REAL EXCHANGE RATE AND EXPORT BEHAVIOR: FIRM LEVEL EVIDENCE

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REAL EXCHANGE RATE AND EXPORT BEHAVIOR: FIRM LEVEL EVIDENCE

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DECLARATION OF ORIGINALITY

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ABSTRACT

Real Exchange Rate and Export Behavior:

Firm Level Evidence

In this thesis, the effect of bilateral real exchange rate changes on the firm-level export behavior of the Turkish manufacturing sector is investigated. Using the detailed panel of Turkish customs and industry data sets covering the years 2007-2014, both export participation and export supply decisions are tested empirically. Export participation results indicate that depreciation of the domestic currency reduces the probability of exporting. On the other hand, it is observed that export supply increases as the domestic currency depreciates. It is also found that more productive and sizeable firms increase their export supply more than smaller firms and that being an importer significantly improves the amount of exports. The results are robust to alternative samples and estimation methods.

ÖZET

Reel Döviz Kuru ve İhracat Davranışı:

Firma Seviyesinde Kanıt

Bu tezde, ikili reel döviz kuru değişiminin Türk imalat sektörünün firma seviyesindeki ihracat davranışı üzerindeki etkisi incelenmiştir. Türkiye'nin 2007-2014 yıllarına ait detaylı gümrük ve sanayi panel data verisi kullanılarak, hem ihracat katılımı hem de ihracat tedariği kararları ampirik olarak test edilmiştir. İhracat katılımı sonuçları, yerel para birimindeki değer kaybının ihracat yapma olasılığını düşürdüğünü gösteriyor. Diğer taraftan, yerel para birimi değer kaybettikçe ihracat tedariğinin arttığı gözlemleniyor. Buna ek olarak, daha verimli ve büyük firmaların ihracat tedariklerini daha fazla arttırdıkları ve ithalatçı olmanın ihracat miktarını önemli ölçüde geliştirdiği bulundu. Sonuçlar alternatif örneklem ve tahmin yöntemleri kullanımında değişmiyor.

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CHAPTER 1

INTRODUCTION

Fluctuations in bilateral exchange rates have consequential effects on export and import dynamics of a country. Various firms entering and exiting the export market every year and the composition of exporters shows imbalances across sectors. Furthermore, new entrants and existing firms in the export market supply different amounts of goods. Hence, in order to explain the effects of exchange rate on the exporting behaviour of a country, one needs to investigate firm level responses to exchange rate changes. There are various possible explanations for the changing distribution of exporters such as state incentives for specific sectors, but I focus solely on the effect of exchange rate changes on export participation and export supply decisions.

There is a vast literature on the entry and exit dynamics of exporters. One branch of the literature is related to sunk entry or exit costs producing hysteresis in trade flows. Roberts and Tybout (1997) studied sunk-cost hysteresis by directly analyzing entry and exit patterns in firm-level panel data. Through a dynamic discrete choice model of exporting behavior, they found significant sunk entry costs in explaining firms' exporting status. Past export participation is shown to increase the probability of exporting by approximately 60 percentage points. Campa (2002), analyzed the responsiveness of a country's export supply to exchange rate changes by dividing this effect into two components: extensive and intensive margins. Similar to Robert and Tybout, he also found sunk cost hysteresis in entry and exit decisions. His results suggested that a 10% depreciation in domestic currency leads to an increase in export volume, but only 1.4% of this increase is due to new exporting firms.

The other explanation for entry into export market following a depreciation in domestic currency is the increasing exporting capability of less

productive firms. Berman, Martin, and Mayer (2012) suggested that domestic currency depreciation leads to higher profits through an increase in sales and markups such that for some firms which are not productive enough to cover the fixed cost of market entry become profitable and they therefore enter the export market. They found that a 10% depreciation increases the exporting probability by around 1.8 percentage points. Bernard and Jensen (1997) studied the causal relationship between exporting and firm performance. They proposed a binary choice non-structural approach to measure the effect of prior success of a firm (proxied by total employment, productivity, and the level of wages) on exporting probability. They found that a 10% increase in employment increases the probability of exporting by 1%.

In addition to examining the export participation choice of firms, this thesis also studies the export supply decision. Conditioning on being an exporter, a single firm's decision about how much to export also depends on exchange rate shifts. There are recent studies that aimed to shed light on this issue. Using a detailed firm level manufacturing data set of English firms, Greenaway, Kneller, and Zhang (2007) investigated the effects of real exchange rate changes on exporting behavior in both participation and supply sides. They found a small effect of the exchange rate on firms' decisions to enter and exit markets, yet they claimed that it significantly affects export shares: one index point real exchange rate depreciation increases the export share by 1.28 percent.

Berman et. al. (2012) examined the heterogeneous reaction of exporters to real exchange rate changes. More productive exporters react to a depreciation in local currency by increasing their markups more and by increasing their volume less. Both high and low productive firms increase their volume after a depreciation of a domestic currency, but less productive firms increase them more. Eaton, Eslava, Kugler, and Tybout (2008) found low cost of shipping for small volumes of export and no significant cost of entry to

export market. Decomposing Colombian trade data into two as extensive and intensive margins to measure the contribution of both existing and new exporters to country's export volume, they discovered that only a small fraction of new exporters manage to survive and after a decade, these survivors constitute almost half of the export expansion. Halpern, Koren, and Szeidl (2015), on the other hand, investigated the effect of imported inputs on productivity. Their results implied that increasing the fraction of imported goods from zero to 100 percent would increase quantity productivity by 24 percent. Although they did not examine the relationship between exchange rate and trade directly, their results were helpful for my work in explaining the multidimensional relationship between exchange rate and trade using the import status of exporters.

In this paper, I estimate the effect of real exchange rate changes on export volume and export participation separately. For export volume, I estimate an econometric model using a detailed firm level panel data set of manufacturing firms in Turkey. Destination specific export volumes and firm specific characteristics of Turkish manufacturing firms are documented for the 2007-2014 period at annual frequency. In my base specification, I found that 10 percent depreciation in domestic currency leads to 5.7 percent increase in export volume.[1] I also found that more productive firms react to exchange rate depreciation by increasing their export volume more. In depreciation periods, a firm with 10 percent higher productivity supplies 0.8 percent more exported products than a less productive firm does. Another finding is that being an importer significantly increases the amount of export volume.

For the export participation of manufacturing firms, I construct a parametric estimation model using the aggregated customs data in firm-year level. Including non-exporters into my sample and firm-specific weighted real exchange rates, we found that firms tend to exit the export market when

[1] Volume is defined in terms of kilogram. A detailed explanation of variables is provided in Chapter 2.

domestic currency depreciates. In my base specification, a 10 percent depreciation of the Turkish Lira reduces the export probability of manufacturing firms by 1 percentage point. This finding contradicts the theoretical prediction, but my results are robust to different samples and estimation methods. Being an importer, on the other hand, increases export probability significantly. If an exporting firm also imports, the probability of exporting increases around 8 percentage points.

The remainder of my study is organized as follows: In Chapter 2, I summarize my sample construction process and provide descriptive statistics on baseline samples. In Chapter 3, parametric estimation models of both export participation and export supply are provided. Chapters 4 and 5 present my baseline and robustness results, respectively. Chapter 6 concludes. Additional descriptives and empirical results are provided in the appendix.

