Learning by Exporting in Turkey: An Investigation for Existence and Channels

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Abstract

Using a rich longitudinal database at the plant level, I shed new light on the causal nexus between exports and productivity for Turkey, a middle-income country. I find evidence for both self-selection into exporting and learning-by-exporting. My main focus is on post-entry effects. To test this hypothesis I follow recent empirical literature and I apply the Propensity Score Matching and a Difference-in-Difference estimator. I find a higher labour productivity and TFP growth for exporting firms in the entry year and some years following the entry. Exports seem to place firms on a superior productivity path. My main contribution is to show the strict linkage between export and import activity: export starters often start also importing. Learning by exporting effects hold when I control for the role of imports and I verify larger productivity gains for firms which start exporting and importing at the same time. Finally, in order to verify if post-entry effects are not only scale effects but work through competition channel and/or technology transfers, I look for a heterogeneity according to the sectoral productivity gap between the domestic market and foreign trade partners. I verify a different timing of efficiency improvements between comparative advantage and disadvantage sectors.

KEYWORDS: exports, self selection, learning-by-exporting, imports

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1   Motivation and previous literature

The nexus between trade and economic growth has always drawn the attention of economists and the recent availability of firm and plant level datasets has renewed the interest for the link between exports and productivity.

Theoretical and empirical literature has verified, both for developed and developing countries, a superior performance of firms selling to foreign markets (Bernard and Jensen, 1999, Bernard et al, 2003), and two main hypothesis about the causal relationship have been suggested. According to the self-selection hypothesis more productive firms self-select into export markets because they are more likely to cope with the export sunk costs - such as transportation costs, distribution or marketing costs - and survive in the more competitive international market. On the other hand, the learning-by-exporting hypothesis predicts that export activity fosters the firms' productivity mainly through three channels: technology transfers, exploitation of scale economies and a tougher competitive pressure. While there is large consensus on the self-selection hypothesis, there is less empirical evidence supporting learning-by-exporting, results are often controversial and learning channels have not been clearly identified (Wagner, 2007a). Post-entry effects are usually negligible or lacking in developed and competitive countries (see Wagner, 2007b, for Western Germany), where it is likely firms are on the technological frontier, operate in an efficient and competitive context and exploit advanced technologies. There could be no great scope of learning in such a framework. On the contrary, firms in developing economies could take advantage of export activity thanks to technology transfers and contacts with more efficient foreign firms, especially if they enter a developed and competitive foreign market. Kraay (1999) for China, Blalock and Jertler (2004) for Indonesia, Fernandes and Isgut (2007) for Colombia and De Loecker (2007) for Slovenia find positive productivity effects stemming from export entry.

I join this debate and present empirical evidence on the relationship between exports and firm performance for Turkey in the period 1990-2001. Turkey is an interesting case to analyse because it is a middle-low income country which underwent, during the 1980s, a deep process of trade openness and the dynamism of its economy is corroborated by the high growth rates experienced in the last decade. Its main trade partners are advanced countries[1], and, in opposite to less developed economies, its firms are endowed of the human capital and capabilities to absorb positive spillovers and exploit opportunities granted by international markets. All these features make Turkey an ideal

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[1]More than 80% of its exports are directed to OECD countries.

context where learning-by-exporting effects could display and be the outcome of technology/knowledge transfers and of a more competitive environment.

I study both the directions of causality between exports and productivity, even if the main focus is on the learning-by-exporting hypothesis that has stronger policy implications for export promotion. Previous empirical evidence on this topic for Turkey is based on two studies. Both Yasar and Rejesus (2005) and Aldan and Gunay (2008), applying Propensity Score Matching techniques and Difference-In-Difference estimators, show that learning-by-exporting may be the reason for the positive correlation between exporting status and firm performance. The latter work also finds evidence supporting the self-selection hypothesis. I confirm these previous findings extending the analysis, compared to Yasar and Rejesus (2005), to a large dataset, including all manufacturing sectors, and a wider time horizon. Differently from Aldan and Gunay (2008) who analyse labour productivity, I focus on Total Factor Productivity (TFP) and I investigate other important firm characteristics. In addition, my contribution is to show the link between the export entry and import activity at firm level, two forms of international involvement that are strictly related. Previous literature on learning-by-exporting has disregarded this relationship[2], and I try to fill this gap. Finally, I add some evidence on the channels of learning-by-exporting, looking for an heterogeneity in post-entry effects according to the type of sector. Previous papers usually do not pay attention on the mechanisms behind post-entry effects. Two exceptions are represented by Fernandes and Isgut (2007) and De Loecker (2007) who verify a significant and larger positive advantage of the participation in foreign markets for plants selling a great share of their exports to high-income countries. The existence of different effects according to trade partners suggests that firm productivity gains of exports do not only reflect scale effects but are also driven by the competition channel and technology transfers. However, behind the approach of this existing literature there is the idea that firms of every sector may reap heterogeneous benefits according to the income level of the destination economy. On the contrary, in this paper I test the idea that the important feature is not the technological level or efficiency of destination country, but the gap between the foreign and the domestic market. I investigate whether the potential for learning is higher in sectors more distant to the technological frontier where spillovers may be more relevant.

