, A.B, J. Branford Jensen, S.J Redding, and Schott, P.K. (2007), "Firms in International Trade", Journal of Economic Perspectives.

Clerides, Sofronis K., Saul Lach, and James R. Tybout (1998), "Is Learning by Exporting Important? Microdynamic Evidence from Colombia, Mexico, and Morocco," Quarterly Journal of Economics 113, no. 3:903-947.

Cohen, Wesley and Steven Klepper (1996), "Firm Size and the Nature of Innovation within Industries: The Case of Process and Product R&D," Review of Economics and Statistics, 78(2), pp. 232-243.

Cohen, Wesley M. and Daniel A. Levinthal (1989), "Innovation and Learning: The Two Faces of R&D," Economic Journal, 99(397), pp. 569-596.

Constantini, James A. and Marc J. Melitz (2008), "The Dynamics of Firm-Level Adjustments to Trade Liberalization," in *The Organization of Firms in a Global Economy*, E. Helpman, D. Marin, and T. Verdier (eds.), Cambridge: Harvard University Press

Criscuolo, Chiara, Jonathan Haskel, and Mathew Slaughter (2005), "Global Engagement and the Innovation Activities of Firms," NBER Working Paper 11479.

Dunne, Timothy, Mark J. Roberts, Larry Samuelson (1989), "The Growth and Failure of U.S Manufacturing Plants" The Quarterly Journal of Economics, 104(4):671-698.

Eaton, Jonathan and Samuel Kortum (1999), "International Patenting and Technology Diffusion: Theory and Measurement," International Economic Review, 40, pp537-70

Eaton, Jonathan and Samuel Kortum (2002), "Technology, Geography, and Trade," Econometrica, 70:5, pp. 1741-79

Goldberg, Pinelopi K., Amit Khandelwal, Nina Pavcnik, and Petia Topalova (2008), "Imported Intermdiate Inputs and Domestic Product Growth: Evidence from India", NBER Working Paper 14416.

Grossman, G. M. and Helpman, E., 1991, *Innovation and growth in the global economy*. Cambridge, Massachusetts, MIT Press.

Halpern, Laszlo, Miklos Koren, and Adam Szeidl (2006), "Imports and Productivity," Mimeo, Department of Economics, University of Berkeley

Keller (2004), "International Technology Diffusion," Journal of Economic Literature, 752-782.

Kasahara, Hiroyuki and Beverly Lapham (2007), "Productivity and the Decision to Import and Export: Theory and Evidence," *Mimeo*, University of Western Ontario.

Klette, Tor J. and Samuel Kortum (2004), "Innovating Firms and Aggregate Innovation," Journal of Political Economy, 112(5), pp986-1018

Kortum, Samuel (1997), "Research, Patenting and Technological Change," Econometrica, 65(6), pp 1389-1419.

Lentz, Rasmus and Dale Mortensen (2008), "An Empirical Model of Growth through Product Innovation," Econometrical, 76(6), pp. 1317-73

Lileeva, Alla and Daniel Trefler (2007), "Improved Access to Foreign Markets Raises Plant Level Productivity… for Some Plants," NBER Working Paper 13297.

Lopez, Ricardo A. (2005), "Trade and Growth: Reconciling the Macroeconomic and Microeconomic Evidence," Journal of Economic Surveys, 19(4), pp 623-648.

Melitz, Marc .J (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", Econometrica, 71, 1695-1725

Muuls, Mirabelle and Mauro Pisu (2007), "Imports and Exports at the level of the firm: Evidence from Belgium," CEP Discussion Paper No 801

Romer, Paul (1990), "Endogenous Technological Change," Journal of Political Economy, 98:5, pp S71-102.

Rossi-Hansberg, Esteban and Mark L. J. Wright (2007), "Establishment Size Dynamics in the Aggregate Economy," American Economic Review, 97:5, pp. 1639-1666

Shaked, Avner and John Sutton (1987), "Product Differentiation and Industrial Structure," Journal of Industrial Economics, 36, pp131-146.