CHAPTER 2

DATA

2.1 Data description

My main data source is the Turkish Statistical Institute, which provided comprehensive panels of Turkish trade flows and firm level characteristics. I tested the predictions of my models with entry to export market and export supply decision using a large database on Turkish firms coming from two sources: The first is, Turkish customs for firm-destination-product level trade data, which reports export and import records both monthly and annually. The database contains the volume (in kilograms) and value (in Turkish Lira, USD and Euro) of exports by destination country and imports by source country for each twelve-digit product. I put a threshold for export value: all flows greater than 1,000 Turkish Liras are recorded. This threshold only eliminates a very small proportion of total exports. The second source is, firm-level annual data set that contains information about firm characteristics including firms' sales, employment, sector of main activity in 2 digit NACE2 classification, cost-revenue items and other balance-sheet variables.

Our sample includes data for the period 2007 to 2014. I focused on export destinations of 31 OECD and 7 non-OECD countries that account for 70-75 percent of the total export value of Turkey in the sample period for different years. Bilateral exchange rates are obtained from OECD database. These exchange rates are just yearly average real exchange rates between Turkey and destination countries. I merged trade data with firm-level characteristics data using a unique firm identifier to match export information with some firm-level estimates including total cost and productivity measures.

2.2 Construction of variables

We created a productivity estimate of a firm by generating firm i's hourly production value at period t:

$$\varphi_{i,t} = \frac{\text{Production Value}_{i,t}}{\text{Total Hours Worked}_{i,t}}$$

For export participation model, I computed real exchange rate as the weighted average exchange rate of a firm across its trading partners weighted by the export share of each destination:

$$e_{i,t} = \sum_{j}^{J} \text{RER}_{j,t} * \text{weight}_{i,j,t}$$

where J is the set of destination countries, $\text{RER}_{j,t}$ is the yearly real exchange rate between destination country j and home country at time t and $\text{weight}_{i,j,t}$ is the share of country j in firm i's total export at period t.

For non-exporting firms, I construct the exchange rate variable using the bilateral exchange rates of the five largest destination markets in each manufacturing sector at period t. I take weights as the share of each of these sectors in the total exports of the industry to those five destination markets.[2]

2.3 Sample description

We create two different samples for export participation and export supply estimation. Export estimation data set is firm-year level whereas export supply estimation data set is firm-destination-year level. To accurately keep track of entry and exit movements of firms in export participation data set, balanced firm-year level sample is created. For export supply estimation, on the other

[2] See Campa (2002)

hand, I use firm-destination-year level observations of all manufacturing firms that have export record in the trade data.

In the industry data of export participation estimation, I restrict the observations to firms for which the declared main activity belongs to manufacturing. Using two digit NACE2 (Nomenclature of Economic Activities) codes, 24 manufacturing industry subgroups are kept. Sample is also restricted for the number of workers so that I keep only firms having at least 5 employees in the specific study period. Then, starting from 2007, yearly industry data set is merged on the consecutive year's data. This gives us a balanced panel data set covering the period from 2007 to 2014 with 8,966 firms in each year in the industry side.

Trade data, on the other hand, is presented at the firm-product-destination-year level. To observe market entry/exit behaviors of firms, I aggregated trade data at the firm-year level. I worked with 31 OECD and 7 Non-OECD countries in the customs data and these countries account for approximately 70 percent of total exports of Turkey. Furthermore, I keep export observations unless the value of export exceeds 1,000 Turkish Liras and yearly export volume is greater than 100 kilos. This eliminates very small proportion of total exports. Before aggregating the trade data, I externally add bilateral real exchange rates to generate firm-specific weighted real exchange rate values. Trade data also has import records of firms. I want to control for the import status of firms to measure the effect of being an importer on export participation decision. Hence, I merge import and export data sets so that I have export records and import status of firms in the same sample.

In order to link firm characteristics with customs records, industry and trade data sets are merged using a unique firm identifier. This provides 8-year panel data of manufacturing firms with export records. Not all manufacturing firms are exporters throughout the study period; some of them export in a specific year while some others do not. The exporting firms are the ones

matched with customs data. In my main sample, I have firm-specific variables such as productivity, number of employees and aggregate trade records of exporting firms in firm-year level.

We generate some other samples to challenge my other questions. To explore the effects of exchange rate changes on entering into new destination rather than being an exporter, I use firm-destination-year level trade data. In this sample, I again use the same industry data that is used for firm-year level investigation (balanced with the same 8,966 firms), but this time there are 38 (number of destination countries) observations for each firm in a specific year. Real exchange rate values are not weighted for this sample and I add new variables such as real GDP per capita and real GDP per capita growth to capture the demand side effect.

In the second part of my study, I explore the effects of real exchange rate on export supply of firms in firm-destination-year level data. Here, I create two data sets that are differentiated only in the composition of manufacturing firms: In the first one, I include the same set of manufacturing firms that I used for export participation estimation while in the second one, industry data is not restricted to the set of manufacturing firms that are presented in each year of the study period[3]. In other words, in the second sample, I include all manufacturing firms having at least 5 employees during 2007-2014 period. On the trade side, I again concentrate on the firm-destination-year level observations of 31 OECD and 7 Non-OECD countries and I employ the same restrictions for export value and volume observations as we did for export participation sample generation. Finally, to get my baseline and robustness samples for export supply estimation, two industry samples are merged with the same customs data.

[3] After this point, I call the first sample "Baseline Sample" and the second sample "Robustness Sample" for export supply estimation.

2.4 Descriptive statistics

Table 1 represents the yearly change in the number of manufacturing firms and exporters. It also presents the firm number changes in my main sample generation process. As can be depicted from the table, the number of Turkish manufacturers and exporters follows the increasing trend during the study period. In 2007, my data set contains 21,899 manufacturing firms but this number goes up to 45,316 in 2014. Also, the number of exporters is 30,438 in 2007, and it is 34,661 in 2014. Table 1 also summarizes my sample generation procedure for the export participation estimation. I want to have a balanced sample throughout the study period to make it easier to keep track of the entering and existing firms. To do that, I take 2007 manufacturers as my base group of firms and match them with consecutive years' manufacturers. This gives a balanced sample with 8,966 firms where each firm is presented in the industry data set. After constructing the balanced manufacturing sample, I merge it with trade data to get a sample containing trade records and firm characteristics. For instance, in 2007, my final sample has 4,397 exporters and 4,569 (8,966-4,397) non-exporters. In row 6 (# of Manufacturing Exporters), I see that the number of exporting and non-exporting firms does not fluctuate much, yet it has still enough variation to monitor entering and exiting firms.

Table A1 in the Appendix shows the distribution of exporting firms by industry and size. The numbers in parentheses shows the number of exporting firms in 2007. The number of firms is distributed heterogeneously across sectors. Whereas several sectors such as textiles, clothing, plastics and minerals contain a much higher number of firms, the firm number in other sectors, such as tobacco, refined petroleum and machine setup, are too low.

