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Entry to Export Markets and Productivity: Analysis of Matched Firms in Turkey

Altan ALDAN
Mahmut GÜNAY

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ENTRY TO EXPORT MARKETS AND PRODUCTIVITY: ANALYSIS OF MATCHED FIRMS IN TURKEY

Altan Aldan and Mahmut Günay*

Abstract

There are sunk costs associated with exporting, hence some firms export and others do not. Research shows that exporters are more productive, employ more workers, and have more capital. Nevertheless, this association does not give a causal relation between firm-specific characteristics and exporting. Therefore, we investigate the effect of entering into export market on productivity and employment with firm-level data using matching and difference-in-difference techniques. We end up with two main conclusions. First, larger and more productive firms self select into export market. Second, starting to export further increases labor productivity and employment.

JEL Classification Codes: D2, F14

Keywords: Exporting, productivity, matching, difference in difference.

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- Contact Information: altan.aldan@tcmb.gov.tr , mahmut.gunay@tcmb.gov.tr

I. Introduction

Exporting has been perceived as one of the main dynamics behind sustainable growth, especially after outstanding experiences of Korea and Taiwan that implemented export oriented strategies since 1960s. Turkey also started to implement outward looking policies after abandoning the import substitution regime in 1980. It is therefore important to analyze the effects of exporting on growth, productivity and employment.

Exporting can affect economy-wide productivity through two channels. First, exporting can shift the resources towards more productive industries and firms. Second, exporting can change the characteristics of firms after they start exporting. Recent research shows that exporters are different from non-exporters in some respects. For example exporters are larger, more capital intensive and more productive[1]. In this paper, we investigate the effects of exporting on firm characteristics, namely productivity and firm size.

Although the relation between exporting and productivity has been investigated at the country and industry level, research at firm-level is scarce. Bernard and Jensen (1995) initiated a new literature that uses firm level data to compare the performances of exporters and non-exporters. In most of the consequent studies, exporters are found to be more productive and larger than non-exporters.[2] There are two alternative but not mutually exclusive explanations about why exporters are more productive and larger than non-exporters. The first explanation is s*elf-selection.* Sunk costs associated with market entrance such as market research, product modification *et cetera* will be a barrier to small firms. On the other hand, foreign markets are generally more competitive than domestic markets. Hence, only more productive firms can enter into foreign markets or firms that plan to become exporters improve their performance before they enter foreign market[3].

The second explanation is *learning-by-exporting*. When firms start exporting they improve their efficiency since they compete in international markets and accumulate knowledge from buyers and competitors. Recent studies have found that more-productive firms self-select into export markets, whereas less evidence associated with learning-by-exporting hypothesis is

[1] For example see Bernard and Jensen (1999) for US, Eaton et al (2004) for France, Clerides et al (1998) for Colombia and Mexico among others.
[2] See Wagner (2007) for a detailed literature survey.
[3] Melitz (2003) models the causality from productivity to exporting.

found. Similar arguments can be made for employment also. Larger firms can have more network opportunities to enter foreign markets or firms can get larger as they enjoy the larger markets due to exporting.[4]

Wagner (2007) surveys the literature that studies the linkage between exporting and productivity. He analyzes 54 microeconometric studies with data from 34 countries that were published between 1995 and 2006. The learning-by-exporting hypothesis in the survey implies mixed results. Only some studies find faster productivity growth and when selection bias is filtered out no statistically significant exporter premium is found.

Girma et al. (2004) use UK data and test the two alternative explanations on the linkage between exporting and productivity. They find that exporters are more productive and they self-select into exporting and that exporting further increase productivity. There is not much consensus about this last issue. They suggest that the reason of increased productivity after starting to export may be due to the difference between the UK and USA. The US firms are closer to technological frontier, US economy is larger and more competitive and hence UK firms have more room for potential benefits of learning. We think Turkey is an interesting case to study learning-by-exporting hypothesis. International competition is more severe than domestic competition and firms have to improve their efficiency to be able to compete in international markets as suggested by Girma et al (2004). The point is that, as the development level of the country increases, difference between international and domestic competition decreases and the potential learning opportunities decrease. Hence, we expect high potential of learning for the Turkish firms.

Regarding Turkey, Özler et. al. (2009) estimate export decision of firms using a data set from Turkish Statistical Institute (TURKSTAT). They find that firm size and capital intensity, among other firm characteristics and export history have positive effects on exporting. Taymaz and Yılmaz (2007), using the data set from TURKSTAT, find that trade liberalization increases total factor productivity (TFP) of Turkish manufacturing firms and that there is a positive association between export/output ratio and TFP.

[4] See Bernard, Andrew B. and Joachim Wagner (1997).

In this paper, we investigate the relationship between firm characteristics (productivity and size) and entrance into export markets. We utilize propensity score matching and difference-in-differences methods that are recently used in case of possible self-selection. We find evidence supporting both self-selection and learning by exporting hypothesis. Larger and more productive firms enter into foreign markets and that starting to export does increase the productivity and employment of firms in the short-run. The next section gives brief information about Turkish economy. Section III discusses the methodology. Section IV presents data and descriptive statistics. Section V shows the estimations and section VI concludes the article.

