Costs of trade and self-selection into exporting and importing: the case of Turkish manufacturing firms

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Costs of trade and self-selection into exporting and importing: The case of Turkish manufacturing firms.

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Abstract

This paper focuses on self-selection into trade by exporting and importing firms, and on the presence of differential variable and sunk costs between exporters and importers across different categories of imports. We use a rich and recent dataset for Turkish manufacturing firms for the period 2003-10. This allows us to provide a comprehensive analysis of firm heterogeneity and the connection between firm-level performance and international trade. We provide evidence on the remarkable heterogeneity across firms where only-importers (importers) perform better than only-exporters (exporters). We detect a self-selection effect for both importing and exporting firms with a stronger effect for importers. The results suggest that the nature of sunk costs varies between importing and exporting activities with importers facing higher sunk costs. Tariffs represent a potentially important source of variation in the variable costs of trading. When taking the tariffs faced by firms into account, we find that the self-selection effect associated with sunk costs is still present but greatly reduced with a smaller reduction for importers compared to exporters.

Keywords: Firm heterogeneity, Self-selection, Sunk Costs, Exports, Imports.

JEL Classification Codes: D24, F10, M20, L10.

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1 Introduction

This paper analyzes the relationship between the self-selection mechanisms associated with the trading activities of firms, and the related costs of trade. We focus on the differentials with regard to self-selection and trading costs between exporting and importing activities, and consider the role of both sunk and variable costs across firms by trading status. The paper uses an extensive data set on the trading activities of firms in Turkey and in so doing aims to expand the empirical evidence for developing /emerging countries on firm heterogeneity in international trade.

The international trade literature has witnessed a dramatic change over the past eighteen years where the focus has switched from the investigation of macro-level agents to the micro players in trade, and where firm-level heterogeneity has emerged as a core topic. The microeconometrics of firms' engagement in international trade was pioneered by Bernard and Jensen (1995), Aw and Hwang (1995) and Roberts and Tybout (1997). The theoretical framework has been largely stimulated by the seminal works of Melitz (2003) and Bernard et al. (2003). With the availability of firm level datasets a substantial empirical literature has shown that internationalized firms show superior performance to the firms who serve only the domestic markets[1]. The majority of the literature focusses on exports, with much less attention paid to imports. In particular, there are relatively few studies on the importing activity and firm-performance nexus for developing countries.

The picture that emerges from this literature suggests that the superior performance of internationalized firms emerges via both self-selection and post-entry effects. Regarding the latter, exporting firms may become more efficient on exporting through learning, or as a result of economies of scale, or via interaction with foreign clients, and being exposed to more intense competition in international markets[2]. The post-entry mechanisms of importing suggest the possibility of learning effects through the importing of intermediate and capital goods via international knowledge spillovers, variety effects and quality effects[3].

The self selection hypothesis, which emerges from the theoretical literature, suggests that (due to the existence of sunk costs and different productivity levels within the same industry), only the most productive firms self-select into export markets. Specifically, Melitz (2003) builds his monopolistic competition model on the assumption that there exist additional costs for firms selling in international

[1] See Greenaway and Kneller, 2007; Wagner, 2007, 2012 and; Redding, 2010 for surveys of the empirical evidence.

[2] For a detailed survey of the learning-by-exporting literature see Silva et al. (2010) and see Martins and Yang (2009) for a detailed analysis of 33 empirical studies.

[3] For theoretical models see Grossman and Helpman (1991), Eaton and Kortum (2001), Acharya and Keller (2007) whereas for empirical evidence see, inter alia, Kasahara and Lapham (2008), Bas and Strauss-Kahn (2010) and Forlani (2010).

markets. Only firms surpassing some threshold level of productivity can therefore make positive profits in international markets. In a related vein, Bernard et al. (2003) shows that self-selection into exporting occurs also via variable trade costs. Accordingly, these variable costs can also create self-selection of productive firms into foreign markets regardless of the presence of any sunk costs. These sunk and/or variable costs are typically linked to knowledge of markets, transportation, marketing and advertising, and the setting-up of foreign distribution channels.

Similarly, the self-selection of more productive firms into import markets results from the existence of fixed and/or variable costs of importing, such that only firms above some productivity threshold import. This enables firms with high productivity levels to offshore some of their production while low productivity firms limit themselves to sourcing from domestic markets. The nature of import costs are related to issues such as the search costs for foreign suppliers, inspection of goods, negotiation, contract formulation, learning and acquisition of customs procedures. Importers are also likely to face greater informational asymmetries associated with imperfect monitoring of the purchased goods quality and cost of transferring the embedded technology (Altomonte and Békés, 2009).

While there is a substantial empirical evidence supporting the self-selection hypothesis of exporting (see among others Roberts and Tybout,1997; Bernard and Jensen, 1999; Aw et al., 2000; Bernard and Wagner, 1997; Isgut, 2001, Delgado et al., 2002); there is much more limited evidence on self-selection into importing (Vogel and Wagner, 2010; Eriksson et al., 2009; Smeets and Warzynski, 2010; Altomonte and Békés, 2010), with a small number of recent papers on the possible heterogeneity across importing and exporting activities (Kasahara and Lapham, 2008; Castellani et al., 2010).