The paper is structured as follows: the next section gives a brief description

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[2]Recently, Kasahara and Lapham (2007) and Castellani et al. (2010) show that firms often both export and import. Muuls and Pisu (2009) study the interactions between exports and imports for the self-selection process.

of data; sections 3 and 4 present results on self-selection and learning-by-exporting hypothesis; and in Section 5 I go in search of learning channels behind the post-entry effects.A final Section concludes.

2 Data and descriptive analysis

2.1 Data

I make use of an original Turkish plant-level database[3], from the Annual Surveys of Manufacturing Industries, collected by Turkish State Institute of Statistics (Turkstat). I have at my disposal an unbalanced panel of plants with more than 25 employees for the whole manufacturing sector in the period 1990/2001[4]. The dataset consists of plant-level information on output, inputs, investments and a large number of plant characteristics such as foreign ownership, import activity, export activity, size, industry and region[5]. After a cleaning procedure, I remain with a dataset of 5,783 firms, for a total of 46,607 observations. There are 3,072 firms exporting at least in one year in the period 1990/2001. I use, as performance indicator, both labour productivity and Total Factor Productivity (TFP) indicators. I compute labour productivity as value added per employee, while the TFP measure is estimated using the semiparametric approach by Levinshon and Petrin (2003) and is retrieved from the production function estimated separately for every 2-digit ISIC sector, TFP. I have also applied the semiparametric approach taking into account the export status of firms, TFP^{exp}[6]. Finally, as robustness check, I have constructed a multilateral TFP index following Good et al. (1997), TFP^{index}.

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[3]The observation unit is the plant, however, throughout the paper I use the terms firm and plant as synonym because most of the firms are single plant firms.

[4]Turkstat collects data on plants with more than 10 employees, but before 1992 it ran two different surveys for firms with more 25 employees and firms with less than 25 employees. In order to keep a longer time horizon as possible I use data for only larger firms. However, I am interested in export activity and only few firms with less than 25 employees export. Import and export data at plant-level are from Foreign Trade Statistics.

[5]I have used the Perpetual inventory method in order to obtain a capital stock measure. All nominal values are deflated using 4-digit ISIC price indices provided by Turkstat, while for capital goods I use a unique deflator for all sectors, but different deflators according to the type of good (machinery and transportation).

[6]I have modified the Levinshon and Petrin (2003) procedure in order to take into account of the export status as an additional control in the dynamic problem (see Van Biesebroeck, 2005 and De Loecker, 2007).

2.2 Exceptional exporters' performance

During the analysed period, the share of exporters in the sample does not present huge changes and increased from about 25% in 1990 to 31% in 2001 (Table 1). This evolution in the firms' involvement in foreign markets rests on the reforms that the government introduced in the 1980s aimed at fostering trade openness and encouraging exports through direct and indirect measures. Even if in the investigated period Turkey signed the Custom Union agreement with European Union (EU) that went into effect in 1996, this important step has not dramatically affected the Turkish exports since EU had already removed tariffs on imports from Turkey before 1996[7].

From Table 1, it also emerges that a large number of exporters are involved in import activity, thus revealing the relevance of two-way traders: more than 65% of exporters are also importers, a feature that will be taken into account in the empirical investigation.

Table 1: Firms in international trade

Year	*Exporters* (%)	*Only Exporters* (%)	*Only Importers* (%)	*TwoWay Traders* (%)
1990	25.35	8.68	10.74	16.67
2001	31.17	10.56	13.22	20.61
Pooled	28.74	9.89	11.74	18.86

My elaborations from firm level dataset.

The "exceptional exporters' performance" that, as mentioned in the introduction, has been found out for a number of countries, is also confirmed for the case of Turkey: simple descriptive statistics, not shown for the sake of brevity, show that exporters are significantly more productive than non exporters, they have a larger number of employees and a larger output, they are more capital intensive, and it is more likely they are importers and foreign-owned. Borrowing from Bernard and Jensen (1999), I test whether the productivity premia the exporters exploit are robust to the control for other firm characteristics: firm size, industry and regional localisation. Table 2 shows the β coefficients of the following OLS regressions:

$$y_{it} = \alpha + \beta export\_dummy_{it} + \delta size_{it} + d_j + d_t + d_r + \epsilon_{it} \qquad (1)$$

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[7]The Custom Union had more effects on the tariffs on Turkish imports, thus the impact of this agreement was mainly on Turkish import flows.

