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ABSTRACT

An increasing body of evidence indicates that an important share of aggregate productivity growth, in both developed and developing countries, arises from the reallocation of resources across plants of different productivity levels. New trade models with heterogeneous firms (Bernard et al., 2003; Melitz, 2003) suggest that international trade plays an important role in this reallocative process. Focusing on a developing country, Chile, we use explicit measures of trade costs to explore the existence of the channels suggested by these new trade models. We provide new key findings for developing countries: first, trade costs affect the reallocative process by protecting inefficient producers, lowering their likelihood to exit, and also by limiting the expansion of efficient plants, lowering their likelihood to export. Second, the reallocative impacts of trade arise not only from tariff barriers but also from transport costs.

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I. Introduction

A great deal of research has been devoted to analyze the effects of international trade on aggregate productivity. At the micro level, a rich literature has evolved to investigate the links between trade and productivity using firm level data. A general finding from this line of research is that firms that engage in international competition tend to be more productive; however, whether trade fosters productivity or more productive firms are able to trade more, has been the subject of much debate (see e.g. Aw, Chung, and Roberts, 2000; Bernard and Jensen., 1999; Bernard and Jensen, 2004; Clerides, Lach, and Tybout, 1998; Harrison, 1994; Pavcnik, 2002: Alvarez and Lopez, 2005; and Fernandes, 2007).

While the discussion on whether trade can increase aggregate productivity by raising plant efficiency still settles, an increasing body of evidence indicates that an important share of aggregate productivity growth, in both developed and developing countries, arises from the reallocation of resources across plants of different productivity levels (see for example, Bernard and Jensen, 1999; Bartelsman, Haltiwanger and Scarpetta, 2004). Moreover, new trade models with heterogeneous firms (Bernard et al., 2003; Melitz, 2003) suggest that international trade plays an important role in this reallocative process. According to these models, trade has a Darwinian effect, weeding out the low and boosting the high productivity firms and raising, in the process, the economy's average productivity. Surprisingly, the empirical support to the reallocation channels suggested by these models is still scarce. One exception is recent work by Bernard, Jensen and Schott (2006).

While Bernard, Jensen and Schott (2006) constitutes an important contribution to the literature, it has focused exclusively on the U.S. Whether similar effects are present in developing countries is relatively less well known. Early work on trade and productivity in developing countries provide some hints that trade indeed fostered aggregate productivity through a better reallocation of resources across plants of different productivity levels. For instance, Tybout (1991) finds that market share reallocations contribute to productivity growth among tradeable sectors in Chile, Colombia and Morocco. Pavcnik (2002) also finds that the reallocation of market shares toward more efficient plants is an important source of aggregate efficiency gains after a period or large liberalization in

Chile. While these studies are very important, they do not explore specifically the channels by which international trade induces these market share reallocations, nor they link such market shares reallocations with explicit measures of trade costs. A more recent work on Colombia (Eslava et al., 2009) advances the state of the research along these lines. Using real effective rates of protection, the authors show that the tariff reductions observed in Colombia during the early 1990s contributed significantly to increase aggregate productivity by raising the exit rate of the low-efficiency plants.

Building on this existing literature, the main goal of this paper is to provide some new evidence for a developing country, Chile, on the various channels by which trade reallocates resources from low to high productivity plants linking these reallocations with measures of trade barriers. Our contribution is twofold. First, we use explicit measures of trade costs including not only tariff barriers but also freight costs, a component of trade costs that has often been ignored in the trade and productivity literature but whose relative importance has increased over time. Second, we explore the role of alternative mechanisms by which trade could increase aggregate productivity through the reallocative process, namely, not only the exit channel but also the entry into exporting channel and the growth of the exporter's channel. We find that trade costs affect the reallocative process not only by protecting inefficient producers, lowering their likelihood to exit, but also by limiting the expansion of the efficient plants, lowering their likelihood to export. We also find that these reallocative impacts arise not only from the presence of tariff barriers but also from transport costs.

The paper proceeds as follows. Section II provides a brief summary of the new trade models that provide the theoretical predictions guiding our empirical analysis. This section also describes the various datasets used in the study. Section III delineates the empirical strategy, presents the econometric estimations and discusses the main empirical findings. Section IV concludes.

II. Theoretical Background and Data Description

II.A. Theoretical Background

Our empirical strategy is guided by the heterogeneous-firm models derived by Melitz (2003) and Bernard et al. (2003). In these models, when trade costs fall, industry productivity rises both because low-productivity, non-exporting firms exit and because high-productivity firms expand through exporting. More specifically, when trade costs fall, exporters experience greater profits to which they respond by expanding their exports. Greater profits also induce more entry into the market. Specifically, lower trade costs reduce the productivity threshold for exporting which increases the number of firms that export to other markets. The new exporters are drawn from the most productive non-exporters plants and from the new entrants. At the same time there is exit from the market. In Melitz's model, the increase in the labor demand led by the expansion of the more productive firms through exporting and from the new entrants raises the real wage in the industry and forces the least productive firms to exit. In Bernard et al.'s model the exit occurs because lower trade costs mean that firms face more competition from foreign firms that on average tend to be more productive than the domestic firms.

