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Exports and Financing Constraints Evidence from Turkey

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Abstract:
This paper examines the link between financing constraints and firm exporting behavior through an in-depth study of the Turkish manufacturing firms between 1996 and 2013. Utilizing a rich firm-level data set, we test for both *ex-ante* and *ex-post* links between exports and financing constraints to tackle potential selection biases and endogeneity problems. We find a positive and statistically significant export premium for financing constraints in general. In further testing we show that there is no significant evidence of pre-entry premium, while we find that financing constraints faced by exporting firms are eased once they start exporting, confirming an improvement in the financial conditions of export starters compared to non-exporters.

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1 Introduction

The links between firm performance and export behavior have been well studied in the framework of heterogeneous firms in international trade, first developed by Melitz (2003). A large literature shows that exporting firms are larger, more productive, and more skill- and capital-intensive than their domestic counterparts (Melitz 2003; Chaney 2013). More recently, a number of works specifically focused on the link between financing constraints and export behavior. Following this literature, we study the link between export behavior and financing constraints using a rich firm-level data set for the Turkish manufacturing industry.

The issue of the links between financing constraints and export performance is of particular importance for developing countries that adopted trade and financial liberalization policies with the understanding that access to finance is among the critical determinants of exports. Mainly due to firm-level data limitations, however, the studies of the links for developing countries have been quite scarce. In this context, Turkey provides an interesting case of analysis of the opportunities and challenges faced by the developing country exporters of non-resource-based products. In the early 1980s, Turkey switched from import-substitution-industrialization policies to export-oriented policies and its exports began rising. Following the 1996 customs union agreement with the European Union, the total volume of exports increased significantly. From 2002 to 2012, the annual growth rate of exports reached 15% on average (World Bank 2014: i). However, imports have rapidly increased as well leading to persistent trade deficits, compelling the government to search for ways to further increase export growth. Despite policies favoring exports and continuous economic growth, the growth of exports has stagnated since 2012 with a decline in 2017. By 2016, exports as a percentage of GDP in Turkey remained low (22%) relative to the average of high-middle income countries (24%), as well as some of the leading non-oil exporters in the MENA region, such as Jordan, Morocco, Tunisia and Lebanon (World Development Indicators). Among the non-oil exporting, resource poor and labor-abundant countries in the MENA region, only Egypt has a lower export-to-GDP ratio (10%) than Turkey.

Our work contributes to the empirical literature on financing constraints and exports in developing countries in numerous ways. First, rather than using a single variable, we construct and employ a multidimensional index of financing constraints. Second, we use a rich data set of financial and real variables for a large number of both public and private firms over 17 years (from 1996 to 2013). Large size and time dimension of data allow us to group firms into multiple categories of non-exporters, export starters and continuous exporters. Third, we address endogeneity issues through various empirical methods. Having shown that exporters in general face lower financing constraints than non-exporters, we further analyze the direction of causation. While it is possible that financially less constrained firms self-select into exporting, export market participation might

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also improve firms' financial conditions. We test for these *ex-ante* and *ex-post* interactions between financing constraint and exports separately. Our results show a positive yet statistically insignificant difference between the constraints faced by export-starters and domestic market oriented firms before the former enter export markets. For the *ex-post* effects, we find that exporting significantly eases the constraints faced by export starters.

In the following section, we present a brief overview of the related literature. We introduce our data set and variables in section three. We present our empirical analysis in section four and conclude in the last section with remarks on the implications of our findings.

2 Literature Review

Financing constraints may directly affect a firm's participation in export markets since entering international markets involves certain costs. Usually, these costs need to be paid upfront whereas the collection of payments takes a considerable amount of time after the receipt of the order. Firms need sufficient initial investment or capital in order to be able to afford these costs and a relatively higher amount of working capital to process the export orders. When we also consider the extra risks taken in export markets, such as exchange rate fluctuations and contract enforcement issues, it becomes clear that financing constraints may be especially binding in making the decision to participate in export markets (Wagner 2014). Theoretical contributions such as Muuls (2008), Chaney (2013), and Manova (2013) formalize these insights in the framework of heterogeneous firms, developed by Melitz (2003).