In this paper we utilize the most recently available dataset covering the whole population of Turkish manufacturing firms with more than 19 employees matched with firm-level international trade data over the period 2003-2010. Being an emerging economy for whom trade has been an important driver of growth, our case constitutes an interesting quasi-natural experiment since our data covers a period in which Turkey experienced a trade boom and underwent a structural transformation in terms of its production and trade patterns. The process of integration of the Turkish economy into the world gained momentum following the Customs Union with the EU in the late 1990s and the EU's decision to start accession talks with Turkey in 2004, accompanied by abundant foreign capital inflows. Following a series of macroeconomic and structural reforms, the Turkish economy recovered relatively quickly from the negative shock of the economic crisis in 2001. We analyze the period after 2002, over which Turkey experiences this recovery and a dramatic export boom. Over 2002-12 the share of Turkish manufacturing industry in GDP was 23.5 percent on average. With an average share of 80 percent in

total exports, Turkey is second to only China among the BRIC countries in terms of the share of manufacturing in exports. Over 2002-12 Turkey's total trade volume increased by 342 percent with an increase of 325 percent in its exports. This compares to the average export performance of its peers in the same income group (Brazil,China, Mexico, and South Africa) whose exports grew by 212 percent.

There are four main contributions of this paper to the literature on trade and firm heterogeneity. First, in considering the self-selection effects we control for the importing status of exporting firms and vice versa. This is commonly neglected in the literature. Such a comparison is crucial for firms operating in the Turkish manufacturing industry for whom a key characteristic is the dependence on imported intermediate goods. Secondly, in exploring the role of self-selection effects we take variable costs (in particular those associated with tariffs) into account, and assess the impact of these on the estimated sunk costs. Thirdly, and building on the literature suggesting a link between productivity and product complexity, we investigate the differentials between the sunk costs for importing/exporting of capital, intermediate and consumption goods. Finally, but equally importantly to the best of our knowledge our paper is the first attempt to investigate self-selection for Turkey, and contributes to the very limited literature on self-selection in importing for less developed countries (see Table 2 of Wagner 2012)[4].

Overall, and consistent with previous work, we show that firms that engage in both sides of trade perform better than those involved only in one side; and that all types of internationalized firms outperform non-trading firms. The distinction between exporters and importers provides evidence as to the heterogeneity across firms, where only-importers (importers) perform better than only-exporters (exporters). We detect a self-selection effect for both importing and exporting firms with a stronger effect for importers. In contrast with much of the literature which fails to control for importing status of exporting firms and vice versa, when we take trading status of firms into account, we find that the self-selection effect is still present, but greatly reduced. The reduction is smaller for importers compared to exporters.

In accounting for sunk costs by means of past-trade experience we show that the extent and nature of sunk costs varies between importing and exporting activities, with Turkish manufacturing importers facing higher sunk costs compared to exporters. In accounting for the variable costs associated with tariffs we show that the sunk costs associated with importing and exporting decline, but with a smaller reduction for importers compared to exporters, hence widening the relative gap between these two. This identifies the importance of variable costs and the need

[4]Existing empirical analyses of Turkey on firm heterogeneity either focus on post-entry mechanisms (Yasar and Rejesus, 2005; Yaşar and Paul, 2008; Maggioni, 2012 and Dalgıç et al., 2014) or investigate the role of importing, exporting and the joint involvement in both activities on the firm product scope and new product introduction (Lo Turco and Maggioni, 2014).

for more research on this. We also show that the sunk costs are higher for capital goods, than intermediate and consumption goods for both of trading activities; and once again with higher sunk costs for importers in terms of each category.

The remainder of this paper is organized as follows. Section two introduces the data used in the empirical investigation and gives some descriptive evidence on trading status dynamics. Section three presents the empirical results. Section four concludes.

2 Data and Preliminary Evidence

This paper is based on two different sources of data collected by the Turkish State Institute of Statistics (TURKSTAT). The first is The Annual Industry and Service Statistics and the second is the Annual Trade Statistics.

The Annual Industry and Service Statistics is a census of firms with more than 19 employees, and a representative survey for firms with less than 20 employees. For this study, we select the whole population of private Turkish manufacturing firms with 20 employees or more. Such firms account for 87 percent of the value of production and 75 percent of employment in 2009 of Turkish manufacturing industry. In the Annual Industry and Service Statistics dataset, firms are classified according to their main activity, as identified by Eurostat's NACE Rev.1.1 standard codes for sectoral classification. The database provides detailed information on a number of structural variables such as revenues, value added, labour cost, intermediate inputs cost, tangible and intangible investment costs together with information on industry and geographical location, foreign ownership and the number of employees. We calculate the capital stock series by applying the perpetual inventory methodology and using the data on investment cost series for machinery and equipment, building and structure, transportation equipment and computer and programming. We use two different measures for firm-level productivity. One is total factor productivity (TFP)calculated using the Levinsohn and Petrin's (2003) semi-parametric approach. The other is the standard labour productivity (LP), defined as value added (gross output net of intermediate inputs) per employee.