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where y can be alternatively: total factor productivity, TFP, labour productivity, LP, number of employees, $Size$, output, Out, capital stock, K, capital intensity (the ratio between capital stock and number of employees), KL, and unit labour cost (calculated as total labour cost over output), ULC. The *export_dummy* variable indicates the export status of the firm. d_j, d_t and d_r are sectoral, time and regional dummies. All coefficients are statistically significant, thus revealing that the superior performance of exporters holds when checking for additional controls. I display an export premium of 18% for TFP in the pooled sample that mimics the findings for other countries[8].

Table 2: Export Premium

	TFP	LP	Size	Out	K	KL	ULC	Obs.
1990	11.2	15.81	107.64	15.36	209.92	17.12	-10.2	3,018
	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)	(0.000)	
2001	21.06	32.9	55.79	30.46	182.93	55.85	-12.21	3,503
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Pooled	17.93	27.64	86.83	27.7	234.16	40.71	-13.22	46,607
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Robust standard errors are calculated and P-Values are in brackets. Coefficients have been transformed in exact percentage values as $(exp^\beta - 1) * 100$.

3   Self Selection

In the previous section, I have verified the positive correlation between export and some firm performance indicators. Now, being interested in shedding light on the causal relationship, for the rest of the paper I keep in my dataset firms that start exporting and firms which never export in the sample period.
I define export starter as a firm which continuously exports from t onwards (for at least two consecutive years) and which had never exported in the previous years (I request to observe at least *t-1* and *t-2*)[9]. I end up with 8 cohorts, one for each year between 1992-99, and 543 starters.

In order to investigate the self-selection hypothesis I analyse ex-ante differences between starters and never exporters. Following Bernard and Jensen

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[8]De Loecker (2007) finds out a labour productivity premium of 30% for Slovenia.

[9]I allow exporters to exit the export market only one year. If starters stop exporting for two years or more, I do not consider the years following the export exit because I am interested in post-entry effects stemming from a continuous export activity. However, I have also tried to re-include in my analysis the observations after the export exit.

(1999), I regress the productivity indicators and other firm characteristics in the pre-export time $t - \sigma$ ($1 \leq \sigma \leq 5$) on a dummy indicating if the firm is an export starter at time t, $start_{i,t}$, and on a set of controls (number of employees, sectoral dummies, regional dummies and time dummies):

$$y_{i,t-\sigma} = \alpha + \beta start_{i,t} + \delta size_{i,t-\sigma} + \eta d_j + \omega d_{t-\sigma} + \mu d_r + \epsilon_{it} \qquad (2)$$

where $y_{i,t-\sigma}$ is the firm-level variable in level or growth rate.
When I investigate variables in levels, the empirical evidence, shown in Table Table 3, supports the self-selection hypothesis: more productive firms become exporters. Additionally, starters before entering export market are also larger, present higher capital intensity and higher output than never exporters. These differences are persistent and significant for the whole pre-entry period, with the exception of TFP, for which pre-entry premia exist in *t-1*, *t-2* and also *t-5*. Especially, a huge pre-entry advantage is displayed in capital and size.

Table 3: Self-Selection: Levels

	$t-5$	$t-4$	$t-3$	$t-2$	$t-1$
TFP	**15.13**	**9.15**	7.85	**14.52**	**18.32**
TFP^{exp}	**13.58**	8.45	6.54	**12.93**	**16.57**
TFP^{index}	**12.05**	5.16	0.77	**9.55**	**12.15**
LP	**24.75**	**21.44**	**20.81**	**26.27**	**30.92**
Size	**39.54**	**49.32**	**59.11**	**62.29**	**75.88**
K	**137.86**	**191.98**	**232.61**	**207.56**	**251.35**
KL	**54.99**	**73.21**	**80.87**	**63.58**	**67.85**
ULC	**-11.80**	**-12.44**	**-16.62**	**-16.44**	**-19.45**
Output	**20.87**	**22.05**	**23.48**	**22.08**	**28.31**
N. observations	7,734	9,483	11,430	13,635	14,265

Robust standard errors are calculated but not shown. Bold values are significant at least at 10%. The employment and capital regressions do not include size as control. TFP is calculated from Levinshon and Petrin (LP) approach. TFPexp iscalculated from LP approach but accounting for the export status. TFPindex is the multilateral index.

The investigation of growth rates allows to verify whether firms modify their behaviour in the pre-entry period according to the future export status. The results, not shown for sake of brevity but available upon request, suggest that future exporters increase their size, their market share and, even if for only one year (*t-2*), their productivity. However, it is difficult to detect whether these changes are in preparation to export entry, having in mind the international market, or whether these changes allow firms to enter the export market in the following period.