II. Turkish Economy: Brief Summary

Turkey followed an inward oriented strategy from 1930s to 1980s[5.] Development strategy for this period was import substitution industrialization which was a dominant strategy between 1960 and 1977 as was the case in many other developing countries. However during this period first and second petroleum shocks raised the import bill as import-substitution heavily depends on raw material imports. As a result of the shocks, trade and current account deficits reached historically high levels and external debt increased sharply. These developments caused a balance of payment crisis. In 1979 output growth rate was negative with high inflation. As a cure to the economic problems "January 24 Decisions" are implemented in 1980 which was supported by international organizations including IMF and the World Bank. Promotion of exports and liberalization of imports were essential targets of this program.

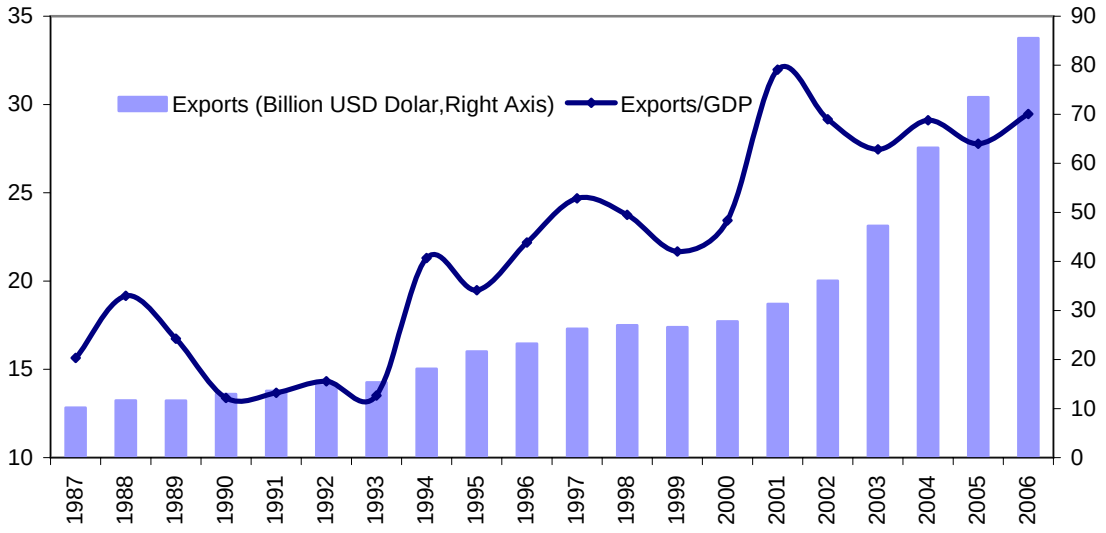
An export-promotion policy through export incentives, like devaluations, was one of the policies used as a policy to reach the targets of the program. Contraction of domestic demand promoted exports in this period. Competitiveness in international trade increased through decline in real wages, large devaluations and also with export incentives. Export growth until 1988 was the most important achievement of the program as exports tripled in 1988 relative to 1980 in dollar terms and share of manufacturing goods increased significantly.

Another episode can be considered as the 1989-1993 period. In 1989 control on foreign capital movements were removed. Economic policies became expansionary as real wages

[5] This part heavily draws from Şahinbeyoğlu and Ulaşan (1999).

increased sharply and agricultural subsidies accelerated. As a result of increased domestic demand, removal of export subsidies due to budgetary constraints and real appreciation of currency export performance slowed significantly (Graph 1).