While these models emphasize how firms with financing constraints are less likely to start exporting, there are also reasons to expect that exporting itself might reduce financing constraints. Guariglia and Bridges (2008) show that exporting firms may have more stable cash flows since their sales are internationally diversified and as long as the business cycles in their markets are not perfectly correlated exporting might decrease their vulnerability to demand-side shocks. Especially for "emerging economies," Ganesh-Kumar, Sen, and Vaidya (2001) argue that, in a context of information asymmetries and financial market imperfections, exporting would send a positive signal to lenders and investors as international markets are perceived to be more competitive and efficient than domestic markets. Such a signal would help firms obtain better financing and face lower financing constraints. Exporting is also likely to allow a firm to access international financial markets, as foreign exchange revenues can be used as collateral (Tornell, Westermann, and Martinez 2003).

A common finding in the empirical literature is that financing constraints are indeed important for the export decisions of firms, as exporting firms are in general less financially constrained than non-exporting firms (Wagner 2014). A number of studies find evidence in support of *ex-ante* effects where firms with lower financing constraints self-select into exporting (see Wagner 2014 for a detailed review). On the other hand, Greenaway, Guariglia, and Kneller (2007) find that participation in exporting improves firms' *ex-post* financial health for a sample of UK manufacturing firms. Silva (2011) reports a similar finding for manufacturing firms in Portugal and Bernini (2012) for a cross-country study of 27 transition economies in East Europe and Central Asia.

There is very limited empirical evidence on the finance-export relationship in MENA countries and Turkey. Among them Fakih and Ghazalian (2014) study the determinants of manufacturing firms' export behavior in eight MENA countries and, due to data limitations, use macroeconomic indicators to capture the effect of financial factors on firms' export participation through a probit model for export decision and through a fractional logit model for export intensity. Kiendrebeogo and Minea (2017) adopt a more advanced empirical approach to examine constraints for the Egyptian manufacturing companies for the 2003–2008 periods and find a strong detrimental effect of financial constraints on the export activity. They address potential endogeneity issues through the use of lagged structures and hazard duration models in their empirical analysis and use alternative measures of financing constraints. While we take a similar approach in both aspects, we adopt a propensity-score matching method combined with a difference-in-difference estimator to explore *ex-ante* differences in financing constraints between export starters and non-exporters. As our data set is derived from balance sheets and income statements of firms, we are able to conduct our analysis at the firm level instead of enterprise level as done by Kiendrebeogo and Minea (2017).

The literature on export behavior and firm performance in Turkey mostly focuses on the productivity-export relationship and explores whether participation in export markets improves productivity (Yasar and Rejesus 2005; Yasar et al. 2007; Aldan and Gunay 2008; Kılıçaslan and Erdoğan 2012; Maggioni 2012). Özer and Böke (2015) argue that in terms of its export performance, Turkish firms lag behind their competitors in innovation and skills, business environment and access to finance. Two recent works look at the link between export market participation and financing constraints among other firm performance indicators (Akarım 2013; Demirhan 2015). Examining the link between export market participation and financing constraints in a single logit regression framework with a limited data set of publicly traded firms, Akarım (2013) finds no evidence of financing

constraints. Empirically, this method suffers from endogeneity problems and selection bias, as it does not recognize the *ex-ante* and *ex-post* effects mentioned above. Demirhan (2015) focuses on the relationship between multiple measures of firm performance and export market participation. The measure of financing constraint used in this study is a version of the leverage ratio, and it leaves out trade credit which has been found to be quite important for the liability structure of Turkish non-financial firms.[1] By using alternative measures including a multidimensional, ranking-based index, our study provides a more rigorous examination of financing constraints for Turkish firms.