In summary, aggregate productivity gains occur with falling trade costs because the low productivity plants exit the market, the most productive non-exporters begin to export, and the current exporters, which are the high-productivity firms, expand their sales in foreign markets. Our exercises consist on investigating whether we observe evidence of these effects in the data.

It should be noted that the predictions of the Melitz (2003) and Bernard et al. (2003) models presume multilateral reductions in trade costs.[1] This is precisely what we have in mind. Our dataset covers the second half of the 1990s and the first half of the 2000s. During this time, policy barriers decreased not only in Chile but in many other parts of the world. Therefore, we can hardly argue that this case represents a unilateral liberalization episode. The same is true for the costs of transportation. Even though LAC countries exhibit in general larger transport costs relative to other regions, the *evolution* of these costs in Chile during the period of consideration followed a trend very similar to many other countries in the world (see IDB, 2008).

II.B. Data Description

The manufacturing data in this study come from the *Encuesta Nacional Industrial Anual* (ENIA). This is an annual survey of manufacturing conducted by the Chilean statistics agency, the *Instituto Nacional*

[1] Melitz and Ottaviano (2008) show that a unilateral liberalization episode might not generate the same effects as in Melitz (2003) in the long run.

de Estadísticas (INE). The ENIA covers all manufacturing plants that employ at least ten individuals. It collects detailed information on plant characteristics, such as manufacturing subsector, production, value added, exports, employment, intermediate inputs, and investment. Capital stocks were constructed using the perpetual inventory method for each plant. The available data covers the period 1995-2006 which provides us with a panel of 65,180 observations. A measure of total factor productivity is constructed using the Levinsohn and Petrin (2003) methodology.

Regarding the trade costs, the standard practice in most of the microeconometric studies about trade and productivity, has been to regard the cost of transporting goods as a nuisance and to just assume they are zero for the sake of simplicity. However, rather than an annoying residual, transport costs have evolved to be what is arguably one of the most important obstacles to trade for many developing countries, including Chile (see Moreira, Volpe and Blyde, 2008). In practical terms, this means that the reallocation impact of trade might not be fully accounted without incorporating this trade cost. Accordingly, we assess the impact of both tariffs and freight rates on the reallocative process.

We calculate ad valorem freight rates as the ratio of the value of freights and insurance over the values of imports (fob). The data come from the Foreign Trade Statistics System of ALADI (Latin American Association of Foreign Trade) which reports import values at the 6-digit HS as well as costs of freight and insurance. The data is aggregated at the 3 digit ISIC rev-2 industry level, where the rate in industry *i* is the weighted average across all products in *i*. The tariff rate is also a weighted average aggregated at the same industry level and come from Nicita and Olarreaga (2006). The tariff rate in this dataset refers to applied tariff rates which take into consideration preference schemes.

Table 1 reports summaries of these trade costs for three alternative years. On average, freight rates declined from 1995 to 2000 but increased since then. For some industries, like petroleum refinery products (353) the increased was severe (more than double). The increase in freight rates from 2000 to 2005 coincides with the overall increase in the international price of oil and fuels for transportation. Despite this recent trend, 20 out of 29 industries experienced overall declines in freight rates between 1995 and 2005. Regarding tariffs, all industries exhibited a fall in their applied tariff rates consistent with the country's long tradition to lower the levels of external protection. While tariff rates remain relatively stable between 1995 and 2000, the fall was more pronounced between 2000 and 2005. On average, the applied tariff in the manufacturing industry declined by around 60% during the period of analysis.

It is important to note that while the average tariff and freight rates were roughly similar at the beginning of the period, by 2005 the tariff rate has become only a fraction of the ad-valorem freight rate. As mentioned before, this is not an exclusive feature of the Chilean economy but a characteristic that is shared by several developing countries. After a wide-ranging process of liberalization, ad valorem freights are today higher than tariffs for both exports and imports in many developing countries (see Moreira et al., op. cit.).

One caveat with respect to our measures of trade costs should be noted. Ideally, we would like to assess the effects of trade costs on productivity incorporating measures of trade costs for both imports and exports. In fact, the theoretical models described above assume similar reductions in trade costs, i.e., both the trade costs of imports and exports change in the same way. Unfortunately, restrictions in our trade costs dataset do not allow us to construct outbound trade costs that cover all the exports of Chile. To the extent that inbound and outbound trade costs change in a similar way, however, this should not be a significant problem. To test this, we combine the ALADI dataset with a dataset on U.S. imports from the U.S. Census Bureau and construct outbound trade costs for Chile using the exports of this country to a handful of LAC countries –for which our data permit- and for the U.S. We find that the correlation of the changes in the inbound and this measure of outbound total trade costs across ISIC 3-digit industries is positive and significant at the 1% level. Nevertheless, we should keep in mind that using inbound trade costs instead of outbound trade costs should only reduce the possibility that we find a response on the export side.