Graph 1.Share of Exports in GDP and Export Volume



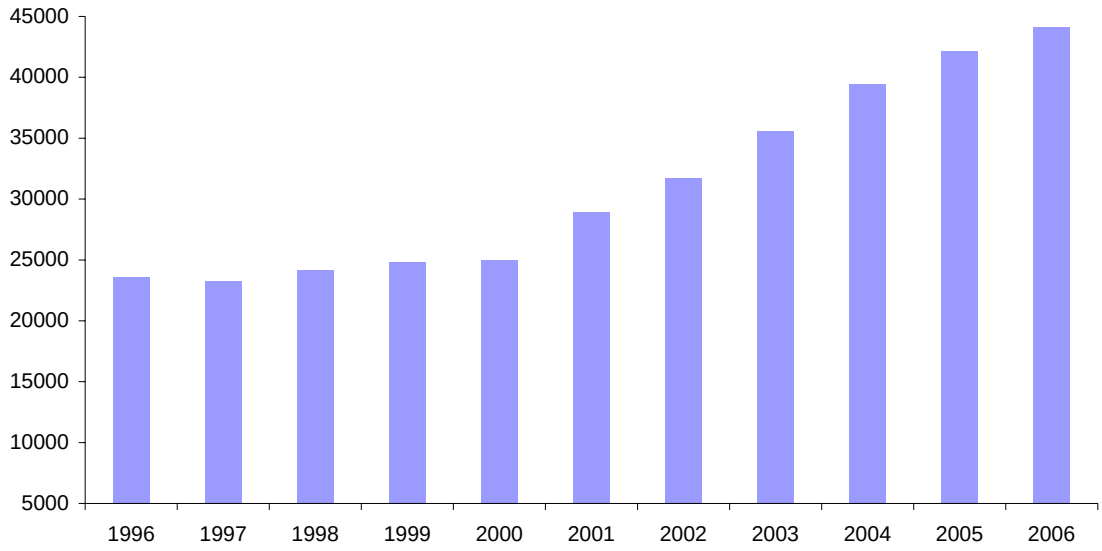
Source: TURKSTAT

There are various developments in 1994-2001 period that affected the economy. A stabilization program was announced in April 5 of 1994 as a result of a financial crisis. This program aimed at reducing domestic demand and increasing exports. Along with the effect of crisis and the stabilization program we see the effect of institutional changes in the Turkish foreign trade. Turkish economy's openness to international trade increased after 1996 as a result of customs union agreement with European Union and also partly because of GATT. There are Asian and Russian crises in this period which hit Turkish economy as well as world economy.

Turkish economy experienced major structural changes after 2001 crisis. Exports increased substantially in this period. Share of exports in GDP started to rise in 1993 from 14 percent to 29 percent in 2006. Exports rise more spectacularly after 2002. Average export growth is 8 percent in 1987-2001 period whereas 24 percent in 2002-2006 period.

Increase in exports is accompanied by increased number of exporting firms by new entrants to export market [6](Graph 2). Number of exporters increased from 23581 to 44159 in 1996-2006 period. Number of exporting firms is relatively stable from 1996 to 2000 period. In this period domestic demand is strong and export growth is relatively low however Turkey joined to customs union. After 2001 crisis firms enter more aggressively in international markets as number of exporters increased 6 percent from 1996 to 2000 and 76 percent from 2000 to 2006. It can be argued that increase in exports in 1996-2000 period was due to intensive margin and post-2001 increase was due to extensive margin.[7]

Graph 2- Number of Exporters

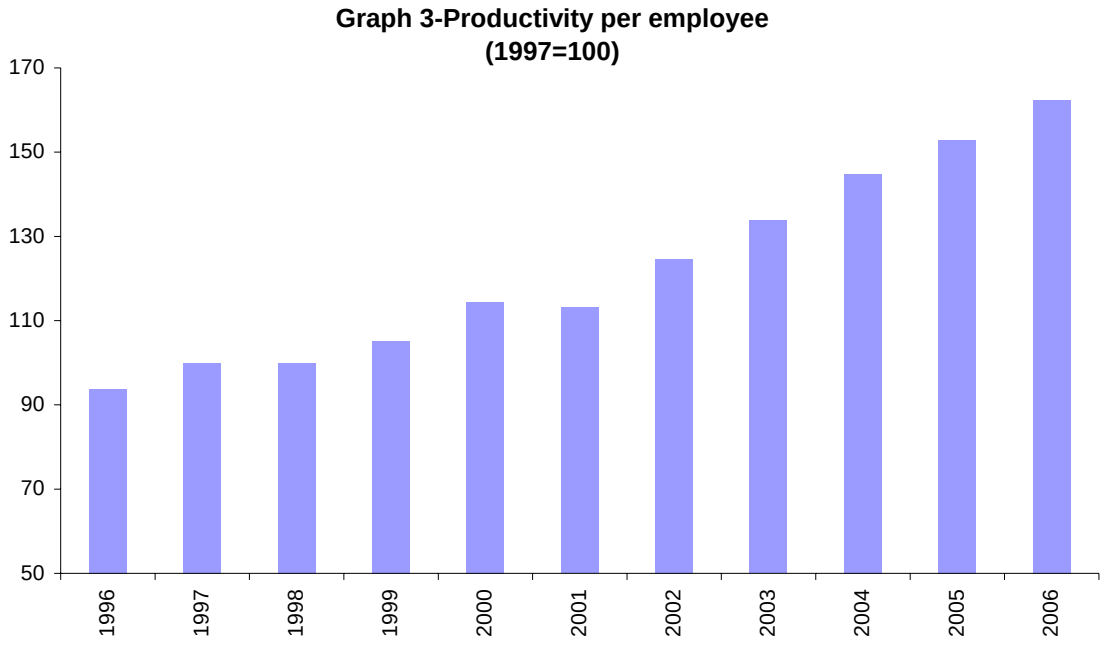


Source: Undersecretariat of Foreign Trade

Partial productivity index per employee provided by TURKSTAT for manufacturing industry shows that productivity per employee increased by 213 percent from 1988 to 2006. More notably, increase in productivity was mostly in the recent period. Looking at the productivity in 1996-2000 and 2001-2006 period reveals that productivity increase in 2001-2006 period is considerably higher than 1996-2000 period. This pattern is similar with the number of exporting firms as more firms entered into export market after 2000.

[6] Data are from Republic of Turkey Prime Ministry Undersecretariat of Foreign Trade. Number of exporters and export volumes by provinces from 1996 to 2006 are available at http://www.dtm.gov.tr/dtmadmin/upload/EAD/IstatistikDb/eko17.xls

[7] Intensive margin refers to the increase exports of the firms that are already in the export market, and extensive margin refers to the entry of new firms to the export market.