In the pre-entry period an interesting evidence is displayed for the import participation. Figure 1 shows an increasing import share gap between starters and never exporters. In particular, there is a significant jump between $t-1$ and t (for firms that never export throughout the sample period $t = 0$ is just the median year in the sample, that is 1995): some firms entering export market also start importing materials at the same time. Different reasons may explain this finding. There may exist common sunk costs or import activity may facilitate the setting up of relationships with local operators and the understanding of the foreign markets. Also, the use of imported inputs may allow firms to produce new goods and adapt the existing ones meeting the preferences, habits and tastes of foreign consumers. Finally, foreign sourcing of cheaper and/or high quality inputs could generate productivity improvements that, in turn, ease the penetration into foreign markets. In the empirical analysis it is important to have in mind the significant linkages between exports and imports.

Figure 1: Import Share Trend
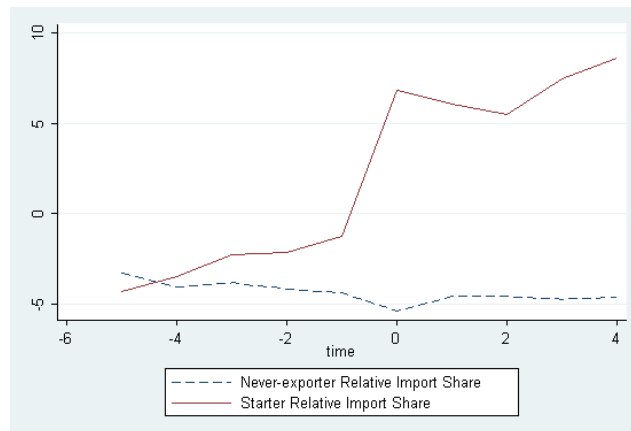
4 Post-Entry Effects

The empirical confirmation of the self-selection hypothesis does not exclude the possibility of learning by exporting: export starters could further improve their efficiency superiority after the export entry. In order to test this hypothesis, I consider a treatment model, where treatment is the export entry and there is a different treatment year for each starter cohort. Treated units are export

starters and controls are never exporting firms. The measure I am interested in is the Average Treatment effect on the Treated (ATT), that is the difference for a treated firm between the outcome it obtains after exporting and the potential outcome it would have obtained if it had never exported. I am not able to observe both outcomes for the same firm, especially the latter one - that is the outcome in the counterfactual situation of no exporting - is unknown and it can be replaced only with the outcome for non exporters provided that they have not exported. This may lead to a selection bias that will be zero only in the case the group of the treated is randomly selected from the population. However, as already displayed above, the selection into export is not random and treated and non-treated firms differ in important characteristics. To mitigate this bias, I use both Propensity Score Matching (PSM) and Difference-In-Difference (DID) strategy (Caliendo and Kopeinig, 2008)[10]. The basic idea of matching is to find, in a large group of non treated units, those firms who are similar to the treated units in all relevant pre-treatment observable characteristics to approximate the counterfactual outcome (Blundell and Costa Dias, 2000). The PSM consists in estimating a propensity score of export entry conditional to observable variables that could affect the probability to enter export market. Then, treated plants are matched with control plants displaying the most similar propensity score. I use the following probit specification for first-time exporting[11]:

$$Pr(START_{it} = 1) = f\{TFP_{t-1}, Size_{t-1}, K_{t-1}, ULC_{t-1}, SkillProd_{t-1}, Imp_{t-1},$$
$$ForSh_{t-1}, SubInp_{t-1}, SubOut_{t-1}, dummies\}$$

(3)

where $START_{it}$ is a dummy variable assuming value 1 if the firm i starts exporting in t. The probit is estimated pooling all cohorts[12] and keeping only never exporters, for all the years they are in the sample, and starters, for the year they start exporting. As regressors, I include the lag of the following variables: total factor productivity, TFP, number of employees, $Size$, and its square, capital stock, K, unit labour cost, ULC, share of skilled production employees, $SkillProd$, foreign share, $ForSh$[13], import status, Imp, sub-

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[10]Blundell and Costa Dias (2000) argue that the use of matching estimator in combination with DID approach can "improve the quality of non-experimental evaluation results significantly".

[11]The chosen probit specification satisfies the balancing test introduced by Rosenbaum and Rubin (1983) and formalized in Becker and Ichino (2002). As robustness check, I have also tried to use other probit specifications and I found similar results.

[12]The estimation on the pooled sample allows to exploit the information contained in the largest possible dataset for modeling the export-starting decision. Estimating different probit for each cohort could lead to a loss of efficiency because of the low number of starters in each cohort.

[13]The foreign share is he capital share owned by foreign shareholders.

contracted input share, *SubInp*, subcontracted output shares, *SubOut*, and dummies for industry, year and region. This specification correctly classifies 96% of observations. Making use of the estimated scores, then, I match plants applying the *Nearest Neighbour* (NN) matching on the *common support*[14]. With NN technique I match a starter with a never exporter having the closest propensity score and I also allow that never exporters are used as a match more than once - matching *with replacement*.

Following Girma et al. (2003), the matching is applied cross-section by cross-section, separately for each cohort. However, since I do not restrict matches to come from the same sector[15], I have calculated ATT effects both on absolute and relative variables. In the latter case, variables are expressed as a deviation from the industry-year mean, in order to take into account the sectoral and time evolution[16].