Vogel, Alexander and Joachim Wagner (2008), "High Productivity in Importing German Manufacturing Firms: Self-Selection, Learning from Importing or Both?," IZA Discussion Paper No.3854

APPENDIX

Table 12 Countries Included

Country	2002	2003	2005	2006	2008	Total
Albania	114	0	146	0	0	260
Argentina	0	0	0	711	0	711
Armenia	117	0	307	0	0	424
Azerbaijan	89	0	0	0	0	89
Belarus	222	0	209	0	85	516
Bolivia	0	0	0	342	0	342
Bosnia	120	0	115	0	0	235
Bulgaria	196	0	214	0	0	410
Chile	0	0	0	631	0	631
Colombia	0	0	0	615	0	615
Croatia	123	0	192	0	0	315
Czech	144	0	304	0	0	448
Ecuador	0	150	0	352	0	502
El Salvador	0	274	0	440	0	714
Estonia	164	0	202	0	0	366
FYROM	76	0	106	0	0	182
Georgia	149	0	144	0	88	381
Guatemala	0	19	0	307	0	326
Honduras	0	13	0	239	0	252
Hungary	194	0	482	0	0	676
Kazakhstan	198	0	424	0	0	622
Kyrgyzstan	111	0	160	0	0	271
Latvia	162	0	171	0	0	333
Lithuania	188	0	180	0	0	368
Mexico	0	0	0	1,044	0	1,044
Moldova	132	0	244	0	0	376
Nicaragua	0	28	0	334	0	362
Panama	0	0	0	192	0	192
Paraguay	0	0	0	349	0	349
Peru	0	0	0	345	0	345
Poland	336	0	750	0	0	1,086
Romania	206	0	524	0	0	730
Russia	307	0	390	0	0	697
Slovakia	131	0	152	0	0	283
Slovenia	182	0	202	0	0	384
Tajikistan	133	0	183	0	100	416
Turkey	417	0	323	0	0	740
Ukraine	381	0	452	0	413	1,246
Uruguay	0	0	0	322	0	322
Uzbekistan	245	0	239	0	117	601
Total	4,837	484	6,815	6,223	803	19,162

Table 13 Descriptive Regression (Panel Regressions: Random Effect)

Dependent Variable	Log Sales	Log Employment	Log Productivity	Sales Growth	Prod Growth	Employ Growth	Log Invest/Worker	NonProd/Prod
Export/Import	1.443	0.897	0.442	0.194	0.056	0.068	0.297	0.079
	(0.127)***	(0.085)***	(0.052)***	(0.031)***	(0.013)***	(0.008)***	(0.077)***	(0.017)***
Import Only	0.312	0.158	0.159	0.093	0.016	0.023	0.143	0.036
	(0.063)***	(0.038)***	(0.038)***	(0.025)***	(0.009)*	(0.009)***	(0.066)**	(0.013)***
Export Only	0.684	0.308	0.327	0.139	0.023	0.036	0.122	0.057
	(0.117)***	(0.088)***	(0.061)***	(0.042)***	(0.013)*	(0.012)***	0.127	(0.019)***
$Log(Labor)_t$			0.035				-0.19	-0.041
			(0.017)**				(0.024)***	(0.005)***
$Log(Sales)_{t-3}$				-0.037				
				(0.006)***				
$Log(Productivity)_{t-3}$					-0.108			
					(0.009)***			
$Log(Labor)_{t-3}$						-0.034		
						(0.003)***		
Observations	3587	3585	3585	3361	3318	3508	2119	3558
R-squared	0.349	0.233	0.55	0.0768	0.215	0.087	0.311	0.249
Breusch & Pagan Test	0.000	0.000	0.000	0.000	0.132	0.000	0.207	0.000

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 14 Majority and Minority Foreign Owned Firms

	Employ Growth	Sales Growth	Proy Growth	Log(Proy)	Prod Innov	Proc Innov	Quality Cert	Foreign Lic
Export/Import	0.077	0.189	0.042	0.207	0.19	0.10	0.085	0.101
	(0.008)***	(0.023)***	(0.009)***	(0.043)***	(0.016)***	(0.024)***	(0.015)***	(0.035)***
Import Only	0.027	0.092	0.02	0.122	0.124	0.055	0.003	0.069
	(0.007)***	(0.019)***	(0.006)***	(0.028)***	(0.014)***	(0.023)**	0.011	(0.029)**
Export Only	0.046	0.174	0.026	0.136	0.154	0.104	0.056	0.121
	(0.010)***	(0.033)***	(0.009)***	(0.041)***	(0.025)***	(0.025)***	(0.025)**	(0.056)**
Foreign (≥50%)	0.046	0.134	0.049	0.177	-0.020	-0.027	0.031	0.154
	(0.008)***	(0.024)***	(0.010)***	(0.032)***	0.018	0.041	(0.013)**	(0.033)***
Foreign (<50%)	0.043	0.069	0.022	0.114	-0.002	-0.147	0.043	0.037
	(0.011)***	(0.034)**	(0.010)**	(0.046)**	0.040	(0.067)**	0.027	0.043
R&D Ind	0.032	0.040	0.017	0.163	0.135	0.209	0.048	0.037
	(0.006)***	(0.014)***	(0.006)***	(0.024)***	(0.020)***	(0.020)***	(0.010)***	(0.016)**
Observations	8097	7695	7608	8097	8089	2737	7997	2730
R2 /Pseudo R2	0.159	0.126	0.311	0.618	0.156	0.15	0.182	0.141