Source: TURKSTAT

III. Methodology

Our aim is to evaluate the effect of starting to export on firms' performance, namely labor productivity and firm size, where employment is used as a proxy for firm size. That is, we are interested in the change in productivity and employment of export starters relative to the productivity and employment had they not exported. This requires one firm to start exporting and continue to be non-exporter at the same time, which is not observable. Therefore, we do not have the exact counterfactual case for export-starters. One possible remedy to this problem may be to compare the performances of export-starters and non-exporters. However, in the existence of self-selection bias, this strategy will not produce reliable results. Eventually, we use matching techniques to find counterfactual firms for export-starters, following Wagner (2002). We then run a difference-in-differences regression in the matched sample.

Matching

Let Y_{1i} and Y_{0i} be the outcome (productivity, employment) of firm *i* if it starts exporting and remains to be non-exporter, respectively and $D_i \in \{0,1\}$ be the indicator of starting to export.

Then, $Y_i = Y_{0i} + D_i(Y_{1i} - Y_{0i})$ will be the actually observed outcome of firm *i* and the average effect of starting to export (average treatment effect on treated) can be estimated as,

$$\tau_{ATT} = [\ E(Y_1 - Y_0 \mid D = 1\ ] = E(Y_1 \mid D = 1) - E(Y_0 \mid D = 1) \qquad (1)$$

We can observe $E(Y_1 \mid D = 1)$ but we cannot observe $E(Y_0 \mid D = 1)$ and thus we must find a substitute. Then, matching method is used to create a counterfactual sample for export starters.

Matching is based on the idea that, the decision for treatment (in our case to start exporting) is based on observable covariates. If we take into account certain observable characteristics of the selection process as well as characteristics that potentially influence the outcome of the treated units (both type of characteristics denoted as X), we can write (1) as,

$$[\ E(Y_1 - Y_0 \mid D = 1, X] = E(Y_1 \mid D = 1, X) - E(Y_0 \mid D = 0, X) \qquad (2)$$

Hence, in order to get an unbiased estimate of the treatment on the treated we need to identify the non-treated units to be as similar as possible to the treated ones in terms of their general behavioral characteristics captured by X.

Conditioning on all covariates is limited in case of a high dimensional vector X[8], Rosenbaum and Rubin (1983) suggest the use of balancing scores b (X). These are functions of the relevant observed covariates X such that the conditional distribution of X given b (X) is independent of assignment into treatment. One possible balancing score is the propensity score, the probability of participating in a program (starting to export) given observed characteristics X. Propensity score is an indicator (a number), which shows the conditional probability of being assigned or not assigned to a particular treatment. By conditional we refer to a set of characteristics X that can predict such an assignment. Propensity score can be shown as, P (X)=P (D=1|X). Rosenbaum and Rubin (1983) prove that in (2), X can be substituted for P (X) so that,

[8] This is often referred to as "curse of dimensionality" in the literature.

$$\left[\ E(Y_1 - Y_0 \mid D = 1, P(X)\right] = E(Y_1 \mid D = 1, P(X)) - E(Y_0 \mid D = 0, P(X)) \qquad (3)$$

In order to estimate the propensity scores; we model entry to export market as a function of prior productivity, prior employment, time and industry dummies. We run a probit regression where a binary dependent variable for export starting is used. This model is a tool to check the hypothesis of self-selection into the export markets, that is whether more productive or bigger firms enter into the export markets. Probit model gives estimates of propensity scores to start exporting for all firms.

We match export starters with non-exporters depending on the propensity scores obtained in probit regression using nearest neighbor matching, that is we match an export starter with a non-exporter which has closest propensity score.[9] We use matching with replacement; so one export starter can be matched with more than one non-exporter or vice versa. Nearest neighbor matching has the risk of bad matches if the closest neighbor is far away. Thus we impose a caliper of 0.01, which avoids bad matches and also does not lead to a significant reduction in the sample. Finally, we impose common support restriction[10], by dropping treatment observations whose propensity score is higher than the maximum or less than the minimum propensity score of the controls.

After constructing the matched sample, we check the quality of matching; that is we inspect if the propensity score matching process has ended with similar values of prior productivity and employment. After matching, average treatment effect on the treated in (1) is estimated.

Difference-in-Differences

Matching takes into account the selection bias due to observable characteristics. However some of the selection bias can remain due to unobservables (omitted variables). Supposing that these unobservable characteristics are constant over time, we can get rid of this selection bias via difference-in-differences estimation if we have panel data.

[9] For details of implementation of matching see Caliendo M. and s. Kopeinig (2005).

[10] Common support restriction rules out the phenomenon of perfect predictability of D given X and ensures that firms with same X values have a positive probability of being both exporter and remaining non-exporter. Implementing the common support condition ensures that any combination of characteristics observed in the treatment group can also be observed among the control group (Caliendo and Kopeinig (2005)).