The implementation of different checks corroborates the goodness of the matching. The propensity score distribution of starters, that is very different from the one of all never exporters before matching, overlaps the one of the matched controls. Also, the highly significant difference in the means of all the relevant firm level characteristics between starters and never exporters completely disappears after the matching. Finally, the re-estimation of the probit in equation 3 on the matched sample displays a pseudo-R^2 not statistically different from zero, thus revealing that treated units and their matched controls have the same probability to start exporting. All these controls, that are not shown for the sake of brevity, confirm that the matching procedure is able to balance the distribution of the relevant variables in the control and treatment group.

Even if the matching procedure is valuable, it does not eliminate the self-selection bias stemming from unobservables. DID strategy allows to correct for time-invariant unobservables. Thus, the implemented DID-PSM estimator compares the differences in outcomes after and before the treatment - in this case, after and before export entry - for the treated group of export starters to the same differences for the matched never exporters[17], and can be written

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[14]I have chosen to match the starter with a single never exporter because of the large population of never exporters at my disposal. I restrict the matching to plants in the *common support*, that is the observations whose "propensity score belongs to the intersection of the supports of the propensity score of treated and controls" (Becker and Ichino, 2002).

[15]I have only included sector dummies on the propensity score computation.

[16]I have also applied the matching to the pooled sample. The resulting ATT effects, computed on relative variables, are similar to the ones shown int the text for the cross-section by cross-section matching.

[17]For never exporter *t=0*, that is the potential entry year, is the export entry year of the treated firm it is matched with.

as:

$$M^{DID-PSM} = \frac{1}{n_i} \sum_{i \in D_i^*=1} [(Y_{i,post} - Y_{i,pre}) - \sum_{j \in D_j^*=0} \omega(i,j)(Y_{j,post} - Y_{j,pre})] \quad (4)$$

Y is the variable of interest; subscripts *post* and *pre* indicate that the variable concerns the period pre and post-entry respectively; $D_i^* = 1$ denotes the group of starters in the region of common support, while $D_J^* = 0$ denotes the group of never exporters, always in the region of common support; n_i is the number of treated units on the common support. The number of control firms that are matched with a starter i is N_i^c; the weight $\omega(i,j) = \frac{1}{N_i^c}$ if the unit j is a matched controls and zero otherwise. In my estimation $\omega(ij)$ is 1 for matched controls because every starter is matched with the single nearest neighbour. I consider four years after the starting year and I compute ATT effects for the entry period *t*, *t+1* till the period *t+4*. Even if my main focus is on productivity effects I also compute ATT effects for other firm characteristics.

Table 4: ATT Effects: PSM-DID estimates

	t	$t+1$	$t+2$	$t+3$	$t+4$
PANEL A					
TFP	**0.140**	**0.177**	**0.259**	**0.218**	0.264
TFP^{exp}	**0.141**	**0.180**	**0.265**	**0.223**	0.267
TFP^{index}	**0.158**	**0.184**	**0.266**	**0.221**	**0.312**
LP	**0.137**	**0.184**	**0.279**	**0.254**	**0.311**
Size	**0.072**	**0.107**	**0.125**	**0.112**	**0.146**
K	0.021	**0.080**	**0.155**	**0.229**	0.243
KL	-0.042	-0.013	0.043	0.155	0.127
ULC	**-0.077**	**-0.140**	**-0.163**	**-0.229**	-0.056
Output	**0.164**	**0.237**	**0.370**	**0.398**	**0.364**
PANEL B					
TFP growth	**0.140**	0.034	-0.050	0.068	0.020
LP growth	**0.138**	0.043	-0.026	0.079	0.032
N. observations	1,064	948	588	324	186

Bold values are significant at least at 10%.
Bootstrapped standard errors are calculated (200 replications).

The ATT effects, displayed in Panel A of Table 4, show that the average TFP effect of exporting is positive and statistically significant. Firms that start exporting grow more than firms only serving the domestic market. There

are also significant and positive effects on capital, size and output[18]. These positive effects are persistent and they last till the fourth year (third year for the capital and productivity) after the export entry[19]. Learning-by-exporting hypothesis is confirmed with every productivity indicator (labour productivity, semiparametric TFP indicators and TFP index). By implementing the matching with a caliper level of 0.01, to prevent the risk of bad matches, similar results are obtained. The sample size decreases when I focus on periods more distant from the export entry due to different reasons: starters can stop exporting after some years; the controls or starters can exit the market; the time dimension of the database does not allow to follow the whole history of the firms after the export entry. Re-computing the post-entry effects for the different firms' samples according to the number of years I can observe the starter after the export entry, as in De Loecker (2007), it emerges that ATT effects are not affected by this source of sample selection.