III. Empirical Analysis

Before analyzing whether a fall in trade costs induces the reallocative effects predicted by the new trade models, we would like investigate whether firms that exit are less productive than firms that do not exit, and whether exporters are more productive than the non-exporters. This is shown in Table 2. Each row in the table reports results from a separate regression of the following form:

$$\ln(TFP_{it}) = \alpha + \beta L_{it} + \gamma X_i + \alpha_j + \alpha_t + \varepsilon_{it}$$

where the dependent variable is the TFP of plant; L_{it} is the plant's labor force (a proxy for size); X_i is a dummy equal to 1 if the plant exit during the sample period (regression in row 1), if the plant is a non-exporter and eventually becomes an exporter (regression in row 2), if the plant is always an exporter (regression in row 3); and α_j and α_t are industry and year fixed effects. The coefficients in the table report the estimated $\hat{\gamma}$ for the three different regressions.

Consistent with evidence in other countries, the results in the first row indicate that after controlling for differences in size and industry characteristics, plants that exit are indeed less productive than plants that do not exit. Plants that exit are on average 11% less productive than plants that do not exit. The second row shows that non-exporters that eventually become exporters are on average more productive than the plants that never export. These plants are 22% more productive than the plants that never export. Finally, the third row shows that plants that export during the entire period are also more productive than the plants that never engage in export activities. These plants are, on average, 28% more efficient.[2]

While not directly testing the effects of trade on resource allocation, these results provide some preliminary elements that are important for the trade-induced allocation effects to take place, namely that the plants that normally exit are on average less productive than the plants that do not exit and that the plants that export, or eventually become exporters, are usually more productive than the plants that do not export.

We now investigate the potential reallocative effects of changing trade costs. We start with plant exit. We employ an empirical strategy that is conceptually similar to Bernard, Jensen and Schott (2006).

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[2] Similar evidence has been found by Alvarez and Lopez (2005) for the case of exporters in Chile.

III.A. Plant exit

To investigate whether plant exit is more likely as trade costs fall, we estimate a probit model of the form:

$$\Pr(e_{ijt+1}) = \phi(\Delta Cost_{jt-1}, X_{jit}, \alpha_j, \alpha_t)$$

where e_{jit+1} takes the value of 1 if plant *i* in industry *j* exits between periods *t* and *t+1*; $\Delta Cost_{jt-1}$ is the change in trade costs in industry *j* between *t-1* and *t*; X_{ijt} is a vector of plant characteristics and α_j and α_t are industry and time effects respectively. Results are presented in Table 3. The first column focuses only on trade costs[3]. The second column includes the plant's productivity. According to the theory, productivity should be negatively associated with plant exit. In column 3 we include additional plant controls that may be related to the probability of exit: the plant's labor force (our proxy for size) and its capital intensity. Finally, in column (4) we also include the interaction between the productivity of the plant and the change in trade costs. This interaction term intends to explore whether the probability of exit when trade costs fall is relatively lower for high-productivity plants. According to the results, a reduction in trade costs increases the probability of plant exit. The coefficient for the change in trade cost is statistically significant at 1% level in all the regressions. Productivity is found to be negatively associated with plant exit. This is consistent with results in Tybout (1991), Liu (1993), Liu and Tybout (1996), and Pavcnik (2002) that find that the probability of exiting is smaller for the more efficient plants. We also find that plants that are larger and have higher capital labor ratios also exhibit a lower probability of exit.

Regarding the interaction term, the coefficient does not seem to be statistically significant. However, the interaction effects in nonlinear models cannot be evaluated simply by looking at the sign, magnitude, or statistical significance of such coefficients (see Ai and Norton, 2003). The marginal effects of interaction terms in nonlinear models require computing cross derivatives that standard econometric packages do not perform. In addition, such marginal effects could have

[3] Total trade costs include the sum of tariffs and freight costs.

different signs and different statistically significances for different observations. Therefore, in order to check whether the marginal effect of productivity increases with falling trade costs, we use the Ai and Norton's algorithm for computing marginal effects of interaction terms in nonlinear models. The procedure calculates the interaction effect, standard error, and z-statistic for each observation. Results are shown in Figures 1a and 1b. The interaction term (Figure 1a) varies substantially with positive values for some observations and negative values for others. In terms of the significance, while the mean z-statistic for all the observations (0.18) is not statistically significant, the interaction effects for a large group of observations are indeed statistically significant (see Figure 1b). Note that the significant observations are positive in value which is consistent with the theory: the marginal propensity that a plant will exit the market driven by its low productivity increases with falling trade costs.