Assume a fixed effects model

$$y_{it} = \phi D_{it} + \delta_t + \alpha_i + \varepsilon_{it} \tag{4}$$

where D_{it} is a binary regressor which equals 1 if firm *i* starts exporting at time t and 0 otherwise, δ_t is a time-specific fixed effect and α_i is a firm-specific fixed effect.[11] The individual effects are eliminated by first differencing and the treatment effect, ϕ, is consistently estimated by the following pooled regression,

$$\Delta y_{it} = \phi \Delta D_{it} + (\delta_t - \delta_{t-1}) + \Delta \varepsilon_{it} \tag{5}$$

If there are two periods, one pre-treatment and one post-treatment, (5) reduces to

$$\Delta y_i = \phi D_i + \delta + v_i \tag{6}$$

The treatment effect estimated via difference-in-differences (DID) model is the difference between differences of treated and non-treated units in the process of treatment. Let $y_{i,E}^{after}, y_{i,E}^{before}, y_{i,NE}^{after}$ and $y_{i,NE}^{before}$ be the post-exporting and pre-exporting productivities of exporting and non-exporting firms. Then, the DID estimate is,

$$\begin{aligned} \phi &= (y_{i,E}^{after} - y_{i,E}^{before}) - (y_{i,NE}^{after} - y_{i,NE}^{before}) \\ &= (y_{i,E}^{after} - y_{i,NE}^{after}) - (y_{i,E}^{before} - y_{i,NE}^{before}) \end{aligned} \tag{7}$$

The OLS estimate of ϕ reduces to

$$\hat{\phi} = \Delta \bar{y}_E - \Delta \bar{y}_{NE} \tag{8}$$

where $\Delta \bar{y}_E$ and $\Delta \bar{y}_{NE}$ are the sample means of differences of productivity (between post export-starting and pre export-starting) in the export-starters and non-exporters, respectively.

Notice that, treatment effects estimated in matching and DID are conceptually different. Matching estimates the differences in outcome itself (not the differences) after treatment. That is,

$$\tau_{ATT} = y_E^{after} - y_{NE}^{after} \tag{9}$$

Consistency of DID estimate of $\hat{\phi}$ is based on the assumption that the time effects δ_t are common across treated and control groups. That is, macro shocks should affect both groups in similar ways. This assumption is often difficult to justify in non-experimental data. Using the combination of matching and DID together will generally improve the quality of estimator

[11] The differences-in-differences specification discussed here is based on Cameron and Trivedi (2005).

(Blundell and Costa Rias (2000)). Matching helps justifying common trends assumption in the sense that treatment and control groups have similar observable characteristics. On the other hand, DID removes the unobserved heterogeneity that might not captured by matching.

IV. Data

We use the data set of the Central Bank of Turkey[12] which contains balance sheets and income statements of Turkish firms both in manufacturing and non-manufacturing firms between years 1989 and 2003 but we use the data for manufacturing firms only since manufacturing sector is the main source of exports. Besides balance sheet items, the data set includes some firm characteristics (though with missing values), such as number of employees, establishment date, legal status, ownership status etc. After dropping firms with missing employment and output observations, we end up with an unbalanced panel of 41463 observations of 4498 firms.

All nominal values are deflated by sectoral price indices (1994=100). Since there is no price index for capital goods, sectoral price indices are also used to deflate all balance sheet and income statement items, including tangible assets, machinery and equipment and output.

Table 1. Selected Statistics for Exporters and Non-exporters

	Productivity	Employment	Real tangible assets pe	Real Machinery pe
Exporter	120.5	180.4	26.4	30.6
Non-exporter	82.8	81.8	17.5	19.2

Notes: Figures are means for each group. pe: per employee. Number of observations in export category is 25200 and 14752 in non-exporter category. Numbers of firms are 2015 and 2475 for exporters and non-exporters, respectively.

We provide means of productivity (partial labor productivity defined as output per employee), employment, real tangible assets per employee and real machinery per employee for exporters and non-exporters. Last two variables are thought to be proxies for capital intensities of the firm to compare exporters and non-exporters. In Table 1 we analyze firm-year pairs. If a firm exports at a year we label it as exporter and if it does not we label it as non-exporter. It is seen that firms that export in a year are more productive, larger and more capital intensive. In the Table A1 in the appendix we analyzed these variables according to sectors to see whether the

[12] See Kaplan et al (2006) and Aydın et al (2006) for more information about data.

pattern seen in Table 1, namely exporters are more productive than non-exporters, is true for all sectors. Results indicate that in all sectors, exporters are more productive than non-exporters.

In this study we tend to figure out the effect of starting to export on productivity. Hence we transform the data set to answer our question. First of all, we define the export-starter. We may take a firm as export starter if the firm does not export at year t but exports at year t+1. However, it may be the case that a firm exports only once in the whole sample and attributing the change in productivity to starting to export may be misleading. Hence we employ the following definition for export starters, non-starters and exporters:

> *A firm is labeled as export starter if it starts exporting at time t, and does not export at t-1, t-2 and t-3 and exports at least in one of the t+1 and t+2. In other words, we name the firm as export starter if it does not export for 3 years, then start exporting and export at least once in the following two years. If a firm does not export in all the six years it is classified as non-exporter and if a firm exports at least 5 of the 6 years it is labeled as exporter.*

With this definition, we omit firms that irregularly export due to conjectural or industry specific reasons etc., but not as a strategy to enter into foreign markets. We also drop firms that had entered into export markets before the analysis period.