The second source of data we utilize is firm level foreign trade flows, which are sourced from customs declarations. The import and export flows are collected for the whole universe of imports and exports at 12-digit GTIP classification (the first 8 digits of which correspond to the CN classification whereas the last 4 digits are country specific). Information on the origin/destination countries of the trade flows is also available in the dataset. In order to conduct our analysis we merge the above two datasets. Our unbalanced panel covers longitudinal data of 38223

firms over the period 2003-2010[5]. The original sample size in the merged dataset was slightly larger but we applied a cleaning procedure largely inspired by Hall and Mairesse (1995).

In order to explore the linkages between firm characteristics and the internationalization status of firms we first classify the firms according to their trading status. We define firms serving only the domestic market as 'non-traders'; firms engaged in exporting activities (including those that only export and those that not only export but also import) as 'exporters'; firms engaged in importing activities (including those that only import and those that combine their imports with exporting activities) as 'importers'; firms that do not export or import separately but are simultaneously involved in exporting and importing activities as 'two-way traders'. We also define 'only-exporters' and 'only-importers'.

In Table 1a, we provide descriptive evidence on our manufacturing industry panel, differentiating between firms according to their participation in foreign markets. From the first column we can see that over 2003-2010, on average 63.3 percent of all firms are internationalized. Two-way traders, representing just over 39 percent of the sample, constitute the largest share of internationalized firms, while firms that engage in only exporting (10.8 percent) or only importing (13.3 percent) are a minority. Exporting firms constitute 50 percent of the panel whereas importing firms' share is slightly higher at 52 percent.

Tables 1a and 1b report on how many firms changed their status over the period of analysis. According to Table 1a, the distribution of firms according to trading status stays fairly constant. For instance, the share of only-exporters stays in a range between 8.5-12 percent while the share of importers stays in a range between 12.1-14 percent. Column four of Table 1a shows that two-way traders are the group most likely to preserve their status. There is also quite a lot of churning in terms of entry and exit. The share of entrants in 2010 with respect to 2003 is 94.5 percent. The share of entrants is highest in the only-exporters category, while the smallest share of entry was realized by only-importers. Firms that were active in 2003 but not in 2010 (i.e. exiting firms/deaths) are evident in all categories with a share of 51.8 percent in total. The group with the largest share of exits are non-trading firms. This is consistent with the theoretical and empirical view that non-traders are at the bottom end of the productivity distribution. Consistently, the smallest share of deaths is realized by firms engaging in both sides of the trading activities which are also shown to be at the top end of the productivity distribution. Additionally, the rate of exits is higher for only-exporting firms compared to only-importers (49.4 percent for only-exporters vs. 43.6 percent for the latter). This might be attributable to higher productivity thresholds for only-importers relative to those of only-exporters, and for which we provide evidence later in this paper.

[5]See Online Appendix for the evolution of the sample over the analysis period.

According to Table 1b, movements of firms between trading categories also shows significant variation. We observe that it is easier for only-importers to switch to two-way trading with respect to only-exporters. Moreover, starting to trade as a two-way trader is a rare event for a non-trader whereas stopping to trade for a two-way trader is the least likely outcome.

Insert Table 1a here.

Insert Table 1b here.

Consistent with the existing literature our data confirm that (i) trade is more concentrated than employment and sales; (ii) a high percentage of export volume is performed by a small number of firms which are very diversified in terms of products and destination countries (see Online Appendix for a detailed analysis of concentration of trade in Turkey).

3 Empirical Analysis

3.1 Do internationalized firms perform better?

In this part of the paper, starting with Table 2 we identify some stylized facts regarding the performance of internationalised firms. These are in line with the picture that emerged from the literature reviewed earlier. We show a clear ranking of firm types by performance from two-way traders to importers and then to exporters. In particular, we find that non-traders are less productive, are less capital intensive, smaller in terms of number of employees and sales and pay lower wages. Conversely two-way traders are the most productive and capital intensive, have the largest numbers of employees, and pay the highest wages.

Insert Table 2 here.

Next, we explore the productivity premia between non-traders and trading firms while controlling for other factors that could also impact on performance. For instance, it is well established that larger firms are on average more productive than smaller firms, or that foreign affiliated firms are on average more productive than firms that only serve the domestic market. Similarly, two-way traders are typically found to be larger and have a higher levels of foreign participation than non-traders. To control for these factors in understanding the performance differentials between firms, and following Bernard and Jensen (1999) and several other studies, we explore the relationship between firm level characteristics and international trading status with the following regression:

$$y_{it} = \alpha + \beta_1 D_{it}^{two-way} + \beta_2 D_{it}^{only-imp} + \beta_3 D_{it}^{only-exp} + \delta Controls + \varepsilon_{it} \qquad (1)$$

Where the subscript i denotes individual firms and t indexes year. The dependent variable y_{it} measures the logarithm either of firms' labor productivity (LP) or total factor productivity (TFP). Dummy variables for trading status are denoted by $D_{it}^{two-way}, D_{it}^{only-imp}$ and $D_{it}^{only-exp}$, respectively. We utilize a series of control variables denoted by a vector of controls including the logarithm of firm's employment, capital intensity and wage per employee as a proxy of skill intensity, as well as two-digit sector, region and year dummies[6]. We also include a foreign affiliation dummy where the foreign capital share is greater than zero. The coefficients β_1, β_2 and β_3 in front of the trading dummies in equation (1) reveal the average trading premia in terms of productivity. The traders' premia can then be computed from the estimated coefficients as $100(exp(\beta)-1)$, showing the average percentage difference in productivity between a firm in one of the three respective groups of trading firms, and the non-trading firms, while controlling for the characteristics included in the vector of controls.