The magnitude of the trade impact on the probability of plant exit is far from being negligible. A one standard deviation decline in total trade costs increases the probability of exit by 0.7 percentage point.[4] Since the probability of exit in the sample is about 11%, this implies an increase in the probability of exit of approximately 6%.

III.B. Entering the export market

Now we investigate the reallocative process through the entry of new firms into exporting. We estimate the impact of falling trade costs on the probability that a non-exporting plant becomes an exporter using a probit model of the following form:

$$\Pr(s_{ijt+1}) = \phi(\Delta Cost_{jt-1}, \gamma X_{ijt}, \alpha_j, \alpha_t)$$

where s_{ijt+1} takes the value of 1 if plant *i* in industry *j* is a non-exporter in period *t* and becomes an exporter in period *t+1*; $\Delta Cost_{jt-1}$ once again is the change in trade costs in industry *j* between *t-1* and *t*; X_{ijt} is the vector of plant characteristics, and α_j and α_t are industry and time effects respectively.

[4] Note that in nonlinear models, the magnitude of the effect of one independent variable is conditional to all the independent variables; therefore, we cannot simply multiply the change in the independent variable by its marginal effect. Rather, we need to evaluate the probability when the change in the trade costs is one standard deviation below its

Results are reported in Table 4 with an increasing number of plant controls in each column. In all the cases we find a negative and statistically significant relationship between the changes in trade costs and the probability of becoming an exporter. Similar to the probit model on plant exit, Figures 2a and 2b present the results of applying the Ai and Norton's procedure for evaluating interaction terms in nonlinear regressions. As the figures show, the interaction effect is negative for most of the observations (Figure 2a), and a fare amount of them are statistically significant (Figure 2b). Indeed, the mean interaction effect for all the observations is statistically significant at the 5% level (z-statistic is -1.96). Again, these results are consistent with the theory: falling trade costs increases the probability of becoming an exporter relatively more in high productivity plants.

The results in this section indicate that the probability of becoming an exporter is higher in industries with greater declines in trade costs. A one standard deviation reduction in trade costs increases the probability of exporting by 0.19 percentage points or in approximately 7%. The average probability of becoming an exporter in the sample is 2.9%.

III.C. Export growth

Finally, we estimate whether a fall in trade costs leads to an export expansion of the firms that are already exporting. To test this prediction we estimate the following model:

$$\Delta Exp_{ijt+1} = \omega(\Delta Cost_{jt-1}, \gamma X_{ijt}, \alpha_j, \alpha_t)$$

where ΔExp_{it+1} is the percentage change in exports between periods *t* and *t+1* and the rest of the variables are defined as before. The estimation is done using OLS. Results are shown in Table 5. While the change in trade costs is negatively associated to export growth, as expected, the coefficients are not statistically significant in any of the regressions.

mean and the other independent variables are at their means and then calculate the difference between that probability and the one obtained when all the independent variables are at their means.

III.D. Tariffs and freight costs

So far, we have presented estimations with measures of total trade costs that add the tariffs and the freight rates in only one component. In this section we include the tariffs and the freight rates separately to investigate whether they have differential impacts on the various channels of the reallocative process.

Table 6 presents the results. For comparison purposes we added the original estimation in which the total trade costs variable is used. Columns (1) - (3), for example, show the probit model for plant exit. Column (1) presents the original estimation as shown in column (4) of Table 3. The trade costs are introduced separately in column (2). The results indicate that both types of costs, tariffs and freights, are important. The coefficient estimates for both the change in tariffs and the change in freight rates are negative and statistically significant.[5] In all the specifications, any difference across industries is controlled by the industry fixed effects. Nevertheless, in column (3) we also include the average import weight of the industry to explicitly control for industry differences in transport intensity. As shown in the table, controlling for industry differences in weight do not change the results.

Columns (4) to (6) show the results for the probability of becoming an exporter. While the coefficient for the tariff rate is negative it is not statistically significant. The coefficient for the freight rate is significant at the 5% level. A one standard deviation decline in freights increases the probability of exporting in approximately 5%. Once again, controlling for transport intensity (column 6) does not change this finding.

Finally, columns (7) to (9) show the results for the growth of exports. The change in total trade costs was not statistically significant in the original regression. Once we separate the effects of tariff and freight costs, the coefficients are still not statistically significant at conventional levels.

[5] Our transport cost measure could be sensitive to exchange rate fluctuations, and therefore could be partly picking up macro conditions. If firms price their goods to market, but do not set their shipping costs, transport costs as a fraction of the value of imports may vary with the exchange rate. We estimate the correlations between the real exchange rate and the freight costs. While this correlation is positive, it is not statistically significant.