Looking at the evolution of productivity gains across years I can gather the hint that in the entry year firms place themselves on a higher TFP path and, then, stay on this "superior" path (De Loecker, 2007). This idea seems to be corroborated by the computation of ATT effects on yearly TFP growth rates. Panel B of Table 4 shows that starters present a significant higher annual growth rate than never exporters only for the entry period. Thus, in the entry year starters go on a higher TFP path compared with never exporters and in the following period they stay on this path and preserve their advantage.

The ATT calculation is a flexible approach, if compared with OLS regressions, because it allows to estimate the conditional expectation of the outcome variable without imposing any linear functional form restriction. However, as robustness check, I have also tried to regress, on the pooled matched sample, the TFP growth on different starter dummies, one for each post-entry year, checking for lagged level of TFP and size, year, region and sector dummies and including firm fixed effects. This analysis again confirms the learning-by-exporting hypothesis. Exploiting this empirical strategy, I also investigate the differences in the post-entry effects for starters while they are still exporting and following their export exit. I find that the positive and significant post-entry effects are confined to the period of exporting. No significant difference is found between starters and never exporters in the years the starter is not

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[18]DID results on the unmatched sample bear, as expected, a stronger impact on the firm efficiency. These results are available upon request.

[19]However, it is worth mentioning that the results for *t+3* and *t+4* are not completely reliable due to the small sample size. I have obtained some changes in magnitude and significance making use of different probit specification for export entry.

exporting anymore[20].

5 In search of learning channels

5.1 The link between exports and imports

Empirical evidence shows, as already noticed, a strict linkage between export and import activity. In particular, export starters often start also importing in the entry year. In this section, I want both to verify that post-entry effects, I found previously, are driven by the export entry and not by the import entry and I test whether two-way starters can obtain larger gains.

In the previous analysis, I have checked for the firm prior import experience including the lagged import dummy in the estimation of the firm export propensity score. As a consequence, the computed post-entry effects were not driven by differences between export starters and never exporters in the past import activity. However, the matching procedure did not check for events that could happen in combination with export entry, in particular for the current import entry. It follows the need to test if the current import status in t could affect, in combination with exporting, firm efficiency, and could contribute to explain it. To this aim, I split the starters' sample in two groups: the first group includes export starters which start also importing in t (they did not import in *t-1*, but import in t); the second group includes all other firms (firms that already imported in *t-1* and continue importing, and firms that import neither in *t-1* nor in t). In both groups of starters I have included the relative matched controls. Table 5 displays that my previous results are generally confirmed also when I drop, from my sample, firms which start importing and exporting at the same time, even if post-entry effects are slightly downsized and there is no significant effect in t^{21}. This finding further supports the existence of significant positive effects stemming from export activity, and I can reject the hypothesis that efficiency improvements previously found are only driven by firms' foreign sourcing. However, I also detect larger productivity gains for firms which start exporting and importing at the same time and, hence, turn to more complex internationalisation strategies.

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[20]These robustness checks are available upon request.

[21]I calculate ATT effects until *t+2* because the two samples are too small for following years.

Table 5: ATT effects: the role for import status

	t	$t+1$	$t+2$
		TFP	
New Importers	**0.206**	**0.239**	**0.210**
Old Importers & Non Importers	0.109	**0.156**	**0.229**

Bootstrapped standard errors are calculated.
Bold values are significant at least at 10%

5.2 Learning-by-exporting: the role of the technological gap

Previous works show that the magnitude of the firm efficiency gain driven by the export activity is related to the competition level of the domestic sector and the characteristics of the destination country. According to Greenaway and Kneller (2007), post-entry effects are less pronounced in internationalised industries and in industries exposed to high levels of $R\&D$ intensity where firms already face a high competition. In opposite, De Loecker (2007) finds that firms, especially in low income countries, may reap larger benefits exporting to advanced countries. Building on these studies, I test whether it is the sectoral gap between the destination country and the domestic market, more than the individual technology/efficiency levels of origin and destination countries, to significantly affect the process of learning-by-exporting and the extent of export gains. Because of the difficulty in measuring the sectoral productivity gap between countries, I use, as a proxy, an indicator of comparative advantage. Turkey is a middle-income country and its main trade partners are European countries and, in general, advanced countries[22]. It is fair to suppose that in sectors where Turkey has no a comparative advantage Turkish firms are less productive, in average, than foreign firms; on the contrary, in comparative advantage sectors the Turkish productive system is more efficient - in absolute or relative terms - than foreign productive systems[23]. It

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[22]Turkish exports to OECD countries represent 80% of total manufacturing exports.

[23]In comparative advantage sectors Turkish firms could be more productive in average than firms of trade partner countries or, even if they are less efficient, the differential of productivity should be lower than the one in comparative disadvantage sectors. Mayer and Ottaviano (2007) show a positive correlation between the revealed comparative advantage, built on trade data, and the estimated comparative advantage, built on productivity data.

follows that new exporters, in comparative disadvantage industries, could be exposed to a more competitive environment when selling abroad and could benefit from higher spillovers since the productivity gap with foreign countries is larger than the one in comparative advantage sectors. This could explain larger post-entry effects stemming from exporting. As a consequence, I expect learning-by-exporting to be stronger in comparative disadvantage sectors.