3 Data Set and Variables

3.1 Data set

We use the *Company Accounts* data set, which covers the period between 1996 and 2013.[2] It is the most comprehensive source of firm-level annual balance sheet and income statement data on nonfinancial firms in Turkey. The data set is well-suited to the study of financing constraints as it includes the firms in the economy that have accounts with the banking system (CBRT *Methodological Information*).[3] We focus on manufacturing firms (NACE Revision 2, industries C10-C33) that constitute the largest portion of employment and total assets in the data set. At the end of 2013, the data set reports around 4,000 manufacturing firms, which make up approximately 54% of total manufacturing sales and 27% of total manufacturing employment in the economy.[4] The number of reporting firms may differ across years leading to an unbalanced panel of data and we include manufacturing firms with at least 5 consecutive years of observations in our sample. We clean the outliers by trimming 2 % at both ends for total assets, employment and sales. The share of exporting firms in our sample is high and shows a steady increase over the years but most firms do not export regularly.

As we are interested in firm heterogeneity with respect to export performance, it is useful to take a look at the characteristics of two types of firms. Table 1 presents summary statistics for both firm categories, exporting and non-exporting. This classification is based on firm-year observations of whether a firm exports in a particular year or not. We observe that, exporting firms are on average larger in size, more productive and more profitable. They also have higher capital-labor ratios, indicating higher capital intensity. The share of research and development expenditures in operational expenditures is also higher for exporting firms as well, though the difference is not large. Finally, based on both measures of financing constraints, we observe that exporting firms tend to face lower constraints.

Table 1: Summary statistics.

Exporting	**Median**	**Mean**	**Standard deviation**	**Number of firms**	**Number of observations**
Size	4.74	4.70	1.00	4206	35,225
Productivity	100,482.90	168,553.00	258,572.50	4206	35,225
Profitability	0.07	0.07	0.19	4206	35,225
R&D	0.00	0.01	0.07	4206	35,225
Capital intensity	18,771.01	38,091.77	84,963.20	4206	35,225
Score A	6.00	6.28	1.94	4206	35,225
Score B	12.00	12.37	3.44	4206	35,225
Not exporting					
Size	3.87	3.98	0.99	2098	10,427
Productivity	89,025.09	156,446.80	278,611.50	2098	10,427
Profitability	0.04	0.05	0.79	2098	10,427
R&D	0.00	0.01	0.07	2098	10,427
Capital intensity	15,276.07	32,371.40	98,174.00	2098	10,427
Score A	5.00	5.37	1.89	2098	10,427
Score B	11.00	11.38	3.43	2098	10,427

Note: All means are significantly different across groups at 1 %.

3.2 Variables: financing constraint

Our main concern is the link between exports and financing constraints. The measurement of financing constraints is a rather difficult task as these constraints are empirically not observable. Even though the researchers are understandably interested in making inferences about certain firm characteristics (size, age … etc), any good measure of financing constraints should be firm-specific as access to finance is highly heterogeneous. Additionally, constraints are time-varying, since a firm may move from an unconstrained to a constrained state over time with changes in investment opportunities or idiosyncratic shocks. This implies that a good measure should be a continuous variable rather than a binary classification to capture the degree of financing constraints.

Building on the seminal work of Fazzari *et al*. (1988), the most common proxy for financing constraints used in the literature is the sensitivity of investment to cash flow, which has been criticized by many. Kaplan and Zingales (1997) argue that under certain conditions, investment-cash flow sensitivities may increase as financing constraints are relaxed and they are not necessarily monotonic in the degree of financing constraints. They show that firms with more liquid assets borrow more and therefore their investment is more sensitive to cash flow shocks due to the leverage effect. Therefore, firms with lower financing constraints may have larger investment-cash flow sensitivities than similar firms with lower levels of liquid assets. Following such criticism, some studies utilized survey data, where firms are directly asked whether they are financially constrained (e. g. Beck et al. 2006). While providing a direct measure, this approach has also been criticized for the subjective nature of self-assessed variables, as well as the difficulties of obtaining periodical survey data. An alternative approach to measuring constraints has been the use of an index, first implemented by Lamont, Polk, and Saaá-Requejo (2001). Using the coefficients of the probabilistic logistics model developed by Kaplan and Zingales (1997) and Lamont, Polk, and Saaá-Requejo (2001) build a "synthetic KZ index," where the degree of financing constraints depends on five financial variables of the firm. The use of KZ index for different samples of firms than the one in the original study has been criticized, as it is not reasonable to expect that the index coefficients remain unchanged.