We mentioned before that using inbound trade costs may reduce the possibility of finding an export response. Our lack of statistically significant results on the trade costs variables, specifically for the growth of exports, might be related to this shortcoming. To explore whether we find further evidence on market selection effects, particularly for the export growth channel, we construct two alternative proxies of outbound trade costs. First, as mentioned in the introduction, we combined the ALADI dataset with a dataset on U.S. imports from the U.S. Census Bureau and construct outbound trade costs for Chile using the exports of this country to a handful of LAC countries -for which our data permit- and to the U.S. The drawback of this measure, however, is that it covers only a limited fraction of the total manufacturing exports of Chile (30%). Indeed, the regressions with these trade costs (not shown) do not provide any additional support to the export growth channel as the coefficients are once again not statistically significant in general.[6]

Our second proxy for outbound trade costs consists on differences between CIF and FOB values. The advantage of this measure is that we can construct outbound trade costs that cover 100% of Chile's total manufacturing exports. There are two shortcomings with this measure, however. First, we can only look at transport costs because import duties are not included in the CIF value. Second, the difference between the CIF and the FOB values is normally a very poor proxy for transport costs as the comparison relies on independent reports of the same trade flow that have been shown to differ for reasons other than shipping costs (see Hummels and Lugovskyy, 2006). Once again, the results with this proxy of outbound shipping costs show no significant effects. Since these are imperfect proxies of outbound trade costs, we can still not rule out the existence of a link between trade costs changes and export growth. An important area for future research will be to use more refined measures of outbound costs to quantify more precisely the impact of trade costs on the export growth of the incumbents.

IV. Concluding Remarks

This paper presents new evidence for a developing country regarding the relationship between aggregate productivity and trade costs. The new evidence is the result of examining two issues frequently ignored in the literature up to this point: first, we use explicit measures of trade costs

[6] Results are available from the authors upon request.

including not only traditional barriers to trade, like tariffs, but also freight costs, a component of trade costs that has often been overlooked. Second, we explore the role of alternative mechanisms by which trade could increase aggregate productivity through the reallocative process, namely, not only the exit channel, the channel most commonly analyzed in the literature, but also the entry into exporting channel and the growth of the exporter's channel.

The results show that trade costs affect the reallocative process across plants of different productivity levels at least through two distinctive channels, by protecting inefficient producers, lowering their likelihood to exit, and by limiting the expansion of efficient plants, lowering their likelihood to become exporters. The results also show that the reallocative impacts of trade come not only from tariff barriers but also from transport costs.

The evidence indicates that there is scope for increasing aggregate productivity in developing countries via the reallocation of resources from low to high productivity plants. The reallocation can be induced not only by reducing taxes on international trade but also by lowering the costs of transportation, a trade barrier that in many developing countries, like Chile, is currently significantly higher than the level of tariff protection. The evidence suggests that developing countries, concerned on raising aggregate productivity, should pursue a trade agenda where transport costs and not only tariff barriers take center stage.

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Table 1: Ad valorem trade costs by three-digit ISIC industry, Chile

Industry		Freights, f_{it} (%)			Tariffs, t_{it} (%)			Total, $f_{it}+t_{it}$ (%)		
		1995	2000	2005	1995	2000	2005	1995	2000	2005
311	Food manufacturing	9.9	9.7	9.7	11.0	10.0	1.8	20.8	19.7	11.5
312	Prepared animal feeds & food products nec	12.1	11.4	12.9	11.0	10.0	1.8	23.1	21.4	14.8
313	Beverages	10.3	9.6	10.6	10.1	10.0	4.3	20.4	19.6	14.9
314	Tobacco	20.4	8.1	8.5	11.0	10.0	3.8	31.4	18.1	12.3
321	Textiles	8.1	7.7	8.0	10.2	10.0	4.4	18.3	17.7	12.4
322	Wearing, apparel	7.9	6.1	6.9	10.8	10.0	5.4	18.7	16.1	12.3
323	Leather products	7.7	8.7	11.7	10.7	10.0	5.0	18.4	18.7	16.7
324	Footwear	6.9	6.2	7.6	10.9	10.0	5.0	17.9	16.2	12.6
331	Wood products	13.1	7.2	7.4	11.0	10.0	5.0	24.1	17.2	12.4
332	Furniture	16.6	14.7	15.4	10.8	10.0	4.2	27.4	24.7	19.6
341	Paper and products	11.5	10.8	12.7	10.9	10.0	3.2	22.3	20.8	15.8
342	Printing and publishing	9.9	10.6	8.1	8.6	8.6	3.4	18.5	19.2	11.5
351	Industrial chemicals	10.4	10.5	10.1	9.7	10.0	3.6	20.2	20.5	13.6
352	Other chemicals	6.5	5.7	5.6	10.4	10.0	3.8	16.9	15.7	9.4
353	Petroleum refinaries	16.2	10.6	29.0	10.6	10.0	3.8	26.8	20.6	32.8
354	Miscellaneous petroleum and coal products	12.0	15.4	10.6	11.0	10.0	5.9	23.0	25.4	16.5
355	Rubber products	9.6	8.1	8.9	10.6	10.0	4.7	20.2	18.1	13.5
356	Plastic products	12.6	10.8	10.3	10.8	10.0	4.8	23.4	20.8	15.1
361	Pottery, china, earthenware	19.6	17.4	17.9	10.4	10.0	4.7	30.0	27.4	22.6
362	Glass and products	14.1	15.2	15.8	10.5	10.0	3.9	24.5	25.2	19.7
369	Other non-metallic mineral products	17.9	21.4	29.7	10.8	10.0	2.8	28.6	31.4	32.5
371	Iron and steel	11.5	10.4	8.4	9.8	10.0	3.0	21.3	20.4	11.4
372	Non-ferrous metals	5.2	4.4	4.1	10.6	10.0	2.0	15.7	14.4	6.0
381	Fabricated metal products	8.6	8.1	7.8	10.6	10.0	4.6	19.2	18.1	12.4
382	Machinery, except electrical	6.4	5.3	5.3	11.0	10.0	5.2	17.3	15.3	10.5
383	Machinery, electric	5.6	4.3	4.5	11.0	10.0	4.7	16.5	14.3	9.2
384	Transport equipment	7.4	6.6	5.8	10.5	9.6	3.9	17.9	16.2	9.6
385	Professional and scientific equipment	5.2	4.9	4.9	10.9	10.0	5.6	16.1	14.9	10.5
390	Other manufactured products	9.6	10.0	10.2	10.9	10.0	5.3	20.5	20.0	15.4
Average		10.8	9.6	10.6	10.6	9.9	4.1	21.4	19.6	14.7