Table 2 represents the export participation of firms. It shows the number of exporters and non-exporters at time t conditional on being an exporter or a non-exporter in the previous period. In each column, sum of the first and third columns gives the number of exporters in that period; similarly,

Table 1. Change in the Number of Firms in Sample Construction

	2007	2008	2009	2010	2011	2012	2013	2014
Industry								
Number of All Firms	83,961	82,660	99,920	106,713	138,013	147,915	168,676	159,426
# of Manufacturing Firms	21,899	31,700	35,028	33,865	41,171	43,256	46,951	45,316
Keeping Appropriate Observations*	21,894	26,779	28,509	29,795	35,588	38,590	41,972	40,074
# of Firms in Balanced Data set**	8,966	8,966	8,966	8,966	8,966	8,966	8,966	8,966
Trade								
Number of Firms	30,438	29,778	29,207	29,452	31,107	32,149	33,427	34,661
# of Manufacturing Exporters	4,397	4,413	4,491	4,499	4,528	4,534	4,531	4,491
# of Non-manufacturing Exporters	26,041	25,365	24,716	24,953	26,579	27,615	28,896	30,170

* includes dropping firms having "0 production value" and missing(.) "number of workers" observations. ** indicates merging of industry data. Fixing 2007 as base year, following years are merged on 2007 data. This gives a balanced panel data set with 8-year study period.

the sum of the second and the fourth columns gives the number of non-exporters. For instance, in the year 2008, there are 4,413(sum of 3,838 and 575) exporters and 4,553(sum of 3,994 and 559) non-exporters. Among those 4,413 exporters, 3,895 of them continue exporting and 518 of them stop exporting in 2009. Transition numbers can be evidence for the persistence across firms in export participation.

Table 2. Firm Transition Numbers in Export Markets

		2008	2009	2010	2011	2012	2013	2014
Exporter	export	3,838	3,895	3,966	3,987	4,003	4,036	4,017
	no export	559	518	525	512	525	498	514
Non-Exporter	export	575	596	533	541	531	495	474
	no export	3,994	3,957	3,942	3,926	3,907	3,937	3,961

Table A2 (see the Appendix) contains descriptive statistics for exporting and non-exporting firms for my restricted sample with 8,966 manufacturing firms. The average productivity and production value stay stable for both exporters and non-exporters, yet the average production value of exporters is roughly 5 times larger than the average production value of non-exporters and more than 80 % of the total production is done by exporting manufacturers. Also, the data shows that exporters are more productive than non-exporters throughout the study period. The fraction of exporters in my restricted sample increases slightly during the study period. In another table in the Appendix, Table A3, I provide further evidence for the persistence of export status in the sample, where 64% of non-exporting firms remain non-exporters during the rest of the study period while 58% of exporting firms keep exporting over the course of study period. The variability of export participation comes from 36% of firms starting as a non-exporter and 42% of firms starting as an exporter but who change their export status at least once.

Table 3. Descriptives of Consistent Exporters, Non-Exporters and Entering-Exiting Firms

	Always Exporter		Always Non-Exporter		Entering-Exiting Firms		Whole Sample	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean
# of workers	105	260.10	45	73.49	55	129.88	58	153.62
Productivity	51.52	86.06	29.55	51.44	40.64	63.79	40.42	66.99
ln(Export Volume)	11.91	11.93	-	-	8.97	9.11	10.91	10.94
ln(Import Volume)	10.80	9.25	0	2.40	7.63	6.49	6.00	6.07
Share of importing firms	78.7%		25.6%		62.2%		55.9%	

Table 3 reports firm-level descriptives of firms by dividing them into three groups: always exporters, always non-exporters and firms that enter/exit the export market at least once during the study period. I have one more group that summarizes the descriptives of whole sample to make comparison easier. It is clear that always exporting firms have a much higher firm size, productivity level, export volume and import volume. Among continuously exporting firms, 78.7% of them also import during the study period. The share of importing firms is the least for firms that never export (25.6%) and they also have the lowest productivity levels and firm size. Table 3 reveals that firms staying in the export market are generally the ones with a bigger size, higher productivity level, and a greater export and import volume. In other words, more productive and sizeable firms tend to stay in the export market. Firms with lower productivity and firm size, on the other hand, struggle to participate in the export market.

We construct two other tables presented in the Appendix, Tables A4 and A5, which summarize the export distribution of sectors by volume and value, respectively. The sectoral volume share reveals that the export volume is dominated by several sectors, notably, by manufacturers of minerals, base metals, motor land vehicles and chemicals. The sectoral value share, on the other hand, implies that motor land vehicles manufacturers overshadow the contribution of other sectors to the export value. Both volume and value shares of exports are distributed non-uniformly and this may require additional sector level attention in the construction of my estimation model.

CHAPTER 3

MODEL

3.1 Export participation model

We now turn to the empirical estimation of the relationship between export participation and currency movements. In order to do this, I use an empirical specification for the export choice. I assume that firms decide whether to export or not according to the following equation:

$$E_{i,t} = \alpha_0 + \alpha_1 \ln(e_{i,t}) + \alpha_2 X_{i,t} + \alpha_3 \ln(e_{i,t}) * X_{i,t} + \alpha_4 \theta_{i,t} + \mu_t + \epsilon_{i,t} \qquad (1)$$

where $E_{i,t}$ denotes the export status of a firm i at period t. If a firm exports at period t, $E_{i,t}$ takes the value of 1; otherwise it is 0. $\ln(e_{i,t})$ is the logarithm of the weighted real exchange rate of a firm i at period t. An increase in exchange rate means domestic currency depreciates. $X_{i,t}$ denotes observable firm characteristics at period t including firm productivity and size, and μ_t denotes year dummies.

We introduce year dummies to control for the annual shocks that are common to all firms such as overall changes in supply of Turkish exports, changes in credit-market conditions and changes in the trade policy of Turkey.[4] The observable firm characteristics vector $X_{i,t}$ controls for the firm-specific variables that are affecting the export decision of a particular firm. These variables include firm productivity, firm size and other firm related effects. The last and the most important variable for my study is the real exchange rate. Changes in the real exchange rate affect the exporting probability by changing the firm's expectations of a future exchange rate and the level of sunk entry and exit cost of exporting[5]. Alternatively, the effects of the real exchange rate

[4] See Roberts and Tybout (1997)
[5] See Campa (2002)

on export participation can be explained through its effects on imports. Firms in developing countries such as Turkey increase their product quality through high-quality imported products and thus, those firms easily enter the export market.

We define weighted the real exchange rate as a weighted average of the bilateral exchange rate between the Turkish Lira and the export destination country's currency where the weights are the proportion of a firm's exports to each destination market. Since I have non-exporting firms in my sample, I also define the sector-specific real exchange rate for those non-exporters. Their weighted exchange rate at time t is calculated using the export records of the five largest trading partners of Turkey at time t. The real exchange rate is weighted by the shares of those five largest countries in each manufacturing sector.[6]

3.2 Export volume estimation

For the export volume estimation, I want to test the reaction of Turkish exporters to real exchange rate movements. In order to do that, I estimate the following specification for the firm-destination-year level data:

$$\begin{aligned} \ln(\text{Volume}_{i,j,t}) = \alpha_0 + \alpha_1 \ln(\text{RER}_{j,t}) + \alpha_2 \ln(\varphi_{i,t}) + \alpha_3 \ln(\text{RER}_{j,t}) * \ln(\varphi_{i,t}) \\ + \alpha_4 \theta_{i,t} + \alpha_5 \ln(\text{RER}_{j,t}) * \theta_{i,t} + \mu_t + \epsilon_{i,j,t} \end{aligned} \tag{2}$$

where $\ln(\text{Volume}_{i,j,t})$ denotes the logarithm of volume [7] exported by firm i to destination j at period t, $\ln(\text{RER}_{j,t})$ is the bilateral real exchange rate between Turkey and destination country j at period t[8], $\varphi_{i,t}$ is the productivity of a firm i at period t defined as the hourly production value of a firm, $\theta_{i,t}$ is the dummy

[6] See Campa (2002)

[7] Recall that export volume is expressed in kilograms.