The results from the pooled OLS regressions and FE regressions are reported in Table 3. For each of these, in the first column we give the results for a standard OLS regression; in the second column, and in order to deal with unobserved aspects of firm-level heterogeneity, we include firm specific time invariant fixed effects; and in the final column we give the results for a dynamic FE model. Supporting the descriptive evidence above, the trade premia in terms of productivity are of considerable magnitude and statistically significant. Specifically, internationalized firms have higher productivity levels than non-trading firms even after controlling for size, capital and skill intensity, region, sector and time effects. The magnitude of the trade premia coefficient declines significantly in the FE specifications pointing to the role of unobserved heterogeneity and the importance of firm specific factors. For instance, in terms of TFP in the OLS specification two-way traders are estimated to be 51 percent more productive than non-internationalized firms, while in the FE model this premium reduces to 14 percent.

In both the OLS and FE specifications, two-way traders have the highest premia followed by firms that only import, while firms that only export have the smallest estimated premia. Note that the hierarchy suggesting that two-way traders perform best followed by only-importers, and then only-exporters and finally non-traders remains after the inclusion of time invariant fixed effects into the equation (1)[7]. This performance ordering of firms is in line with other empirical work using

[6]The region dummies identify 12 Turkish regions distrubuted according to the NUTS2 classification.

[7]In order to compare the coefficients within each regression, we have performed the Wald

this workhorse model (Muuls and Pisu, 2009; Serti and Tomasi, 2009; Altomonte and Békés, 2009; Silva et al.,2012; Castellini et al., 2010) with the exception of McCann (2009) and Vogel and Wagner (2010)[8]. The fact that importers are more productive than exporters can be attributed two different but not mutually exclusive explanations. The first is to do with self-selection effects and associated sunk/fixed costs; and the second is to do with the possible impact of importing on productivity. Indeed, regarding the latter Dalgıç et al. (2014) show that importing has a greater impact on productivity compared to exporting in Turkish manufacturing industry.

Regarding the former, advocates of self-selection suggest that only more productive firms will be able to import due to the presence of fixed costs of importing. That the evidence from both the descriptive statistics and regressions suggest higher performance premia for only-importers (importers) than only-exporters (exporters), reinforces the idea of a stronger self-selection mechanism associated with importing at work with respect to exporting. In turn this may be driven by higher fixed costs associated with importing, in comparison to exporting. In the next section we therefore turn to analyzing the existence of self selection mechanisms with a special focus on the question of whether a stronger mechanism is at work for importing activities in comparison to exporting in Turkish manufacturing industry.

Insert Table 3 *here.*

Note that, so far the analysis should be largely seen as providing correlations/associations between firm performance and international trade engagement as opposed to unequivocally showing causality. The existing literature frequently fails to employ dynamic specifications in order to address issues of endogeneity[9]. Hence, in order to shed light on possible endogeneity associated with the FE regressions, we test a dynamic specification, and this also serves as a robustness check. We run a series of fixed effects regressions in which we incorporate the lagged dependent variable as an additional regressor. Including the lagged dependent variable may produce biased and inconsistent parameter estimates because of its correlation with the individual specific effects. While in such cases, GMM estimators are generally used (Blundell and Bond, 1998; Bond, 2002), in large samples as ours the standard results for the dynamic model indicate that the OLS levels estimator is biased upward, while the within-group estimator is biased downward (Bond, 2002; Bernard and Jensen, 2004). We report on the FE estimates

test of the difference between the coefficients on only-export and only-import dummies. Our F-statistics are highly significant rejecting the hypothesis that the two coefficients are equal.

[8] McCann (2009) working with data for Irish firms, and Vogel and Wagner (2010) on data for East and West Germany find that only exporting firms out-perform only importing firms.

[9] Silva et al.(2013) is the only study that employs such a dynamic specification in this context.

with lagged dependent variables for equation (1) in Table 3. The results from the dynamic specifications are consistent with our previous finding indicating the positive correlation between firm productivity and trade engagement as well as the clear pattern of performance ordering among the types of internationalization status. Further, the significant coefficient of the lagged dependent variables in these regressions confirms that a firm's performance history affects its current position.

3.2 Self-Selection & Sunk Costs: Exporting vs Importing

Evidence from Tables 1a and 1b demonstrated a substantial number of firms switching their internationalization status. This variation in our data signals the importance of identifying the self-selection mechanisms at work. In addition, in Table 1a we observe a more persistent behavior for importing firms with respect to exporters and, in Table 1b we observe that a higher percentage of importers switch to two-way trading than is the case for exporters. This may suggest higher sunk costs for importing with respect to exporting in Turkey. We therefore proceed by shedding light on whether firms self select into trade and whether this effect is stronger for importing and finally consider the driving forces behind this.