Table 2: Average plant TFP relative to comparator group

Plants that exit / plants do not exit	-0.1107***
	(0.0075)
New exporters / Non-exporters	0.2175***
	(0.0104)
Always exporters / Non-exporters	0.2779***
	(0.0129)

Notes: Plant-level regression results. Dependent variable is the plant's TFP. Regressors include the plant's size (Labor), year and industry fixed effects, and a dummy equal to 1 if the plant exit during the sample period (regression in row 1), if the plant is a non-exporter and eventually becomes an exporter (regression in row 2), if the plant is always an exporter (regression in row 3). Coefficients in the table report results for this dummy variable on the three different regressions

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 3: Probability of exit

Regressor	Probit plant exit (1)	Probit plant exit (2)	Probit plant exit (3)	Probit plant exit (4)
Change in total trade costs	-0.0965***	-0.0847***	-0.0805***	-0.0807***
	(0.0198)	(0.0177)	(0.0165)	(0.0169)
Productivity		-0.0275***	-0.0236***	-0.0242***
		(0.0019)	(0.0018)	(0.0020)
x Change in total trade costs				-0.0125
				(0.0207)
Labor			-0.0204***	-0.0205***
			(0.0033)	(0.0033)
Capital / Labor			-0.0047***	-0.0047***
			(0.0014)	(0.0014)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	48263	47161	47161	47161
Pseudo R2	0.01	0.02	0.03	0.03

Notes: Plant-level probit regression results. Numbers are marginal effects. Robust standard errors adjusted for clustering at the three-digit ISIC level in parentheses. Industry fixed effects are also at the three-digit ISIC level. Dependent variable indicates plant exit between years t and t+1. First regressor is the change in total trade costs (freights and tariffs) between t-1 and t. Other regressors are plant controls for year t where productivity, labor and capital/labor are the plant's TFP, its total labor force and the capital labor ratio respectively. All plant controls are in logs.

***; **; * significant at the 1%, 5% and 10% level respectively

Table 4: Probability of entering the export market

Regressor	Probit new export (1)	Probit new export (2)	Probit new export (3)	Probit new export (4)
Change in total trade costs	-0.0271***	-0.0259***	-0.0234***	-0.0197**
	(0.0094)	(0.0096)	(0.0082)	(0.0080)
Productivity		0.0052***	0.0033***	0.0028**
		(0.0010)	(0.0012)	(0.0013)
x Change in total trade costs				-0.0095
				(0.0061)
Labor			0.0062***	0.0062***
			(0.0008)	(0.0008)
Capital / Labor			0.0041***	0.0041***
			(0.0006)	(0.0006)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	42673	41793	41793	41793
Pseudo R2	0.02	0.02	0.06	0.06

Notes: Plant-level probit regression results. Numbers are marginal effects. Robust standard errors adjusted for clustering at the three-digit ISIC level in parentheses. Industry fixed effects are also at the three-digit ISIC level. Dependent variable indicates whether a non-exporting plant in year t becomes an exporter in year t+1. First regressor is the change in total trade costs between t-1 and t. Other regressors are plant controls for year t where productivity, labor and capital/labor are the plant's TFP, its total labor force and the capital labor ratio respectively. All plant controls are in logs.