We calculate productivity and employment of firms for six-year rolling periods to compare change in the firm characteristics. For example, we classify firms for 1989-1994 period according to above definition, and then move to 1990-1995 period and continue until 1998-2003 period. We take average of the productivity and employment for the first three years and for the second three years in our six-year sample and compare second three-year averages to see the effect of starting to exports on export-starters relative to non-starters. In other words we have two observations for a firm, its productivity and employment for the first and second three-year periods. We match firms with respect to first three-year values and then compare matched firms in the second three-year period. For instance, to construct an observation we take average of 1989, 1990 and 1991 for the firms we classified as export starter and non-starter and base our matching according to these values. We calculate average productivity and employment for the 1992, 1993 and 1994 and compare difference between productivities

of starters and non-starters. Then we compare difference of the productivity and employment of the starters and non-starters for two periods (difference-in-difference analysis). After constructing our sample for the firms for 1989-1994 period, we move to 1990-1995 period and construct relevant variables.

In Table 2, we provide means of the variables in Table 1 for the categories that we defined above. Figures in Table 2 are similar to the Table 1 in which we did not classify firms but firm-year pairs.

Table 2. Selected Statistics for Exporters, Non-exporters and Export-starters.

	Productivity	Employment	Real tangible assets pe	Real Machinery pe
Exporter	127.5	191.9	31.8	34.6
Non-starter	83.2	72.3	12.1	12.3
Starter	119.8	133.3	25.0	26.4

Notes: Figures provided in the table are the means. pe: per employee. Number of observations for exporter, non-starter and starter are 22228, 9617 and 10908 respectively. Number of firms are 2042, 1041 and 647 for exporters, non-starters and starters, respectively.

In Table 2, we provide statistics for exporters when they export and for non-exporters when they do not export. To be more clear consider a firm that does not export for the first 7 years (say from 1989 to 1995) and export for the following 8 years (say 1996-2003). Our definition labels it as non-exporter for 1989-1994 period and exporter for the 1998-2003 period and export-starter for 1993-1998 six year period. In Table 2, statistics are given for the exporters when they export and for non-exporters when they do not export. Therefore, considering the example firm we calculate mean for the first 7 years and classify it under non-exporter columns of Table 2 and for the last 8 years we include it in the exporter columns of Table 2. It is seen that exporters are more productive and bigger than export-starters and export-starters are more productive and larger than export non-starters. In Tables 1 and 2 statistics are calculated for the whole sample (unbalanced panel). Models estimated in the next section, however, give the difference in the means of export-starters and non-starters for the samples that we used after filtering data according to our definition and methodology.

V. Empirical Results

a. Selection Bias

We start with estimating the model of entering into foreign markets via probit, to see whether self-selection hypothesis is valid. The estimated probit model is

$$Pr(D=1|X)=F(X\beta) \qquad (10)$$

where D is the binary dependent variable, which is equal to 1 if the firm is an export starter (in our definition above) and 0 if it is non-exporter. X is the set of independent variables, including constant, average employment and employment in the three years prior to export starting (Aemp1 and Aprod1), industrial and time dummies.

Table 3: Matching Results

	Probit Coefficients	Means (Unmatched Sample)			Means (Matched Sample)		
		E.S.	N.E.	% Bias	E.S.	N.E.	% Bias
Aemp1	0.0010**	108.95	78.51	25.0**	103.91	105.65	-1.4
Aprod1	0.0005**	96.36	90.87	4.6	98.65	91.00	6.4
Aemp		125.50	79.40	36.3**	121.27	101.20	15.8**
Aprod		122.20	95.79	11.6**	122.21	93.60	12.6**

Notes: E.S. and N.S. denote export starters and non-exporters, respectively. ** denotes significance of coefficients at 5% in the probit regression and significantly different means of E.S. and N.E. at 5 % in the t-test of mean difference. A set of sectoral and year dummies are added to the probit regression. Number of observations is 4224 and 1491 in the unmatched and matched samples, respectively.

The second column of Table 3 gives the results of probit regression. Both prior employment (Aemp1) and productivity (Aprod1) have positive and significant coefficients, signing out the validity of self-selection hypothesis. Thus larger and more productive firms enter into the foreign markets. The following three columns give the means of these variables of treatment and control groups (export starters and non-exporters) in the whole sample before matching and the standardized bias[13]. The means show that bigger and more productive firms enter into foreign markets. The difference between the mean firm size of export-starters and non-

[13] The standardized bias is the difference between of the sample means in the treated and non-treated (unmatched or matched) sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups; E. Leuven and B. Sianesi (2003). "PSMATCH2: Stata module to perform Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing" http://ideas.repec.org/c/boc/bocode(s432001.html (Version 3.0.0)

exporters is large and significant. On the other hand, the difference between productivity of export starters and non-exporters is smaller and statistically insignificant. Thus, the results indicate that there is a selection bias of exporters via mainly firm size. The results are in line with the results of Özler (2009).

Given that there are signs of self-selection, there is room for performing matching in order to get rid of selection bias, which could lead to biased estimator. Matching is based on the propensity scores (conditional probabilities to export) estimated via probit regression. From the full sample of 4224 observations, a matched sample of 1491 observations is formed. The success of matching can be seen in the last three columns for Aemp1 and Aprod1. The difference of mean firm size of export starters and non-exporters turns to be insignificant and insignificance of productivity is maintained.