We start with addressing the question whether being a trader is associated with firms' ex-ante superior performance. If more productive firms become traders then we should expect to find significant differences in productivity between future trade starters and future non-starters several years before entry. In order to do so, we define an only-export-starter as a firm which had never traded in the previous two years ($t-2$ & $t-1$) and starts to exporting-only in year t. In this way, we can compare firms which did not trade internationally in years $t-2$ & $t-1$ and start to export in year t with firms that did not trade at all. Only-import-starters and two-way-starters are defined similarly. We thus have six cohorts and each corresponds to a year between 2005 and 2010. To explore the pre-entry differences in productivity between trade-starters and non-traders, we estimate the following equation with the usual controls:

$$y_{it-\rho} = \beta_0 + \alpha_i + \beta_1 D_i^{Starter} + \delta Controls_{t-\rho} + \varepsilon_{it}, \text{ with } 1 \leq \rho \leq 2. \qquad (2)$$

where $D_i^{Starter}$ is a dummy variable taking value one if the firm is a starter and zero if the firm is always a non-trader. The results are reported in Table 4, where we consider the premia with regard to both labour productivity and total factor productivity. The coefficients show the average percentage performance differential at $t-2$ between starters at t and firms with no international trade activity over the whole period. Overall, and in line with previous studies we find a self-selection effect for both importing and exporting firms. Specifically, the results confirm that internationalized firms are ex-ante more productive than non-traders.

The productivity premia is highest for two-way starters, and this applies both to labour productivity and total factor productivity.

Note also that, the pre-entry levels of the productivity indicators are larger for only-import starters than those of only-export starters. For instance, two years before entering the import market, import starters are 31.9 percent more productive, in terms of TFP, and 26.6 percent in terms of labour productivity than always non-traders, while the corresponding figures for export starters are 28.3 percent and 20.4 percent. The differentials are even greater when looking at one year before entry (36.8 percent and 36.9 percent for importers with respect to TFP and labour productivity, and 29.1 percent and 21.1 percent for exporters). This suggests that importing-only firms exhibit ex-ante performance advantages with respect to those that export-only, in turn indicating a stronger self-selection for importing than exporting[10].

Insert Table 4 here.

Failing to control for the importing status of exporting firms and vice versa might lead to overstating the role of self-selection in exporting and importing respectively. Thus, we further investigate the productivity premia of future two-way traders compared to future only-exporters and future only-importers. In this way, we account for importers that start to export by comparing firms that imported but not exported in years $t-2$ and $t-1$ and start to export in t with firms that always imported but not exported at all. Similarly, we investigate the productivity premia of exporters that start to import. This can be seen in the last four columns of Table 4 where, analogously to before, the coefficients show the average percentage productivity difference at $t-2$, between only-exporters that start to import at t (only-importers that start to export at t) and only-exporters (only-importers) that do not start to import at all. We find that when taking into account the importing status of export starters, the performance premium of export starters is still present but greatly reduced. The premium is 6.7 percent with respect to TFP and 7.4 percent with regard to labour productivity. Similarly, the productivity premium of import starters goes down, but by considerably, and is 21.8 percent with respect to TFP, and 24.7 percent with regard to labour productivity.

Hence, taking into account the importing (exporting) status of exporters (importers) respectively serves to accentuate the higher productivity associated with

[10]To provide an alternative approach, instead of estimating equation 2 and comparing the coefficients on only-export and only-import starters, we estimate a version of equation 2 for exporters and importers using the Seemingly Unrelated Regressions methodology. We test for the equivalence of the coefficients on export/import dummies, and the results indicate that they are statistically different. See Online Appendix for details.

importing in contrast to exporting firms. In addition, these findings indicate that the initial pre-entry premia reported in Table 4 may overstate the extent to which export and import starters have higher initial productivity levels. We therefore conclude that for Turkish manufacturing firms the self-selection effect is evident in both exporting and importing activities but is stronger with respect to importing. A limited number of studies control for the importing status of exporting firms or vice versa in investigating self-selection effect associated with entering into foreign markets. Following a similar analysis and using Hungarian data, Altomonte and Békés (2009) also find that ex-ante productivity of importing is larger than that of exporting.

A stronger self selection effect at work for import starters compared to export starters might suggest higher sunk costs of importing. Accordingly, we shed some light on the differentials between the sunk costs of importing and exporting. In order to do so, we estimate three dynamic models for firms that only-export, only-import and those involved in both activities. Following Roberts and Tybout (1997), Bernard and Jensen (2004) and Muûls and Pisu (2009), we interpret the coefficient of the lagged dependent variable as a measure of the importance of sunk costs. The rationale behind our interpretation is that sunk costs generate hysteresis in export (import) market participation thus we account for sunk costs by means of past trade experience. We estimate the following random effects panel probit regression where we include lagged TFP, and number of employees as firm-level performance controls:

$$P(y_{it} = 1, x_{it}, y_{it-1}, u_i) = f(\alpha + \rho y_{it-1} + \beta' x_{it} + u_i) \tag{3}$$