An alternative measure that does not rely on an estimation with structural coefficients is a class-ranking index, first introduced by Musso and Schiavo (2008) and later adopted by Bellone et al. (2010). Here, firms in a certain class (e. g. industry or region), which are believed to be relatively homogenous, are ranked based on several variables that are found to have a relationship with financing constraints. For each variable, the relative position of each firm to the corresponding class average is computed and firms are ranked based on this relative position. Then, rankings from all variables are collapsed into a single score of financing constraints. In this study, we collapse information from four different variables selected on the basis of their perceived importance in determining ease of access to external funds: firm size, profitability, liquidity, and cash flow generating ability. Firm size is based on total assets; profitability is measured as return on total assets (ROA); liquidity is the ratio of current assets to current liabilities; and cash flow generating ability is the ratio of net profits to net sales. For each of these four dimensions and for each year, we first compute the two-digit NACE sector averages and scale each firm/year observation by the corresponding two-digit NACE sector average. Sector averages are used to account for industry-specific differences in these financial variables. Based on the distribution of these scaled values within each year, we assign a number to each firm, ranging from one to five, depending on the quintile the firm observation corresponds to. Hence, for each firm/year observation we end up with four scores ranging from one to five. By adding up these four scores we obtain an index for each firm in each year. Index values are expressed as ranging from two to ten. Firms with low scores are expected to be the most financially constrained; as the index number goes up, we expect financial constraints to be weakened. For robustness check, we use two versions of the index. A broad version (Score A) is the one described above with computed from rankings on all four variables. A narrow version (Score B) is computed from rankings on the first two variables.

3.3 Control variables

While focusing on the link between financing constraints and export market participation, we control for five main determinants of exports: firm size, productivity, profitability, research and development expenditures and capital intensity (Bernard and Jensen 1999). Firm size is considered to be one of the main determinants of participation in export markets as larger firms are usually thought to have superior performance due to the higher market power that comes with economies of scale and easier access to finance. A related variable is productivity, which is seen as an indicator of firm success and is expected to have a positive impact on export market participation. As larger and more productive firms are also expected to have higher profitability, profitability is another indicator used in order to represent firm performance. It is presumed that export markets require higher quality products and producing those high quality products requires skilled workers, technology and capital. To capture these, we control for innovation, proxied by the share of research and development ex-

penditures to operating expenses. Finally, we control for the capital-labor ratio as a measure of capital intensity to approximate the technological intensity of the production process (See Appendix A for variable definitions).

4 Empirical analysis

We employ three models in the empirical analysis below. The first model in section 4.1 tests whether exporting firms in our sample have lower financing constraints than non-exporting firms in general. Once we identify that the financing constraints are different between exporting and non-exporting firms we examine the direction of causality by separating firms into two categories of export starters and non-exporters. The second model in section 4.2 examines the *ex-ante* effect of constraints on exporting and asks whether firms with lower financing constraints are more likely to start exporting compared to firms facing higher constraints. Our regression analysis considers firm fixed effects, as well as the set of firm level control variables mentioned above. Following this, our third model in section 4.3 examines the *ex-ante* differences and asks whether firms' financing constraints are eased after starting to export. Here we use propensity score matching combined with difference-in-difference method to analyze whether export starters and non-exporters with similar characteristics display different outcomes in the degree of financing constraints they face, over time. As reviewed by Wagner (2014), previous evidence suggests that financing constraints are important in the export decisions of firms and in general exporting firms are financially less constrained than non-exporting firms. While there is some evidence as to both *ex-ante* and *ex-post* effects, Wagner (2014) also reports that results from various empirical studies are more mixed.