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 15 Estimation with Access to Finance

	Employ Growth	Sales Growth	Proy Growth	Log(Proy)	Prod Innov	Proc Innov	Quality Cert	Foreign Lic
Export/Import	0.067	0.176	0.043	0.201	0.175	0.099	0.073	0.1
	(0.009)***	(0.022)***	(0.009)***	(0.046)***	(0.017)***	(0.024)***	(0.015)***	(0.035)***
Import Only	0.017	0.087	0.021	0.117	0.114	0.052	-0.002	0.068
	(0.007)**	(0.019)***	(0.006)***	(0.030)***	(0.016)***	(0.023)**	0.012	(0.029)**
Export Only	0.036	0.175	0.027	0.137	0.136	0.10	0.048	0.117
	(0.011)***	(0.039)***	(0.010)***	(0.043)***	(0.027)***	(0.026)***	(0.025)*	(0.056)**
Foreign (≥%10)	0.047	0.118	0.046	0.177	-0.022	-0.057	0.032	0.124
	(0.007)***	(0.019)***	(0.009)***	(0.031)***	0.018	0.036	(0.013)**	(0.031)***
R&D Ind	0.034	0.050	0.019	0.178	0.154	0.208	0.052	0.037
	(0.006)***	(0.014)***	(0.007)***	(0.026)***	(0.021)***	(0.020)***	(0.010)***	(0.015)**
Access to Finance	0.044	0.057	-0.006	-0.037	0.078	0.019	0.009	0.0082
	(0.006)***	(0.014)***	0.006	0.024	(0.015)***	0.022	0.010	0.013
Observations	7081	6708	6632	7081	7074	2715	6986	2708
R2 /Pseudo R2	0.166	0.134	0.308	0.606	0.161	0.15	0.191	0.141

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 16 Estimation with Total Hours Worked

	Employ Growth	Sales Growth	Proy Growth	Log(Proy)	Prod Innov	Proc Innov	Quality Cert	Foreign Lic
Export/Import	0.067	0.161	0.049	0.211	0.18	0.097	0.081	0.105
	(0.010)***	(0.023)***	(0.012)***	(0.058)***	(0.019)***	(0.025)***	(0.017)***	(0.035)***
Import Only	0.019	0.081	0.025	0.116	0.124	0.053	-0.0002	0.070
	(0.008)**	(0.017)***	(0.008)***	(0.038)***	(0.020)***	(0.023)**	0.014	(0.029)**
Export Only	0.042	0.118	0.023	0.126	0.136	0.098	0.066	0.123
	(0.013)***	(0.029***	(0.012)*	(0.054)**	(0.030)***	(0.025)***	(0.029)**	(0.061)**
Foreign (≥%10)	0.037	0.085	0.057	0.204	-0.030	-0.062	0.021	0.123
	(0.008)***	(0.021)***	(0.011)***	(0.035)***	0.024	(0.035)*	0.017	(0.032)***
R&D Ind	0.036	0.040	0.015	0.136	0.147	0.208	0.055	0.036
	(0.006)***	(0.016)**	(0.007)**	(0.028)***	(0.021)***	(0.020)***	(0.011)***	(0.016)**
Total Hrs/Week	0.001	0.001	0.0002	0.001	-0.000	0.0003	-0.000	0.0001
	(0.0001)***	(0.0002)***	(0.0001)*	(0.0004)***	0.0001	0.0002	0.000	0.0002
Observations	5632	5320	5253	5632	5628	2685	5549	2678
R2 /Pseudo R2	0.176	0.142	0.306	0.6	0.171	0.151	0.204	0.142

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 17 Estimation with Multi Plant Firms