After the matching procedure shown in section 4, I have split sectors according to the revealed comparative advantage (henceforth, RCA),[24] and I have defined postCA a vector of dummy variables for the post-entry period for starters in comparative advantage (CA) sectors, and postCD a similar vector for starters in comparative disadvantage sectors (CD). Then, I compute heterogeneous post-entry effects by type of sector:

$$\Delta TFP_{i,s} = \alpha + \beta_1 postCA_{i,s} + \beta_2 postCD_{i,s} + \epsilon_{is} \qquad (5)$$

where $\Delta TFP_{i,s}$ is the productivity growth between every post-entry year and pre-entry year[25]. I compare the productivity change following export entry with the one in the pre-entry period and I consider separately post entry effects according to the comparative advantage status of the starters' sector. The coefficient β_1 captures the average change in the performance related to the entrance in the export market for starters in comparative advantage sectors, while the coefficient β_2 can be interpreted as the same effect for starters in comparative disadvantage sectors. These coefficients have to be interpreted as efficiency differentials with respect to the omitted group, that is never exporters. I run simple OLS regressions.

Results in Table 6 show that for the entry year starters in CA sectors are improving their productivity if compared with non-exporters, while there are no significant effects for starters in CD sectors. In the following years, effects in CA industries turn progressively to be non significant, while in CD

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[24]The RCA is defined as $RCA_i = \frac{X_{TUR,i}/X_{TUR}}{X_{W,i}/X_W}$, where $X_{TUR,i}$ and X_{TUR} are the exports in the industry i and in the aggregate manufacturing sector for Turkey, while $X_{W,i}$ and X_W are the ones for the comparison group of countries. The index is higher than one in comparative advantage sectors. In order to calculate this index I have used 3digit sectoral trade data from CEPII and the comparison group of countries consists of EU countries, Russia and Usa. These countries are the main Turkish trade partners. The same pattern of comparative advantage is obtained using as comparison group only EU countries, OECD countries or the rest of the world. The list of comparative advantage sectors, that is quite constant during the sample period, is available upon request.

[25]For the entry period it is calculated as $\Delta TFP_{i,0} = tfp_{i,t} - tfp_{i,t-1}$, where tfp is in logarithms, while for the first year following the entry it is calculated as $\Delta TFP_{i,1} = tfp_{i,t} - tfp_{i,t-2}$ and so on. The variable TFP is always expressed as a deviation from the industry-year mean.

Table 6: ATT Effects: Technological Gap

		t	$t+1$	$t+2$	$t+3$	$t+4$
TFP	Starters in CA sectors	**0.180**	**0.187**	**0.264**	0.059	0.086
	Starters in CD sectors	0.104	**0.157**	**0.254**	**0.352**	**0.399**
CumTFP	Starters in CA sectors	**0.180**	**0.307**	**0.476**	0.378	0.715
	Starters in CD sectors	0.104	**0.341**	**0.609**	**0.818**	**1.467**

Bold values are significant at least at 10%. Bootstrapped standard errors are computed. $CumTFP$: is the firm cumulative productivity.

sectors exporters start experiencing significant gains since *t+1* and it seems they continuously increase their efficiency. Hence, there is a different timing of post-entry effects according to the sector: firms in CA sectors can take advantage from the export activity immediately when they enter foreign markets, on the contrary it seems that firms in CD sectors need some time in order to exploit the opportunities offered by foreign markets. In CD sectors firms are not able to absorb immediately spillovers from the international environment - new technologies, new production strategies - because the gap with foreign markets may be large and they may have to spend some efforts in order to prepare themselves to take advantage from the new context. In opposite, in CA sectors firms does not face any difficulty in exploiting the potential of learning. However, when starters in CD industries are ready to absorb spillovers from the new context they can exploit a higher potential of learning than firms in CA industries. This hypothesis seems to be confirmed when I analyse the cumulative productivity[26] of firms.

6   Concluding remarks

With this work I contribute to support the hypothesis of a potential for learning stemming from export activity when the analysed country is not at the technological frontier. Focusing on the case of Turkey, I show that export starters gain a higher efficiency in the post-entry period. It seems that firms

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[26]The cumulative productivity is calculated as $CumTFP_{i,s} = ln \sum_{\delta=0}^{s} TFP_{i,t+\delta} - lnTFP_{i,t-1}$, where t is the entry year.

thanks to export activity catch up a superior productivity path in the entry year and they stay on this path in the following period.

My analysis displays also a strict linkage between export and import entry. Firms often start importing and exporting at the same time and it is important to control for this simultaneity in the analysis of post-entry effects. Productivity gains also hold when I take into account the current import status. In addition, the benefits seem to be larger when firms are involved in both international strategies.