4.1 Firm characteristics and export behavior

We start with a basic question: do the exporting firms in our sample face lower financing constraints than non-exporting firms? Before moving to the analysis of the sources of differences between exporting and non-exporting firms, we first check for firm characteristics and year effects to see whether there is evidence showing that exporting firms face lower financing constraints. Following Bernard and Jensen (1999), we apply a standard approach in the literature on firm productivity and exports in order to calculate the export premium on financing constraints. More specifically, we estimate the following fixed effects model:

$$ln\,(Score_{it}) = \alpha + \beta\, Exporter_{it} + \delta_t + \rho_i + \mu_j + \varepsilon_{it} \quad (1)$$

where $Score_{it}$ is the index of financing constraints faced by firm i in year t, expressed in logarithmic terms. $Exporter_{it}$ is a dummy variable taking the value of 1, if the firm i exports in year t. δ_t represents year dummies, ρ_i represents firm-fixed effects, μ_j represents industry fixed effects at two digit level based on NACE. Revision 2 classification. ε_{it} is the error term. The export premium is computed from the estimated β coefficient as ($\exp^{\beta}$ -1)*100. A positive and statistically significant premium is interpreted as the percentage difference in financing constraints between exporters and non-exporters.

Table 2 presents the results for export premium with both measures of constraints from two separate models. Model 1 is a pooled OLS regression for $\ln(\text{Score}_{it}) = \alpha + \beta\ \text{Exporter}_{it} + \delta_t + \mu_j + \varepsilon_{it}$, where firm-fixed effects are omitted to capture the impact of only time and industry effects. Model 2 is a firm-fixed effect panel regression for $\ln(\text{Score}_{it}) = \alpha + \beta\ \text{Exporter}_{it} + \delta_t + \varepsilon_{it}$, where industry effects are not included. Our results indicate that, for both measures of financing constraints, there is a positive and statistically significant export premium. The magnitude of this premium is higher with pooled OLS results relative to firm-fixed effect panel model. Based on a comparison of Akaike's information criterion (AIC) and Bayesian information criterion (BIC), the fixed-effect panel model (Model 2) provides a better fit for data; hence we conclude that export premium on financing constraints ranges from 4.3% to 1.5%, depending on the measure of the constraint used.[5] Our main concern is about the source of this positive relationship. There are two possible explanations for this overall relationship. First, firms with already lower financing constraints may self-select into exporting implying *ex-ante* differences between exporters and non-exporters. Second, firms' financing constraints may ease up after they start exporting. i. e. *ex-post* improvement for export starters. In the next section, we test the self-selection hypothesis and then in the following section we look at the *ex-post* relationship between financing constraints and exports.

Table 2: Export premium.

	Model 1: Time and industry fixed-effects		Model 2: Time and firm fixed-effects	
	β coefficient	Export premium	β coefficient	Export premium
SCORE A	0.18062*** (0.0041895)	19.8%	0.0423601*** (0 0.0061617)	4.3%
SCORE B	(0.0819327)*** (0.0036154)	8.5 %	0.0148812** (0.005292)	1.5%

Note: Robust standard errors are in parenthesis. *** indicates significance at 1 %. Export premium is computed as (exp^β -1)*100. AIC and BIC statistics for each model indicate that panel regression with time and firm-fixed effects (Model 2) is a better fit for data, regardless of the choice of SCORE measure.

4.2 Ex-ante *financial advantage of exporters?*

In order to compare *ex-ante* and *ex-post* differences in financing constraints, we identify two categories of firms: export starters and non-exporters. The former is defined as firms that do not export for at least 2 consecutive years before starting to export in the current year and continue to export for at least two more consecutive years. Hence, we require them to continuously export for at least 3 years after not exporting for at least 2 years. The firms in the latter category do not export at all. By defining the second category in this way, we make sure that there is no transition between the two categories. Our final sample has a total of 862 firms, of which 444 are export starters.