	Employ Growth	Sales Growth	Proy Growth	Log(Proy)	Prod Innov	Proc Innov	Quality Cert	Foreign Lic
Export/Import	0.074	0.125	0.061	0.359	0.115	0.100	0.109	0.10
	(0.015)***	(0.030)***	(0.024)**	(0.092)***	(0.025)***	(0.024)***	(0.027)***	(0.035)***
Import Only	0.013	0.042	0.029	0.171	0.098	0.053	0.004	0.068
	0.011	(0.023)*	0.019	(0.074)**	(0.024)***	(0.023)**	0.024	(0.029)**
Export Only	0.020	0.029	0.025	0.215	0.066	0.104	0.126	0.119
	0.022	0.036	0.027	(0.109)*	(0.040)*	(0.026)***	(0.055)**	(0.056)**
Foreign (≥%10)	0.031	0.103	0.1	0.386	-0.094	-0.066	0.069	0.125
	(0.011)***	(0.029)***	(0.023)***	(0.058)***	(0.033)***	(0.036)*	(0.026)***	(0.032)***
R&D Ind	0.022	0.029	0.008	0.127	0.21	0.209	0.048	0.036
	(0.008)**	0.017	0.012	(0.042)***	(0.017)***	(0.020)***	(0.013)***	(0.016)**
Multi-plant firm	0.037	0.070	0.034	-0.009	0.041	0.023	0.064	0.011
	(0.015)**	(0.024)***	0.024	0.068	0.032	0.036	(0.025)***	0.022
Observations	2730	2443	2406	2730	2726	2729	2646	2722
R2 /Pseudo R2	0.161	0.2	0.3	0.575	0.147	0.15	0.291	0.142

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 18 Estimation with Controlling for Market Competition: Log(Markup)

	Employ Growth	Sales Growth	Proy Growth	Log(Proy)	Prod Innov	Quality Cert
Export/Import	0.074	0.214	0.038	0.166	0.202	0.081
	(0.011)***	(0.030)***	(0.007)***	(0.042)***	(0.019)***	(0.019)***
Import Only	0.030	0.088	0.018	0.115	0.104	0.012
	(0.008)***	(0.025)***	(0.005)***	(0.029)***	(0.016)***	0.013
Export Only	0.047	0.233	0.035	0.137	0.187	0.059
	(0.012)***	(0.045)***	(0.009)***	(0.043)***	(0.030)***	(0.030)**
Foreign (≥%10)	0.045	0.107	0.029	0.119	0.004	0.018
	(0.008)***	(0.027)***	(0.009)***	(0.034)***	0.019	0.014
R&D Ind	0.045	0.053	0.015	0.169	0.024	0.027
	(0.008)***	(0.021)**	(0.007)**	(0.032)***	0.023	0.017
log(Markup)	-0.004	0.007	-0.002	-0.044	0.033	-0.008
	0.004	0.013	0.004	(0.017)**	(0.013)**	0.007
Observations	4885	4780	4740	4885	4881	4873
R2 /Pseudo R2	0.161	0.113	0.346	0.667	0.0974	0.148

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 19 Estimation with Controlling for Market competition: Number of Competitors

	Employ Growth	Sales Growth	Proy Growth	Log(Proy)	Prod Innov	Quality Cert
Export/Import	0.063	0.198	0.033	0.136	0.187	0.077
	(0.011)***	(0.031)***	(0.007)***	(0.037)***	(0.023)***	(0.021)***
Import Only	0.029	0.073	0.01	0.083	0.105	0.005
	(0.009)***	(0.028)***	(0.005)**	(0.030)***	(0.021)***	0.015
Export Only	0.045	0.201	0.023	0.097	0.177	0.054
	(0.012)***	(0.048)***	(0.008)***	(0.038)**	(0.032)***	(0.031)*
Foreign (≥%10)	0.044	0.119	0.031	0.137	0.011	0.025
	(0.008)***	(0.028)***	(0.009)***	(0.031)***	0.020	0.016
R&D Ind	0.042	0.072	0.021	0.193	0.037	0.028
	(0.010)***	(0.025)***	(0.007)***	(0.030)***	0.024	0.019
Competition (1-3)	0.026	0.005	-0.011	0.173	0.008	-0.008
	0.023	0.054	0.018	(0.087)**	0.069	0.046
Competition (≥4)	0.014	0.001	-0.011	0.137	-0.009	-0.025
	0.022	0.053	0.016	0.086	0.067	0.049
Observations	4010	3917	3882	4010	4006	3994
R2 /Pseudo R2	0.157	0.121	0.355	0.681	0.0991	0.15

Robust standard errors clustered by country and industry are in parentheses. I control for 2-digit industry, survey year, and country fixed effects. *** p<0.01, ** p<0.05, * p<0.1