Subscript i and index t denotes the individual firms and years, respectively. The binary variable y_{it} indicates whether the firm is a trader or not in one of three subsequent forms (exporting-only, importing-only or being a two way trader); x consists of our firm level performance controls including the mean of these controls as well as region, sector and year dummies; u_i captures the firm level unobservables where f denotes the cumulative normal distribution and where u_i can be expressed as [11]:

$$u_i = \beta_o + \beta_1 y_{i0} + \beta_2 \bar{x}_i + \epsilon_i \tag{4}$$

The results of the random effects dynamic probit model are presented in Panel A of Table 5. As is standard in the literature, we confirm that the more productive

[11] In order to deal with the initial condition bias existing in dynamic limited dependent variable models and the possible correlation between the controls and unobserved heterogeneity we utilize Wooldridge's (2005) methodology which models firm specific effects u_i as a function of the initial condition and other explanatory variables. Accordingly, the model becomes a random effects probit model.

the firms are, the more likely they are to self select into trade. Looking at the coefficients on the lagged dependent variables, we find that Turkish firms face sunk costs of engaging into international markets and the nature of these sunk costs varies between importing and exporting activities[12]. Specifically, we see that the coefficient associated with the lagged import status is higher than exporter coefficient. This suggests that the sunk costs of importing-only are higher than the sunk costs of exporting-only for Turkish manufacturing firms.

Insert Table 5 here

It is also possible that self-selection mechanisms may be linked to variable costs of trade. As in Melitz and Ottaviano (2008) and Bernard et al. (2003) higher variable costs of trading also mean only more productive firms will be able to enter into trade markets. That is they present different selection mechanisms based on variable trade costs instead of sunk costs of trading. In their model setting, market size and variable costs determine the toughness of competition and hence the strength of the self-selection effect. Data from the World Bank Doing Business Surveys suggests that there are indeed higher costs of importing for Turkey. Exporting a standard container of goods requires larger number of documents, takes more time and costs higher for an importing firm than with respect to those of exporting for Turkish firms[13]. Such data is not available neither at the product or bilateral levels hence making it impossible to include such information as a variable in our regressions. However, another key variable cost are the tariffs faced by the firms both with regard to importing and in export markets. In order to control for the variable costs of trading we re-run the dynamic probit regressions in Panel B of Table 5 including import and export tariffs as additional controls. In calculating the firm level tariffs, we use import and export tariffs at HS6 digit product category from WITS-Trains database. We then calculate firm level tariffs by weighting each product-country level (e.g. export line) tariff rate with the share of that product in the total exports of the firm. In this way, we get an average tariff rate which is specific to each firm.

The results in Panel B of Table 5 reinforces our previous finding that there is a stronger self-selection effect for importers than exporters, and with the strongest effect for two-way traders. We see that when we control for tariffs, the coefficients representing the sunk costs for exporting and importing shrink to 0.878 and 0.949 from 0.921 and 0.959, respectively; and that the biggest reduction takes place with

[12]The initial trade status coefficients are high in magnitude and statistically significant correcting for the bias introduced by the 'initial condition' problem.

[13]The data suggests that exporting a standard container of goods requires 7 documents, takes 13 days and costs $990. Importing the same container of goods requires 8 documents, takes 14 days and costs $1063 in 2010. Over 2005-2012, the period in which the data is available, one can see that cost of importing in all dimensions is higher that that of exporting for Turkey.

regard to exporters. This suggests that the tariff-related variable cost element is a more important component of the forces driving self-selection effect for exporters than with respect to importers. However, in addition, now the sunk costs of importing-only become relatively higher than previously in comparison to the sunk costs of exporting-only. Hence failing to consider the variable costs of trade may underestimate the sunk cost differences between importers and exporters.

Next, and given the previous finding that importing is associated with higher sunk costs we try and shed more light on the sunk costs that firms might face while selecting into trade markets. Altomonte and Békés (2010) argue that importers face uncertainty in their trading relationships (e.g. with regard to the quality of the product). This uncertainty is likely to be higher the more complex is the good being traded; therefore the fixed costs of trading are likely to be higher for more complex goods. They show that importers are more productive than exporters and associate this with higher import complexity. One way of looking at the different types of goods and at the complexity of goods is to classify them according to their final use. Therefore, we utilize United Nations' Classification by Broad Economic Categories (BEC) and define products traded in three broad categories as: consumption goods, intermediate goods and capital goods. Capital goods (e.g. machinery) are frequently more complex and may require after-sales service etc. with respect to other categories (Keller and Yeaple, 2008).

The descriptive evidence for Turkey reveals that the share of capital goods imports in total imports is higher compared to capital goods exports in total export. Thus Turkish imports seem to be more complex than exports. We distinguish between three types of firms: capital goods importers/exporters; intermediate goods importers/exporters and consumption goods importers/exporters. An only-importer (only-exporter) firm is defined to be capital goods importer (exporter) if the share of capital goods imports (exports) in its total value of imports (exports) is equal to or greater than 0.5. We define the other categories similarly.