[8] Similar to my specification for export participation, an increase in exchange rate means that domestic currency depreciates.

variable indicating import status of firm i (if firm i imports at period t, then $\theta_{i,t}$ equals to 1) and μ_t denotes year dummies. Lastly, I introduce sector-destination fixed effects to control for the time-invariant sector (or destination) characteristics that may have an effect on export supply of firms such as trade costs or trade habits that may have a strengthening or weakening impact on the relationship between specific sectors and destinations.

Conventionally, the expected sign of α_1 is positive. Since a depreciation in domestic currency makes the export products of the home country cheaper, this increases the demand for cheaper products. Exporting firms react to the increasing demand either by boosting their export volume or by raising their export prices. Typically, firms in developing countries such as Turkey do not have strong market power in their export destinations. If they reflect the effects of depreciation on their export prices, they may lose their market share. Thus, the predicted reaction is that they will increase their export volume more and their markup less.

I have another estimation model which includes a logarithm the of number of workers of a firm instead of a logarithm of a productivity variable. The number of workers variable is a good measure to reflect the size of a firm and adding it into my model makes it possible to capture firm variability as investigating the effects of real exchange rate movements.

$$\begin{aligned} \ln(\text{Volume}_{i,j,t}) = \alpha_0 + \alpha_1 \ln(\text{RER}_{j,t}) + \alpha_2 \ln(\lambda_{i,t}) + \alpha_3 \ln(\text{RER}_{j,t}) * \ln(\lambda_{i,t}) \\ + \alpha_4 \theta_{i,t} + \alpha_5 \ln(\text{RER}_{j,t}) * \theta_{i,t} + \mu_t + \epsilon_{i,j,t} \end{aligned} \tag{3}$$

where $\lambda_{i,t}$ is the number of workers of a firm i at period t which is the only difference between equations (2) and (3).

CHAPTER 4

EMPIRICAL RESULTS

4.1 Export participation

In theory, depreciation of the domestic exchange rate increases the probability of exporting. Recall that an increase in real exchange rate implies a depreciation of the domestic currency. Hence, the expected sign of the weighted exchange rate variable is positive. In this section, I test this prediction and measure the effect of a real exchange rate on the exporting probability of a firm i at period t. In my equation, I also include firm-specific characteristics such as productivity and the number of employees as well as the import status of firms.

Table 4 summarizes my findings. $\ln(e_{i,t})$ is the weighted exchange rate, $\varphi_{i,t}$ is firm productivity, $\lambda_{i,t}$ is the number of workers, and $\theta_{i,t}$ is the export status dummy variable. I use different estimation methods to test the robustness of my results. Columns (i) to (iii) include probit estimates, columns (iv) to (vi) include logit estimates, and columns (vii) to (ix) include linear probability model estimates. All three methods have sector-destination fixed effects and a dummy variable that indicates the import status of a firm. In contrast to theoretical prediction, my results suggest that an exchange rate depreciation in domestic currency reduces the probability of entering the export market. In all three methods, the coefficient of weighted exchange rate variable is negative and significant. I also found that more productive firms and firms with more workers have higher probability of participating in the export market. Interaction variables, on the other hand, reveal that a negative effect of exchange rate on export probability decreases with increasing productivity and firm size. In column (i), for instance, a 10 percent increase in firm productivity increases the export participation probability by 0.4 percentage points and in column (ii), a 10 percent increase in the number of workers increases the export

Table 4. Export Participation - Firm-Year Level

	Probit			Logit			LPM		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
DV: $E_{i,t}$									
$\ln(e_{i,t})$	-0.26***	-0.41***	-0.10**	-0.46***	-0.72***	-0.20**	-0.09***	-0.15***	-0.04***
$\ln(\varphi_{i,t})$	-	-	0.19***	-	-	0.32***	-	-	0.06***
$\ln(e_{i,t})$*$\ln(\varphi_{i,t})$	0.04***	-	-	0.07***	-	-	0.01***	-	-
$\ln(\lambda_{i,t})$	-	-	0.32***	-	-	0.54***	-	-	0.10***
$\ln(e_{i,t})$*$\ln(\lambda_{i,t})$	-	0.07***	-	-	0.11***	-	-	0.02***	-
$\theta_{i,t}$	1.00***	0.91***	0.81***	1.65***	1.51***	1.34***	0.37***	0.33***	0.30***

***,** and * denote 1, 5 and 10 percentage significance of variables, respectively. Exchange rate is the firm specific weighted real exchange rate. Sector-year fixed effects are absorbed in all specifications.

participation probability by 0.7 percentage points during depreciation periods. I also report the import status of firms in my all specifications. According to my results, importing firms are more likely than non-importers to enter the export market.

Most empirical estimations find that a depreciation in the domestic currency increases export probability.[9] In developing countries such as Turkey, however, there are other factors that affect an export participation decision. The expansion of most Turkish manufacturing firms depend on external credits from sources abroad. Tiryaki and Kurul (2015) show that exporter firms in Turkey are more likely to get credit. In depreciation periods, the burden of these credits becomes heavier. Additionally, in depreciation periods, the whole economy deteriorates in Turkey, even in the domestic market. Not only do exporters stop exporting but firms producing for the domestic market aslo experience stagnation or even they shut down. Therefore, it is reasonable to observe an exporting probability reduction during domestic currency depreciation periods in countries like Turkey.

Alternatively, the negative effect of exchange depreciation on export participation can be explained by the structure of the entering/exiting firms. In Table 3, it is clear that the most productive and sizeable firms are the ones that continue exporting during the whole study period whereas the least sizeable and productive firms are not able to participate in the export market. I observe entering/exiting movements mostly for average size firms that have average productivity levels. This means that bigger firms are not affected much by exchange rate movements when they decide whether to enter or exit the export market. They always stay in the market and the aggregate exporting responses of those firms do not change. On the other hand, smaller firms with a lower level of productivity react to the exchange rate by altering their exporting decision. I already stated that Turkish firms are credit constrained

[9] See Berman etal. (2012), Campa (2002) and Bernard and Jensen (2001)

and that depreciation periods are times where the whole economy worsens in Turkey. Since smaller firms are more sensitive to worsening economic conditions, their reaction would be to leave the market and that could be the reason for the observed negative relationship between exchange rate depreciation and export participation probability.