Finally, I try to shed some light on the channels of learning-by-exporting and I look for an heterogeneity in post-entry effects according to the sectoral efficiency gap between the domestic context and foreign markets. I verify a different timing of productivity improvements across sectors: new exporters in comparative disadvantage sectors take more time to reap the benefits of export market, but, in the "long term", the potential of learning could be larger than in comparative advantage industries because the distance to the frontier is higher. This finding supports the hypothesis that competition and technology spillovers are significant channels through which exports may affect firm's productivity.

References

[1] ALDAN, A. AND M. GUNAY, 2008. Entry to Export Markets and Productivity: Analysis of Matched Firms in Turkey. The Central Bank of the Republic of Turkey, Working Paper 08/05.

[2] BECKER, S.O. AND A. ICHINO, 2002. Estimation of average treatment effects based on propensity scores. *The Stata Journal* 2(4), 358–377.

[3] BERNARD, A. AND B. JENSEN, 1999. Exceptional exporters performance: cause, effect or both?. *Journal of International Economics* 47(1), 1-25.

[4] BERNARD, A., J. EATON, B. JENSEN, AND S. KORTUM, 2003. Plants and Productivity in International Trade. *American Economic Review* 93(4), 1268-1290.

[5] BLALOCK, A. AND J.B. JERTLER, 2004. Learning from exporting revisited in a less developed setting. *Journal of Development Economics* 75(2), 397-416.

[6] BLUNDELL, R. AND M. DIAS, 2000. Evaluation methods for non-experimental data. *Fiscal Studies* 21(4), 427–468.

[7] CALIENDO, M. AND S. KOPEINIG, 2008. Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys* 22(1), 31-72.

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[8] CASTELLANI D., SERTI F. AND C. TOMASI, 2010. Firms in International Trade: Importers and Exporters Heterogeneity in the Italian Manufacturing Industry. *The World Economy* 33(3), 424-457.

[9] DELGADO, M., J. FARINAS, AND S. RUANO, 2002. Firm productivity and export markets: a non-parametric approach. *Journal of International Economics* 57(2), 397-422.

[10] DE LOECKER, J., 2007. Do Exports Generate Higher Productivity? Evidence from Slovenia. *Journal of International Economics* 73(1), 69-98.

[11] FERNANDES, A. AND A. ISGUT, 2007. Learning-by-Exporting Effects: Are They for Real?. MPRA Paper 3121.

[12] GIRMA, S., D. GREENAWAY, AND R. KNELLER, 2003. Export market exit and performance dynamics: a causality analysis of matched firms. *Economics Letters* 80(2), 181-187.

[13] GREENAWAY, D. AND R. KNELLER, 2007. Industry Differences in the Effect of Export Market Entry: Learning by Exporting?. *Review of World Economics* 143(3), 416-432.

[14] GOOD, D.H., M. NADIRI,AND R. SICKLES, 1997. Handbook of Applied Econometrics: Micro-econometrics. Blackwell: Oxford.

[15] KASAHARA H. AND B. LAPHAM, 2007. Productivity and the decision to import and export: theory and evidence, mimeo, University of Western Ontario.

[16] KRAAY, A., 1999. Exportations et Performances Economiques: Etude dun Panel dEntreprises Chinoises. *Revue d'Economie du Developpement* 1–2, 183-207.

[17] LEVINSOHN, J. AND A. PETRIN, 2003. Estimating Production Functions Using Inputs to Control for Unobservables. *Review of Economics Studies* 70(2), 317–341.

[18] MAYER, T. AND G.I.P. OTTAVIANO, 2007. The Happy Few: The internationalisation of European firms. Bruegel Blueprint Series.

[19] MUULS, M. AND M. PISU, 2009. Imports and Exports at the Level of the Firm: Evidence from Belgium. *World Economy* 32(5), 692–734.

[20] ROSENBAUM, P. AND D. RUBIN, 1983. The central role of the propensity score in observational studies for causal effects. *Biometrica* 70(1), 41-55.

[21] SERTI, F. AND C. TOMASI, 2008. Self Selection and Post-Entry effects of Exports. Evidence from Italian Manufacturing firms. *Review of World Economics* 144(4), 660–694.

[22] VAN BIESEBROECK, J., 2005. Exporting Raises Productivity in sub-Saharan African Manufacturing Firms. *Journal of International Economics* 67(2), 373–391.

[23] WAGNER, J., 2007a. Exports and productivity: A survey of the evidence from firm level data. *World Economy* 30(1), 60–82.

[24] WAGNER, J., 2007b. Exports and Productivity in Germany. *Applied Economics Quarterly* 53(4), 353–373.

[25] YASAR, M. AND R.M. REJESUS, 2005. Exporting status and firm performance: Evidence from a matched sample. *Economics Letters* 88(3), 397-402.