Table 6 presents the random effects dynamic probit regressions run with these categories of firms in question. Given the importance of including the variable cost element associated with tariffs, all these regressions include the import and export tariffs faced by each firm. We show that the sunk costs are higher for capital goods, than intermediate goods, followed by consumption goods, and this applies to both importers and exporters. The coefficient of the lagged dependent variable associated with sunk costs of importing-only are 0.974, 0.923 and 0.831 for capital, intermediate and consumption goods importers respectively. While, the coefficients associated with the sunk costs of exporting-only are 0.919, 0.914 and 0.821 for capital, intermediate and consumption goods importers respectively. Note, first, that in each case these coefficients are higher for importers with respect to those for exporters. Second, that the differential is the largest with regard to

capital goods. Once again these results reinforce our previous finding that sunk costs, to the extent that they drive self-selection, are more important in the case of importing than exporting in Turkey. As the sunk costs of capital goods are higher, this also lends support to the notion that this arises because of the higher complexity associated with such imports (as in Altomonte and Békés (2010)).

Insert Table 6 here

4 Concluding Remarks

This paper uses a rich and recent dataset for Turkish manufacturing firms from 2003 to 2010 to provide the first comprehensive analysis of firm heterogeneity connecting firms' performance to international trade. More importantly, we investigate self selection into foreign markets systematially for Turkey, with a particular focus on the differential between importing and exporting with regard to the self-selection effect, and the role of variable and sunk costs in importing and exporting.

Overall, in line with the picture emerging from the existing literature we show a clear ranking of firm types by performance from two-way traders to importers-only and then to exporters-only. The evidence suggests higher performance premia for only-importers (importers) than only-exporters(exporters), which in turn implies a stronger self-selection mechanism associated with importing with respect to exporting. Indeed, we confirm the self-selection effect for both importing and exporting firms with a stronger effect for importers in Turkey.

In so doing so we show that: (i) being a trader is associated with firms' ex-ante superior performance; (ii) the pre-entry levels of firm's productivity are larger for only-importers than those of only-exporters; (iii) the self-selection effect is still present but is somewhat reduced with a smaller reduction for importers compared to exporters after controlling for the importing status of exporting firms and vice versa; (iv) the nature of sunk costs varies between importing and exporting activities with importers facing higher sunk costs.

We also show that the self-selection mechanism is associated with both variable and sunk costs. In particular, if we take the tariff related variable costs of trade into account, we find that the relative sunk costs for importing are even higher than for exporting. We further show that the sunk costs are highest for capital goods, than intermediate and consumption goods for both of trading activities, with higher sunk costs for importers in terms of each category. These results suggest the importance of further research exploring the determinants of both sunk and variable costs in trade, and the differential costs which are likely to be present between importers and exporters.

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Tables:

TABLE 1a

Trade Participation and Employment Rates by Trade Status

	Percentage of Firms					
	2003-2010	**2003**	**2010**	**Same Status**	**Exit**	**Entry**
Non-Traders	36.7	40	38.23	16.7	72.3	111.7
Only-Exporters	10.8	8.53	11.98	16.3	49.4	148.5
Only-Importers	13.3	13.99	12.1	18.2	43.6	75.4
Two-way Traders	39.2	37.5	37.69	53.2	33.6	70.8
Total				30.5	51.8	94.5

TABLE 1b

Transition of Firms Between Trading Categories (2003-2010)

	2003	**Start Trading**	**Stop Trading**	**Switch**	**2010**
Non-Traders	100	11.0	7.9		136.4
Only-Exporters	100	13.9	9.9	24.4	200.4
Only-Importers	100	9.3	9.2	29.0	123.3
Two-way Traders	100	5.1	2.8	10.4	143.3
Total	100				142.6

Notes: The Table 1b gives percentage of firms according to 2003 values. Columns 2,3 and 4 report the switches of continuing firms in and out of each status The movements between non-traders and the three types of traders are reported in column 2 and 3, while in column 4 we report those traders that switch trading status.

TABLE 2

Firm Performance According to Trade Status (2003-2010)

	LP	**TFP**	**Employee**	**Capint**	**Wage_L**
Exporters	10.16	7.76	138.89	10.83	8.79
Importers	10.24	7.83	144.23	10.91	8.82
TW traders	10.29	7.87	164.06	10.96	8.86
Non-traders	9.49	7.17	48.93	9.97	8.51
Only-Exporters	9.67	7.35	47	10.34	8.53
Only-Importers	10.07	7.69	85.18	10.79	8.68

TABLE 3

Trade Premia Regressions (2003-2010)

	LP			*TFP*		
	Pooled Regression	FE	Dynamic FE	Pooled Regression	FE	Dynamic FE
Two-way trader dummy	0.591***	0.131***	0.117***	0.401***	0.131***	0.116***
	(0.00621)	(0.00973)	(0.0106)	(0.00641)	(0.00977)	(0.0106)
Only-export dummy	0.144***	0.0716***	0.0607***	0.0801***	0.0725***	0.0606***
	(0.00739)	(0.00972)	(0.0106)	(0.00764)	(0.00977)	(0.0106)
Only-import dummy	0.429***	0.0799***	0.0787***	0.323***	0.0775***	0.0730***
	(0.00744)	(0.00948)	(0.0102)	(0.00764)	(0.00952)	(0.0102)
Observations	111619	111619	85422	111619	111619	85422
R-squared	0.393	0.063	0.070	0.812	0.059	0.054

Notes: Reported are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as labor productivity (LP) and total factor productivity (TFP) at time t respectively. Asterisks denote significance levels (***: p < 1%;**: p<5%; *:p<10%). All regressions include region, sector, foreign affiliation and year dummies as well as capital intensity (Capint), wages per employee (Wage_L) and logarithm of firms' number of employees as controls. Dynamic FE regressions include lagged dependent variables. All dependent variables are in natural logarithms.