With regard to the import status of firms, the coefficient of the import dummy variable shows that importers are more likely to enter the export market. This is also an acceptable finding for Turkey because Turkey depends on a current account deficit for its economic growth. In other words, most firms use high level of imported input in production so that their growth is import-oriented. Using imported inputs makes firms more productive and increases their production amount, which enables firms to export. This historical growth tendency of Turkey, which arises from a current account deficit, validates my finding that the probability of being an exporter is higher for importer firms.

4.2 Export volume

Next, I present my findings regarding export volume estimation. I generate two estimations methods for the same firm-destination-year level sample: one with sector-destination fixed effects and the other with firm-destination fixed effects. I also include firm productivity, the number of workers of a firm, a dummy variable indicating the import status of a firm, a bilateral real exchange between Turkey and a destination country,-and its interactions with other variables.

Table 5 reports my results. The coefficient of the real exchange rate variable is positive in all specifications. In column (i), my results suggest that a 10 percent depreciation increases export volume of a firm to a single destination

Table 5. Export Supply - Baseline Results

	Sector-Destination Fixed Effects					Firm-Destination Fixed Effects				
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
DV: $\ln(\text{Volume}_{i,j,t})$										
$\ln(\text{RER}_{j,t})$	0.62***	0.32**	0.65***	0.26*	0.57***	0.26***	0.22***	0.27***	0.22***	0.27***
$\ln(\varphi_{i,t})$	-	0.51***	-	0.36**	-	-	-0.16**	-	-0.16**	-
$\ln(\text{RER}_{j,t})$*$\ln(\varphi_{i,t})$	-	0.05*	-	0.08***	-	-	0.08***	-	0.08***	-
$\ln(\lambda_{i,t})$	-	-	0.79***	-	0.66***	-	-	0.21***	-	0.22***
$\ln(\text{RER}_{j,t})$*$\ln(\lambda_{i,t})$	-	-	-0.03	-	-0.003	-	-	0.04***	-	0.04***
$\ln(\text{RGDPPC}_{j,t})$	0.94***	0.99***	1.03***	1.03***	1.05***	1.65***	1.70***	1.67***	1.70***	1.67***
$\theta_{i,t}$	0.97***	0.66***	0.36***	3.29***	2.75***	0.19***	0.20***	0.19***	0.04	0.02
$\ln(\text{RER}_{j,t})$*$\theta_{i,t}$	-	-	-	-0.52***	-0.48***	-	-	-	0.03	0.03

***,** and * denote 1, 5 and 10 percentage significance of variables, respectively. Exchange rate is the bilateral real exchange rate between Turkey and destination country. Columns (i)-(v) have year dummies and sector-destination fixed effects are absorbed. Columns (vi)-(x) have year and sector dummies and firm-destination fixed effects are absorbed.

by 6.2 percent and this coefficient is significant at the 1 percent level. In my specifications with sector-destination fixed effects, export volume also increases with firm productivity (columns (ii) and (iv)). However, I find a negative relationship between productivity and the real exchange rate in firm-destination fixed effects specifications (columns (vii) and (ix)). This may stem from the absorbing effects of firm-destination fixed effects since my productivity measure does not change for a specific firm across different destinations and the productivity level of firms stays stable during the study period. In column (iv), on the other hand, the level effect of the exchange rate variable is 0.26, but this effect increases to 0.34 (0.26+0.08) for firms that are 10% more productive than a typical firm. This finding is also valid for other specifications (columns (ii), (vii), (ix)). My results on exchange rate-productivity interaction variable show that more productive exporters react to exchange rate depreciation by increasing their export volume more. Bigger firms (firms with higher numbers of workers), on the other hand, seem to export a higher amount of products in all specifications (columns (iii), (v), (vii) and (ix)). When I add the interaction term of the number of workers to the exchange rate variable, I see that firms with a 10 percent increase in the number of workers increase their export volume by 0.4 percentage points more (columns (viii) and (x)). However, this finding is not valid if I add sector-destination fixed effects: the coefficient of interaction term is negative and insignificant. Lastly, I found that importing firms export more and this result is robust to all my specifications. The exchange rate-import status interaction variable is negative in the sector-destination fixed effect model implying that an exchange rate depreciation reduces export volume for importing firms. Compared to the sector-destination fixed effects model, the coefficient of interaction variable is insignificant and much smaller in absolute terms.

The sign of the real exchange rate variable corroborates the existing literature. Berman e t al. (2012) and Smith (2004) also find a positive

relationship between exchange rate depreciation and export volume. According to my results, the exchange rate-firm size interaction variable has a small positive effect (in some other specifications such as columns (iii) and (v), this effect is even smaller in absolute terms and is negative) on export volume. The reason that I detect this small effect is that even the biggest Turkish exporters have small market shares in their export destinations. During depreciation periods, they are unable to enlarge their export share too much because they are not sufficiently competitive. Therefore, the effect of firm size is not particularly high in domestic currency depreciation times. With regard to the exchange rate-import dummy interaction variable, I get a negative coefficient. This effect can be explained by the import-dependent growth dynamics of developing countries such as Turkey. Turkish firms traditionally increase their production through importing and expanding their size in the export market. However, in depreciation periods, importing becomes more expensive and its costs negatively affect production and therefore, export. This is why I observe an adverse effect of importing on export volume in depreciation periods.

CHAPTER 5

ROBUSTNESS

I now turn my attention to alternative samples and estimation specifications to test the robustness of my findings. First, I report export participation estimates for firm-destination-year level data. Secondly, export supply estimations for a different sample is presented and finally, I report the export supply reaction of different firms to real exchange rate changes (in terms of firm size and export volume amount).

5.1 Firm-destination-year level export participation

To measure the effect of exchange rate movement on export participation in the firm-destination-year level sample, I employ the same estimation method that I use for firm-year level data. If a firm exports to destination j at period t, the value of $E_{i,j,t}$ takes the value of 1; otherwise, it is 0. Table 6 summarizes my findings. My results are robust to more disaggregated sample estimation. The coefficient of the bilateral real exchange variable is negative and significant at a 1% significance level in all specifications except for column (iii). The depreciation of the Turkish Lira decreases the probability of exporting for manufacturing firms in firm-destination-year level which is parallel to my firm-year level results. Being an importer increases export probability and more productive firms are more likely to enter the export market-for example, firms with a higher number of workers, which is what I observe in the firm-year estimation. I also add interactions of the exchange rate with productivity and firm size variables. During depreciation periods, more productive firms (and firms with a higher number of workers) have a higher probability of entering the export market. In column (i), a 10 percent depreciation reduces export

Table 6. Export Participation - Firm-Destination-Year Level

	Probit			Logit			LPM		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
DV: $E_{i,j,t}$									
$\ln(e_{i,t})$	-0.07***	-0.20***	0.08***	-0.04***	-0.07***	-0.01***	-0.02***	-0.04***	-0.01***
$\ln(\varphi_{i,t})$	-	-	0.11***	-	-	0.02***	-	-	0.02***
$\ln(e_{i,t})$*$\ln(\varphi_{i,t})$	0.04***	-	-	0.01***	-	-	0.001***	-	-
$\ln(\lambda_{i,t})$	-	-	0.27***	-	-	0.06***	-	-	0.04***
$\ln(e_{i,t})$*$\ln(\lambda_{i,t})$	-	0.06***	-	-	0.01***	-	-	0.01***	-
$\theta_{i,t}$	0.43***	0.29***	0.25***	0.06***	0.03***	0.02***	0.01***	0.01***	0.004***
$\ln(RGDPPC_{j,t})$	0.29***	0.31***	0.31***	0.08***	0.08***	0.08***	0.08***	0.08***	0.08***

***,** and * denote 1, 5 and 10 percentage significance of variables, respectively. Exchange rate is the bilateral real exchange rate between Turkey and destination country. All columns have year and sector dummies. Columns (iv)-(vi) have sector-destination fixed effects, columns (vii)-(ix) have firm-destination fixed effects.

probability by 0.7 percentage points for an ordinary firm while this probability is -0.03 (-0.07+0.04) for firms that are 10 percent more productive than an ordinary firm. In column (ii), I observe that a firm with a 10 percent higher number of workers has a 0.6 percentage higher probability to export.