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 5: Change in log exports

Regressor	OLS export growth (1)	OLS export growth (2)	OLS export growth (3)	OLS export growth (4)
Change in total trade costs	-0.0460	-0.0583	-0.0593	-0.0516
	(0.1397)	(0.1358)	(0.1352)	(0.1332)
Productivity		-0.0142	-0.0169	-0.0183
		(0.0142)	(0.0152)	(0.0180)
x Change in total trade costs				-0.0316
				(0.2003)
Labor			0.0013	0.0013
			(0.0054)	(0.0054)
Capital / Labor			0.0145**	0.0144**
			(0.0048)	(0.0047)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	4857	4809	4809	4809
R2	0.01	0.01	0.01	0.01

Notes: Plant-level OLS regression results. Robust standard errors adjusted for clustering at the three-digit ISIC level in parentheses. Industry fixed effects are also at the three-digit ISIC level. Dependent variable is the difference in plants' log exports between years t and t+1. First regressor is the change in total trade costs between t-1 and t. Other regressors are plant controls for year t where where productivity, labor and capital/labor are the plant's TFP, its total labor force and the capital labor ratio respectively. All plant controls are in logs.

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Table 6: Tariff and Freight Costs

Regressor	Probit plant exit (1)	Probit plant exit (2)	Probit plant exit (3)	Probit new export (4)	Probit new export (5)	Probit new export (6)	OLS export growth (7)	OLS export growth (8)	OLS export growth (9)
Change in total trade costs	-0.0807***			-0.0197**			-0.0516		
	(0.0169)			(0.0080)			(0.1332)		
Change in tariff costs		-0.0248**	-0.0258**		-0.0051	-0.0052		-0.0266	-0.0257
		(0.0098)	(0.0098)		(0.0036)	(0.0037)		(0.0825)	(0.0881)
Change in freight costs		-0.0174*	-0.0168*		-0.0109**	-0.0109**		-0.0448	-0.0453
		(0.0103)	(0.0101)		(0.0055)	(0.0056)		(0.1033)	(0.1036)
Productivity	-0.0242***	-0.0251***	-0.0251***	0.0028**	0.0036**	0.0036**	-0.0183	-0.0074	-0.0074
	(0.0020)	(0.0021)	(0.0021)	(0.0013)	(0.0013)	(0.0013)	(0.0180)	(0.0159)	(0.0159)
x Change in total trade costs	-0.0125			-0.0095			-0.0316		
	(0.0207)			(0.0061)			(0.2003)		
x Change in tariff costs		-0.0118	-0.0118		0.0025	0.0025		0.0828	0.0828
		(0.0095)	(0.0095)		(0.0030)	(0.0030)		(0.0523)	(0.0523)
x Change in freight costs		0.0111	0.0110		-0.0050	-0.0050		-0.1441	-0.1441
		(0.0117)	(0.0117)		(0.0053)	(0.0053)		(0.1991)	(0.1989)
Labor	-0.0205***	-0.0205***	-0.0205***	0.0062***	0.0062***	0.0062***	0.0013	0.0016	0.0016
	(0.0033)	(0.0032)	(0.0032)	(0.0008)	(0.0008)	(0.0008)	(0.0054)	(0.0053)	(0.0053)
Capital / Labor	-0.0047***	-0.0047***	-0.0047***	0.0041***	0.0041***	0.0041***	0.0144**	0.0144***	0.0144***
	(0.0014)	(0.0014)	(0.0014)	(0.0006)	(0.0006)	(0.0006)	(0.0047)	(0.0047)	(0.0047)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47161	47161	47161	41793	41793	41793	4809	4809	4809
R2	0.03	0.03	0.03	0.06	0.06	0.06	0.01	0.01	0.01

Notes: Robust standard errors adjusted for clustering at the three-digit ISIC level in parentheses. Industry fixed effects are also at the three-digit ISIC level. Regressions (3), (6) and (9) also control for the average import weight by industry (not shown)