Finally, we look at the effects of entering into foreign markets on firm size and productivity. The rows for Aemp and Aprod show the sample means and standardized biases of average employment and productivity in the three years after starting to export, respectively. In the unmatched sample, mean firm size and productivity of export starters are significantly larger than those of non-exporters. The same conclusion applies to the sample after matching although the difference of mean firm size reduces.

In sum, matching analysis points out to the fact that more productive and especially larger firms self-select into entering foreign markets and that exporting further increases firm size and productivity. In order to determine the effects of exporting more accurately i.e. get rid of unobserved heterogeneity due to matching only on observable characteristics, we move on to difference in differences analysis in the next subsection.

b. Effects of Exporting

i) Productivity

After matching, we start difference in differences (DID) analysis of productivity using the full sample. We start with the simple model (equation 6), which simply gives the difference of the growth rates of export starters and non-exporters, and augment the model with control variables. That is we estimate the model below via OLS;

$$\Delta y_i = \phi D_i + \delta + \beta X_i + v_i \quad (11)$$

where Δy_i is the difference of average labor productivity between the post entry period (3 years after starting to export) and pre entry period (3 years before starting to export) and X is the set of control variables. In model 1 at Table 4, there is no control variable. In model 2, sectoral and time dummies are added. Model 2 augments the model using initial productivity and initial machinery and equipment capital per employee. In model 4, change in machinery and equipment capital is used instead of initial machinery and equipment capital.

Table 4: DID Results for Productivity (Unmatched Sample)

	Model 1	Model 2	Model 3	Model 4
D	33.27 (9.71)*	27.02 (10.19)*	31.11 (10.40)*	13.05 (4.75)*
Initial Prod.	-	-	-0.33 (0.07)*	-0.24 (0.07)*
Initial Capital (per employee)	-	-	-0.09 (0.13)	-
Change in Capital (per employee)	-	-	-	2.07 (0.70)*
Time and Industry effects	NO	YES	YES	YES
R^2	0.01	0.06	0.12	0.34

Notes: All models are estimated via OLS. Robust standard errors in parenthesis. * denotes significance at 5 %. Number of observations is 4224.

In all models, the effect of exporting (the coefficient of D) has a significant and positive effect on firms' productivity. Initial productivity has a negative and significant effect in models 3 and 4, in line with the expectation of convergence models. However, initial capital does not have a significant effect. Instead of initial per employee capital, investments are used in model 4 and they have a large and significant effect. It is also seen that the effect of export starting on productivity is much lower in model 4 compared to other first three. This may be due to the fact that, firms that decide to enter into foreign markets simultaneously increase their investment and the coefficient of export starting in the first three models may include the effect of investments.

The results shown in Table 4 may be misleading in the sense that selection bias found in the previous section may distort the assumption that macro shocks have similar impacts on export starters and non-exporters. In order to check for robustness of our findings, we repeat the exercises above for the matched sample. The results reveal that, even after filtering out the

effect of selection bias, entrance to foreign markets has a positive effect and this effect is significant at 10% significance level.

Table 5: DID Results for Productivity (Matched Sample)

	Model 1	Model 2	Model 3	Model 4
D	33.20 (10.93)**	33.70 (11.28)**	35.59 (11.91)**	11.58 (6.70)*
Initial Prod.	-	-	-0.39 (0.11)**	-0.32 (0.10)**
Initial Capital	-	-	-0.17 (0.18)	-
Change in Capital (per employee)	-	-	-	2.58 (1.01)**
Time and Industry effects	NO	YES	YES	YES
R^2	0.01	0.04	0.09	0.43

Notes: All models are estimated via OLS. Robust standard errors in parenthesis. ** denotes significance at 5 %, * denotes significance at 10%. Number of observations is 1491.

ii) Employment

We repeat a similar exercise for employment. Four models for growth of employment are estimated. Similar to productivity, we start with results from unmatched sample. We start with a model, which does not have any control variable (Model 1). Then we augment the model with sectoral and time dummies (Model 2). In model 3, we add initial employment prior to starting to export and, in model 4, we add age. The results are shown in table 6.

Table 6: DID Results for Employment (Unmatched Sample)

	Model 1	Model 2	Model 3	Model 4
D	15.68 (2.56)**	17.01 (2.63)**	19.22 (2.56)**	18.58 (2.52)**
Initial Employment	-	-	-0.09 (0.02)**	-0.08 (0.02)**
Age	-	-	-	-0.40 (0.16)**
Time and Industry effects	NO	YES	YES	YES
R^2	0.01	0.03	0.07	0.07

Notes: All models are estimated via OLS. Robust standard errors in parenthesis. * denotes significance at 5 %. Number of observations is 4224.

Results in Table 6 reveal that entrance to export markets has a significant and positive effect on employment growth. Convergence hypothesis is also valid for employment (Models 3 and 4) and older firms have less incentive to increase employment (Model 4). Older firms may be more conservative in increasing employment than the new ones since new firms may be more

aggressive to get market share. Besides, fluctuations in the Turkish economy may have constrained the employment growth of older firms that are more institutionalized and risk averse.