5.2 Export supply with alternative samples

We create two samples to test the effect of the exchange rate on export volume, the baseline sample and the robustness sample. Here, I present the estimation results of my robustness sample. As stated earlier, our robustness sample includes all export observations that belong to manufacturing firms while my baseline sample includes only export observations of manufacturers that are presented in the industry data set throughout the study period. In other words, in the robustness sample, I do not put a condition that manufacturers have to be presented in the industry data throughout the sample period and this brings more observations.

Table 7 reports the robustness sample results. The coefficient of the real exchange rate variable is positive in all specifications of the sector-destination fixed effects model. Productivity and firm size are also positively related to export volume, but their interactions with the exchange rate seems statistically insignificant meaning that the exchange rate effect does not vary among firms with different levels of productivity and number of workers. In the firm-destination fixed effects model, however, the exchange rate coefficient is inconsistent with my baseline findings. I observe a negative coefficient in columns (vii) and (ix), but it turns to positive in all other specifications. The introduction of firm-destination fixed effects may be responsible for this inconsistency because it captures some of the heterogeneity that I expect the exchange rate to meet. As expected the level of the import

Table 7. Export Supply - Alternative Sample

	Sector-Destination Fixed Effects					Firm-Destination Fixed Effects				
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
DV: $\ln(\text{Volume}_{i,j,t})$										
$\ln(\text{RER}_{j,t})$	0.31***	0.21**	0.36***	0.24*	0.36***	0.26***	-0.41***	0.05	-0.41***	0.05
$\ln(\varphi_{i,t})$	-	0.61***	-	0.56**	-	-	-0.57***	-	-0.57***	-
$\ln(\text{RER}_{j,t})$*$\ln(\varphi_{i,t})$	-	0.02	-	0.03*	-	-	0.16***	-	0.16***	-
$\ln(\lambda_{i,t})$	-	-	0.63***	-	0.63***	-	-	0.26***	-	0.26***
$\ln(\text{RER}_{j,t})$*$\ln(\lambda_{i,t})$	-	-	-0.005	-	-0.005	-	-	0.04***	-	0.04***
$\ln(\text{RGDPPC}_{j,t})$	0.75***	0.81***	0.81***	0.81***	0.81***	1.53***	1.52***	1.52***	1.52***	1.52***
$\theta_{i,t}$	0.45***	0.12***	-0.15***	0.82***	-0.16	0.10***	0.09***	0.07***	0.15	0.02
$\ln(\text{RER}_{j,t})$*$\theta_{i,t}$	-	-	-	-0.14***	0.001	-	-	-	-0.01	0.01

***,** and * denote 1, 5 and 10 percentage significance of variables, respectively. Exchange rate is the bilateral real exchange rate between Turkey and destination country. Columns (i)-(v) have year dummies and sector-destination fixed effects are absorbed. Columns (vi)-(x) have year and sector dummies and firm-destination fixed effects are absorbed.

status variable is positive except in column (v), yet its interaction with the exchange rate does not provide much insight to my export volume investigation.

We also explore the relationship between export price and exchange rate movement. Since the customs data set includes the value and volume records of exports, I can generate a proxy for export prices. This study can be useful in understanding whether exporting firms absorb the effect of exchange rate changes on their export volume or export prices. I test this effect in my baseline sample by replacing my dependent variable with logarithm of export price:

$$\begin{aligned}\ln(\text{Export Price}_{i,j,t}) = \alpha_0 + \alpha_1 \ln(\text{RER}_{j,t}) + \alpha_2 \ln(\varphi_{i,t}) + \alpha_3 \ln(\text{RER}_{j,t}) * \ln(\varphi_{i,t}) \\ + \alpha_4 \theta_{i,t} + \alpha_5 \ln(\text{RER}_{j,t}) * \theta_{i,t} + \mu_t + \epsilon_{i,j,t}\end{aligned} \tag{4}$$

where $\ln(\text{Export Price}_{i,j,t})$ is the logarithm of my price proxy; other variables remain the same with the export volume specification. In Table A6, I summarize my findings. Apparently, real exchange rate movements have no significant effect on export prices. Firm characteristics and import status also have no systematic significant effect on the export price reaction of firms. This result is not conclusive for my analysis, but the reason for the insignificant relationship that I observe between export price and explanatory variables may be the aggregation of customs data. In my baseline sample, I am unable to observe product level heterogeneity in the pricing of exporters. There are many multi-product firms in the data, and the pricing strategy of different products would also be different: for multi-product exporters, the importance of export products are not all the same,[10] and I lose this heterogeneity by aggregating

[10] Most multi-product firms have a core product in their export bundle and give more weight to this core product. Hence, to capture this heterogeneity, product bundle should be restricted to a single product or product level analysis should be performed. (See Berman etal. (2012))

observations over products. Thus, I do not observe a heterogeneous reaction of exporters at the product level and get insignificant explanatory variables.

Finally, I want to explore the heterogeneous reaction of firms by dividing my baseline and robustness samples into four different subsamples: In the first 2 subsamples, I keep only firms remaining within the lowest and the top 25 number of workers percentiles. In the second 2 subsamples, observations remaining in the lowest and the top 25 export volume percentiles are kept. The results are summarized in Tables 8 and 9. Both smaller and bigger exporters react to exchange rate depreciation by increasing their export volume, but the reaction of the latter is higher. Comparing columns (iii) and (vi) of Table 11, for example, I see that firms in the lowest 25 percentile increase their export volume by 4.1 percent, while firms in the highest 25 percentile expand their export volume by 8.4 percent following a 10 percent domestic currency depreciation. This is a reasonable result since export volume basically reflects the relative export shares of firms. Firms with a higher export volume would also have higher export share and, they therefore have more space to adjust their volume (for depreciation, expected and observed reaction is export volume raise). This finding is valid for the robustness sample (see columns (ix) and (xii)). When it comes to the import dummy variable, the effect is larger for bigger exporters. The coefficient of exchange rate-import dummy interaction variable is negative in all specifications, and this effect is larger for bigger exporters in absolute terms (in columns (iii) and (vi), coefficient is -0.24 and -0.60, respectively.). Implications of level and interaction of import dummy include the following: larger exporters are generally larger importers and the level effect of the import dummy is expected to be greater for larger exporters. Additionally, because of the import-oriented growth habit of Turkish manufacturers, depreciation would hit bigger importers harder and this prediction is verified by the more negative coefficient of interaction variable for larger exporters that I observe in column (vi).