*** ; ** ; * significant at the 1%, 5% and 10% level respectively

Figure 1a: Probit Plant Exit, Interaction Effects

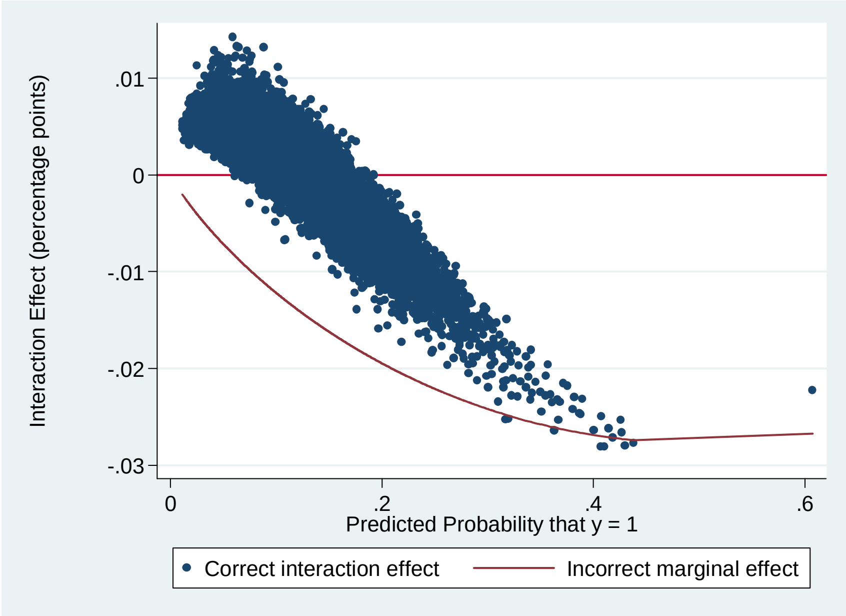

Figure 1b: Probit Plant Exit, z-statistics of Interaction effects

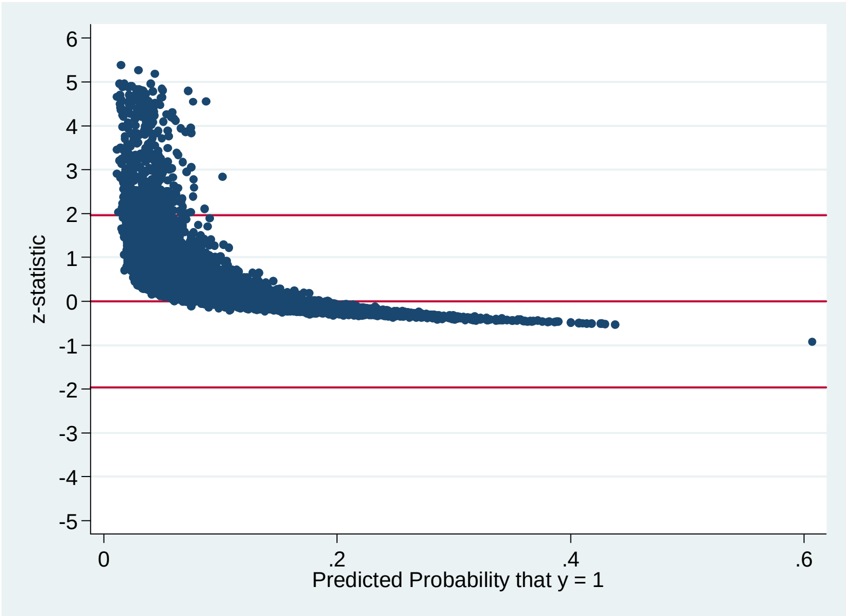

Figure 2a: Probit New Export, Interaction Effects

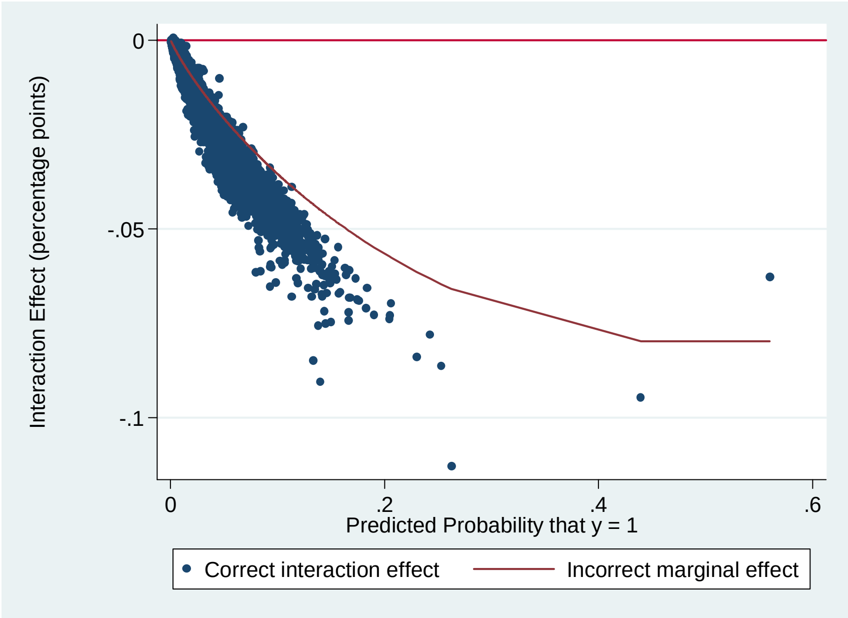

Figure 2b: Probit New Export, z-statistics of Interaction Effects