In Table 7 below, we present the DID results for employment growth in the matched sample. Entry to foreign markets has similar and even higher effect in the matched sample. The coefficients of initial employment and age are similar to those in the unmatched sample.

Table 7: DID Results for Employment (Matched Sample)

	Model 1	Model 2	Model 3	Model 4
D	21.39 (3.05)**	21.60 (3.11)**	22.09 (2.97)**	20.91 (2.93)**
Initial Employment	-	-	-0.10 (0.02)**	-0.08 (0.03)**
Age	-	-	-	-0.69 (0.23)**
Time and Industry effects	NO	YES	YES	YES
R^2	0.03	0.05	0.10	0.11

Notes: All models are estimated via OLS. Robust standard errors in parenthesis. ** denotes significance at 5 %, * denotes significance at 10%. Number of observations is 1491.

VI. Conclusion

Exports are seen as an important means of sustainable growth in the low or middle-income economies such as Turkey. In this paper, we focused on the microeconomic effects of starting exports at firm level data. We investigated the effects of exports on firm productivity and employment.

It is a stylized fact that exporter firms are bigger and more productive but this association does not yield a causal relation between exporting and firm characteristics. Thus, we elaborate on the set of firms that start export and that do not, and do not take the already exporter firms into account.

It is theoretically - and for developed countries empirically- shown that bigger and more productive firms enter into foreign markets, causing the selection bias problem in the econometric analysis. In order to get rid of this bias, we utilize propensity score matching used generally in quasi-experimental studies in social sciences, in which entrance to foreign

market is estimated as a function of firm characteristics before starting to export and each export starter is matched with a non-exporter based on propensity scores (conditional probability). The results in matching analysis reveal that there is self-selection in entrance to export markets and exports further increase productivity and employment. Owning to the availability of the time series dimension of data, we also used difference in differences methodology and reached similar results of effects of exporting.

The results suggest that policies to increase productivity and firm size may increase the export performance of the economy. On the other hand, starting to export itself increases the firm size and productivity and hence growth. Thus, an optimal policy for sustainable growth via exports should include microeconomic reforms that increase productivity and size of the firms as well direct support to exporting.

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Table A1. Selected Statistics for Exporters and Non-exporters According to Sectors

SECTORS		Observation	Productivity	Employment	Machinery pe	Tangible Assets pe
15-Food and Beverages	Exporter	3652	180.4	152.9	15.4	16.9
	Non Exporter	3318	101.9	64.9	7.5	10.6
17-Textile	Exporter	3928	96.4	233.5	70.6	53.0
	Non Exporter	1734	69.2	121.8	57.4	38.4
18-Apparel	Exporter	3743	72.6	172.3	5.5	7.5
	Non Exporter	538	59.3	122.4	6.9	7.8
19-Leather	Exporter	528	77.8	120.9	8.8	9.2
	Non Exporter	244	55.3	44.3	6.4	7.4
20-Wood	Exporter	429	94.6	112.2	21.6	18.3
	Non Exporter	808	64.0	43.1	10.5	10.3
21-Paper	Exporter	569	130.2	216.8	56.9	45.3
	Non Exporter	366	106.2	86.8	28.5	28.8
22-Publishing	Exporter	269	402.7	116.2	85.1	75.3
	Non Exporter	385	68.1	54.6	14.9	13.2
24-Chemicals	Exporter	1723	195.8	183.3	23.9	31.0
	Non Exporter	1025	140.7	94.2	14.0	16.2
25-Plastic	Exporter	1279	121.5	141.1	36.3	26.7
	Non Exporter	784	73.8	60.0	13.4	11.2
26-Mineral	Exporter	1343	103.3	214.7	46.0	37.3
	Non Exporter	1326	73.0	114.5	24.8	29.4
27-Metals	Exporter	1161	195.5	215.0	54.8	48.2
	Non Exporter	730	134.9	84.0	34.5	23.6
28-Fabricated Metal	Exporter	1358	90.5	140.5	21.2	18.2
	Non Exporter	877	67.1	53.9	8.4	9.3
29-Mach. and Equip.	Exporter	1727	72.9	147.3	14.9	14.3
	Non Exporter	1043	45.9	85.6	17.7	16.6
31-Electrical Machinery	Exporter	839	103.1	184.3	30.8	22.1
	Non Exporter	376	56.7	81.8	16.4	9.9
32-Radio and TV	Exporter	210	194.0	243.6	39.8	27.7
	Non Exporter	90	72.7	43.0	3.7	7.5
33-Medical and Optical	Exporter	272	52.0	102.6	8.4	5.8
	Non Exporter	132	33.5	94.4	6.2	8.3
34-Motor Vehicles	Exporter	1288	66.4	222.4	22.8	16.5
	Non Exporter	495	39.9	89.7	12.0	10.4
35-Other Transport Equip.	Exporter	137	178.5	148.3	28.9	57.9
	Non Exporter	101	99.0	57.4	21.6	40.3
36-Furniture	Exporter	561	74.8	157.2	8.1	8.8
	Non Exporter	327	47.3	64.5	7.1	7.7