Table 8. Export Supply - Alternative Sample (Observations With the Lowest and Top 25 Percentile Export Volume)

	Baseline Sample						Robustness Sample					
	Lowest 25			Top 25			Lowest 25			Top 25		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)
DV: $\ln(\text{Volume}_{i,j,t})$												
$\ln(\text{RER}_{j,t})$	0.28*	0.38**	0.41**	0.55***	0.63***	0.84***	0.04	0.04	0.05	0.49***	0.49***	0.64***
$\ln(\text{RGDPPC}_{j,t})$	0.53**	0.56**	0.58**	1.01***	1.01***	1.03***	0.41*	0.40*	0.40*	1.06***	1.06***	1.05***
$\theta_{i,t}$	-	0.57***	1.76***	-	0.25***	3.26***	-	-0.004	0.37	-	-0.09**	1.47***
$\ln(\text{RER}_{j,t})$*$\theta_{i,t}$	-	-	-0.24*	-	-	-0.60***	-	-	-0.07	-	-	-0.30***

***,** and * denote 1, 5 and 10 percentage significance of variables, respectively. Exchange rate is the bilateral real exchange rate between Turkey and destination country. All columns have year dummies and sector-destination fixed effects are absorbed.

Table 9. Export Supply - Alternative Sample (Observations With the Lowest and Top 25 Percentile Number of Workers)

	Baseline Sample						Robustness Sample					
	Lowest 25			Top 25			Lowest 25			Top 25		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)
DV: $\ln(\text{Volume}_{i,j,t})$												
$\ln(\text{RER}_{j,t})$	0.19*	0.16*	0.19**	0.25***	0.40***	0.45***	0.05	0.04	0.05	0.17***	0.16***	0.29***
$\ln(\text{RGDPPC}_{j,t})$	0.23*	0.22	0.23*	0.38***	0.37***	0.37***	0.13	0.12	0.12	0.40***	0.40***	0.37***
$\theta_{i,t}$	-	-0.12***	-0.11	-	0.51***	1.42***	-	-0.09***	-0.02	-	0.37***	2.05***
$\ln(\text{RER}_{j,t})$*$\theta_{i,t}$	-	-	-0.11*	-	-	-0.18***	-	-	-0.01	-	-	-0.33***

***,** and * denote 1, 5 and 10 percentage significance of variables, respectively. Exchange rate is the bilateral real exchange rate between Turkey and destination country. All columns have year dummies and sector-destination fixed effects are absorbed.

In Table 9, I replicate the specifications shown in Table 8 for firm size. The exchange rate coefficient of smaller-sized firms is smaller and statistically less significant than the coefficient of bigger firms in all columns of both the baseline and the robustness samples. This implies that bigger firms react to exchange rate depreciation by increasing export volume more than smaller firms do. Findings on the level of the import status variable and its interaction with exchange rate suggest that the import-dependent results of exporting are still valid in firm size partition: since bigger firms are also bigger importers, the import dummy coefficient is higher for firms remaining in the top 25 percentile of the number of workers. Also, depreciation of the domestic currency affects bigger importers more, and the interaction coefficient is higher in absolute terms for firms with a greater number of workers. These findings are accurate for both baseline and robustness samples.

CHAPTER 6

CONCLUSION

In this thesis, I investigate the effects of real exchange rate movements on the export behavior of Turkish manufacturing firms using a detailed panel of customs data with industry characteristics. First, the export participation of manufacturing firms into the export market is analyzed. I generate a parametric estimation model using a firm-year level data set with firm-specific weighted exchange rates and other firm characteristics such as firm productivity, firm size measure (number of workers) and a dummy variable that indicates an import status. I used different estimation techniques and found that exchange rate depreciation reduces export entry probability in all specifications. As the existing literature confirms, more productive firms (and also firms with a greater number of workers) are more likely to become exporters. Being an importer also affects export probability positively. To check the robustness of my findings, I explore the export participation of firms at the firm-destination-year level. The results of the alternative sample verify the baseline results: exchange rate depreciation still reduces export participation at destination level and the effects of firm size and productivity on entry to the export market are the same as firm-year level findings.

The second objective of this thesis is to provide empirical evidence for exchange rate effects on the export volume supply of manufacturing firms. To measure this effect, I create a parametric estimation model for firm-destination-year level data set with a bilateral real exchange rate and firm characteristic variables. The results imply a positive relationship between exchange rate depreciation and export volume in most of my specifications. Interactions of firm-specific variables, on the other hand, yield a better understanding of the export dynamics of manufacturing firms in Turkey. More

productive firms, for instance, react to exchange rate depreciation by increasing export volume more than less productive ones. The import dummy variable shows that being an exporter increases export supply, while, during depreciation periods, I observe a negative effect of being an importer on export volume. This finding makes sense considering the import-oriented growth habit of Turkish firms. Developing countries generally ground their economic growth on current account deficit; they grow as they import more. Depreciation periods worsen the import oriented costs and thus, firms decrease their production and export supply. I provide robustness for export supply estimation using a different sample and the results basically coincide with my baseline results. Finally, I explore the heterogeneous volume reaction of firms to exchange rate changes by dividing my baseline sample into percentiles of firm productivity and firm size. These results show that more productive firms (and firms with a higher number of workers) react to domestic currency depreciation by supplying greater amount of export products than less productive ones do. Furthermore, the negative relationship between being an importer and export volume during depreciation periods is more severe for more productive firms (and for more sizeable firms).

APPENDIX

Table A1. Number of Firms by Industry and Size 2007 (Number of Employees=x)

Industry	x<20	20≤x<50	50≤x<100	100≤x<200	200<x≤500	x>500
Food	21	498	180	107	92	50
Beverage	2	26	6	9	6	3
Tobacco	0	1	1	1	5	3
Textile	17	457	206	195	155	78
Clothing	15	632	243	184	118	50
Leather	2	150	49	17	7	3
Wood Products	3	81	27	11	5	5
Paper Products	1	115	40	36	25	4
Press Printing	1	83	18	12	5	0
Refined Petroleum	1	10	3	0	1	1
Chemicals	16	138	46	37	21	11
Medicines	1	15	8	11	9	13
Plastics	7	315	114	73	40	11
Minerals	8	330	173	102	74	32
Base Metal	14	157	59	50	32	21
Fabrication Metal	9	374	142	117	54	11
Computer-Optic	2	45	12	15	11	4
Electrical Equipment	4	185	70	50	32	21
Unclassified Machineries	11	406	133	76	35	14
Motor Land Vehicles	3	192	71	79	55	32
Other Vehicles	9	34	16	9	11	6
Furniture	3	199	83	48	17	12
Other Manufacturing	5	112	25	18	15	1
Machine Setup	2	32	12	1	1	2

Table A2. Exporting and Non-Exporting Firms

	2007	2008	2009	2010	2011	2012	2013	2014
Exporter								
# of Firms	4,397	4,413	4,491	4,499	4,528	4,534	4,531	4,491
Avg. Production Value*	52.7	56.5	45.0	49.5	62.6	60.8	63.0	64.8
Avg. Export Value*	9.74	9.87	7.67	7.93	9.95	9.35	9.83	10.35
Avg. Productivity	81.6	79.8	71.6	75.4	82.3	80.2	80.5	79.9
Fraction of Export Value	0.48	0.52	0.41	0.46	0.46	0.44	0.45	0.43
Fraction of Firms	0.49	0.49	0.50	0.50	0.51	0.51	0.51	0.51
Fraction of Production Value	0.83	0.84	0.82	0.81	0.83	0.82	0.82	0.82
Non-Exporter								
# of Firms	4,569	4,553	4,475	4,467	4,438	4,432	4,435	4,475
Avg. Production Value*	10.2	10.5	9.7	11.8	13.3	13.2	14.2	14.3
Avg. Productivity	56.1	52.7	49.1	51.4	58.3	56.1	57.2	57.0

* Millions of Turkish Liras in 2007 constant prices.