TABLE 4

Ex-ante Performance Differentials of Trade Starters

					LP					
	(t-2)	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*
Non-trader that starts to export in t (dummy)	0.186***	0.191***								
	(0.0259)	(0.0253)								
Non-trader that starts to import in t (dummy)			0.236***	0.314***						
			(0.0447)	(0.0430)						
Non-trader that start to two-way trade					0.364***	0.415***				
					(0.0270)	(0.0255)				
Importer that starts to export in t (dummy)							0.071**	0.106***		
							(0.0295)	(0.0315)		
Exporter that starts to import in t (dummy)									0.221***	0.281***
									(0.0299)	(0.0292)
Observations	10070	12664	10263	12866	9551	12157	2549	2854	1784	2119
R-squared	0.241	0.251	0.253	0.268	0.246	0.257	0.243	0.265	0.207	0.258
					TFP					
	(t-2)	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*
Non-trader that starts to export in t (dummy)	0.249***	0.255***								
	(0.0591)	(0.0597)								
Non-trader that starts to import in t (dummy)			0.277***	0.313***						
			(0.0461)	(0.0457)						
Non-trader that start to two-way trade					0.325***	0.444***				
					(0.0964)	(0.0906)				
Importer that starts to export in t (dummy)							0.065**	0.104***		
							(0.0319)	(0.0235)		
Exporter that starts to import in t (dummy)									0.197***	0.251**
									(0.0706)	(0.0689)
Observations	10070	12664	10263	12866	9551	12157	2549	2854	1784	2119
R-squared	0.125	0.116	0.130	0.117	0.129	0.118	0.138	0.145	0.181	0.187

Notes: Reported are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as labor productivity (LP) and total factor productivity (TFP) at time t-2 and t-1 respectively. Asterisks denote significance levels (***: p < 1%;**: p<5%; *:p<10%). All regressions include region, sector, foreign affiliation and year dummies as well as lagged values of capital intensity (Capint), wages per employee (Wage_L) and logarithm of firms' number of employees as controls. All dependent variables are in natural logarithms.

TABLE 5

Dynamic Panel Probit Regressions

	Panel A(without tariffs)			*Panel B(with tariffs)*		
	Only-exporter	Only-importer	Two-way trader	Only-exporter	Only-importer	Two-way trader
Only-export dummy(t-1)	0.921***			0.878***		
	(0.0269)			(0.0260)		
Only-import dummy(t-1)		0.959***			0.949***	
		(0.0225)			(0.0223)	
Two-way trader dummy(t-1)			1.072***			1.055***
			(0.0217)			(0.0211)
Employee(t-1)	0.0889**	0.0925**	0.112**	0.0855**	0.0997**	0.115***
	(0.0371)	(0.0475)	(0.0451)	(0.0442)	(0.0464)	(0.044)
TFP(t-1)	0.0215***	0.0348***	0.0416***	0.0268***	0.0335***	0.0483***
	(0.0067)	(0.0048)	(0.0138)	(0.005)	(0.0043)	(0.0134)
Wage_L(t-1)	0.0100	0.0203**	0.0603*	0.0109	0.0174***	0.0604**
	(0.0449)	(0.0083)	(0.0364)	(0.0424)	(0.0057)	(0.0354)
Observations	85412	85412	85412	85412	85412	85412

Notes: The table reports dynamic panel probit regressions. *(t − 1)* indicates that the variable is lagged. Reported are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as binary outcome variables of being an only exporter, only importer and two way trader respectively. Asterisks denote significance levels (***: p < 1%;**: p<5%; *:p<10%). All regressions include means of the continuous explanatory variables and initial values of the dependent variables as well as region, sector, foreign affiliation and year dummies as controls.

TABLE 6

Dynamic Probit Regressions w.r.to BEC Classification

	WITH TARIFFS					
	Capital Exporter Only	Intermediate Exporter Only	Consumption Exporter Only	Capital Importer Only	Intermediate Importer Only	Consumption Importer Only
Capital Exporter Only (t-1)	0.919***					
	(0.0387)					
Intermediate Exporter Only (t-1)		0.914***				
		(0.0248)				
Consumption Exporter Only (t-1)			0.820***			
			(0.0396)			
Capital Importer Only (t-1)				0.974***		
				(0.0387)		
Intermediate Importer Only (t-1)					0.923***	
					(0.0277)	
Consumption Importer Only (t-1)						0.831***
						(0.0737)
Observations	82869	83105	83278	82696	83278	83278

Notes: The table reports dynamic panel probit regressions. *(t − 1)* indicates that the variable is lagged. Reported are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as binary outcome variables of being an only exporter, only importer and two way trader respectively. Asterisks denote significance levels (***: p < 1%;**: p<5%; *:p<10%). All regressions include means of the continuous explanatory variables and initial values of the dependent variables as well as region, sector, foreign affiliation and year dummies as controls.