Table A3. Export Consistency

	Frequency
Trajectory Type	
Always a non-exporter	0.64
Begin as a non-exporter, switch once	0.13
Begin as a non-exporter, switch at least twice	0.23
Always a exporter	0.58
Begin as a exporter, switch once	0.15
Begin as a exporter, swtich at least twice	0.27

Table A4. Market Share of Manufacturing Sectors (Volume)

Industry	2008	2009	2010	2011	2012	2013	2014
Food	5.97	9.08	8.64	6.86	6.64	6.45	6.27
Beverage	0.34	0.41	0.45	0.36	0.40	0.47	0.46
Tobacco	0.28	0.43	0.42	0.31	0.36	0.32	0.40
Textile	2.71	3.26	3.43	3.19	2.85	2.65	2.99
Clothing	0.48	0.65	0.68	0.51	0.53	0.54	0.52
Leather	0.07	0.10	0.12	0.09	0.08	0.09	0.09
Wood Products	0.54	0.09	0.17	0.29	0.18	0.17	0.38
Paper Products	0.99	1.10	1.11	0.91	1.18	1.42	1.45
Press Printing	0.07	0.09	0.09	0.09	0.11	0.12	0.11
Refined Petroleum	13.39	3.68	4.16	6.54	7.49	8.23	5.11
Chemicals	9.95	8.56	8.52	7.34	8.37	7.30	6.86
Medicines	0.16	0.25	0.23	0.20	0.24	0.22	0.21
Plastics	2.74	3.18	4.06	3.86	3.85	4.17	4.32
Minerals	25.57	35.76	28.32	26.43	25.46	23.95	22.45
Base Metal	19.67	17.79	21.46	25.52	25.50	25.98	30.44
Fabrication Metal	1.99	1.97	2.50	3.04	2.61	2.95	2.83
Computer-Optic	0.07	0.04	0.04	0.03	0.02	0.02	0.03
Electrical Equipment	2.07	2.72	2.96	2.38	2.47	2.42	2.71
Unclassified Machineries	1.54	1.11	1.37	1.49	1.50	1.44	1.61
Motor Land Vehicles	9.49	9.10	10.77	10.11	9.72	10.77	10.39
Other Vehicles	1.16	0.24	0.11	0.10	0.12	0.08	0.11
Furniture	0.28	0.30	0.30	0.27	0.23	0.18	0.17
Other Manufacturing	0.14	0.08	0.07	0.07	0.08	0.05	0.07
Machine Setup	0.33	0.01	0.02	0.01	0.01	0.01	0.02

Table A5. Market Share of Manufacturing Sectors (Value)

Industry	2008	2009	2010	2011	2012	2013	2014
Food	5.83	7.02	6.82	6.61	6.71	6.61	7.60
Beverage	0.08	0.09	0.09	0.07	0.07	0.08	0.08
Tobacco	0.90	1.60	1.20	0.90	1.10	1.00	1.30
Textile	5.73	6.72	6.62	6.61	6.21	5.91	6.20
Clothing	5.53	8.02	7.83	6.81	7.01	6.71	6.80
Leather	0.30	0.30	0.30	0.30	0.30	0.30	0.40
Wood Products	0.20	0.07	0.09	0.10	0.10	0.20	0.20
Paper Products	0.70	0.90	0.80	0.70	0.80	0.90	1.00
Press Printing	0.10	0.20	0.20	0.20	0.20	0.20	0.20
Refined Petroleum	3.92	0.80	1.30	2.30	2.60	2.60	1.20
Chemicals	3.12	2.71	3.21	3.21	4.31	3.70	3.20
Medicines	0.50	0.70	0.60	0.60	0.70	0.60	0.70
Plastics	4.42	5.32	6.02	6.31	6.31	6.31	6.40
Minerals	2.01	2.21	2.01	1.80	1.90	1.90	1.90
Base Metal	10.55	7.62	9.23	11.62	11.02	10.31	11.61
Fabrication Metal	2.31	2.41	2.61	3.81	3.41	3.50	3.40
Computer-Optic	0.40	0.30	0.30	0.20	0.20	0.20	0.10
Electrical Equipment	5.53	6.22	6.32	5.51	5.91	5.31	5.70
Unclassified Machineries	5.23	4.91	5.22	5.71	6.11	6.11	6.90
Motor Land Vehicles	32.67	37.91	36.62	33.85	31.95	34.14	31.62
Other Vehicles	6.94	2.61	1.51	1.70	1.90	2.30	2.40
Furniture	0.40	0.50	0.30	0.30	0.30	0.30	0.20
Other Manufacturing	0.80	0.80	0.70	0.70	0.80	0.70	0.80
Machine Setup	1.81	0.05	0.08	0.07	0.08	0.09	0.07

Table A6. Export Price

	Sector-Destination Fixed Effects					Firm-Destination Fixed Effects				
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
DV: ln(Export Price$_{i,j,t}$)										
ln(RER$_{j,t}$)	-0.08*	-0.08	-0.10*	-0.05	-0.06	0.02	0.03	0.03	0.03	0.03
ln($\varphi_{i,t}$)	-	-0.19***	-	-0.12*	-	-	0.09***	-	0.09***	-
ln(RER$_{j,t}$)*ln($\varphi_{i,t}$)	-	0.004	-	-0.01	-	-	-0.01***	-	-0.01**	-
ln($\lambda_{i,t}$)	-	-	-0.15**	-	0.08*	-	-	0.08***	-	0.08***
ln(RER$_{j,t}$)*ln($\lambda_{i,t}$)	-	-	0.01	-	-0.004	-	-	-0.02***	-	-0.02***
ln(RGDPPC$_{j,t}$)	0.08	0.06	0.06***	0.05	0.05	0.10***	0.09***	0.09**	0.09***	0.09***
$\theta_{i,t}$	0.07***	0.14***	0.17***	-1.04***	-1.05***	0.001	-0.001	-0.002	0.10	0.06
ln(RER$_{j,t}$)*$\theta_{i,t}$	-	-	-	0.23***	0.24***	-	-	-	-0.02	-0.01

***,** and * denote 1, 5 and 10 percentage significance of variables, respectively. Exchange rate is the bilateral real exchange rate between Turkey and destination country. Columns (i)-(v) have year dummies and sector-destination fixed effects are absorbed. Columns (vi)-(x) have year and sector dummies and firm-destination fixed effects are absorbed.

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