Following the empirical methodology used by The International Study Group on Exports and Productivity (ISGEP 2008), we investigate the pre-entry differences in financing constraints between export starters and non-exporters.[6] If financially less constrained firms are more likely to become exporters, then we should find significant differences in the score measure between future export starters and non-starters several years before the former begin to export. Formally, we estimate the following model:

$$ln\,(Score_{it-s}) = \alpha + \beta\ Starter_{it} + \ \sigma\ Control_{it-s} + \ \delta_{t-s} + \ \rho_i + \ \varepsilon_{it-s} \tag{2}$$

where $Score_{it\text{-}s}$ is a measure of financing constraints and $Starter_{it}$ is a dummy for export status taking the value of 1 if the firm i starts to export in the current year t. $Control_{it\text{-}s}$ is a vector of control variables that includes firm size (the log of the number of employees), the log of labor productivity and the log of the ratio of R&D expenditures to operating expenses, the log of operating profitability and the log of capital-labor ratio. The regression also includes time dummies (at t-s) to control for exogenous differences correlated with macroeconomic factors. Subscript s takes the values of 2 and 1 to compare the scores of export starters versus that of non-exporters 2 and 1 years before. A firm fixed effect (ρ_i) is included to capture possible unobserved factors originating from firm level heterogeneity. The model above does not imply a causal relationship but it makes it possible to analyze the strength of the pre-entry premium. This way we can see whether firms that export in time t already had higher scores indicating lower financing constraints.

The results of the regressions with two different *Score* variables and two different lag structures are presented in Table 3. While the main coefficient of interest in these results is that of the *Starter* dummy, the results from control variables are also interesting to note. Regardless of the time dimension or the measure of constraints, *Score* variable is always significantly and positively related with size, labor productivity and operational profitability. These findings confirm the general suggestions of the literature on heterogeneous firms by indicating that the firms facing lower financing constraints (as implied by higher *Score* values) are larger in size, more productive and more profitable. Turning to the coefficient (β) for Starter dummy, we see that a positive and statistically significant value of β would confirm the self-selection hypothesis where firms previously facing lower financing constraints are more likely to be export starters. The results from all regressions show a positive yet statistically insignificant value for β. Therefore, we do not report an export premium and instead conclude that statistically there is no difference between the financial standing of today's exporters and today's non-exporters 2 years before the former started to export, controlling for the characteristics included in the vector *Control*. In his review of the 32 empirical studies on export and financing constraints Wagner (2014) reports that most studies confirm the presence of a self-selection effect where financially less constrained firms self-select into exporting. Based on our results, self-selection hypothesis cannot be confirmed in the case of Turkish export starters.

Table 3: *Ex-ante* interaction between indicators of financing constraints and starting to export.

Dependent variable	Lagged values of SCORE A		Lagged values of SCORE B	
	t-1 (s = 1)	t-2 (s = 2)	t-1 (s = 1)	t-2 (s = 2)
$Starter_{it}$	0.0023622(0.0132315)	0.0115141	0.0145606	0.008765
		(0.012991)	(0.0102354)	(0.0119959)
$Size_{it-s}$	0.1861259***	0.1831824***	0.0764916***	0.0694241***
	(0.005534)	(0.0060191)	(0.00569380	(0.0058146)
$K/L\ ratio_{it-s}$	0.0129037***	0.0140201***	−0.0014834	−0.0014225
	(0.0027524)	(0.0029032)	(0.0028237)	(0.0029222)
$Productivity_{it-s}$	0.1715664***	0.1646692***	0.0745112***	0.0659037***
	(0.0060835)	(0.0057904)	(0.0058953)	(0.0052236)
$R\&D_{it-s}$	0.0258934	0.012944	0.0314913	0.0223766
	(0.0266296)	(0.0283812)	(0.0235137)	(0.0247795)
$Profitability_{it-s}$	2.770083***	3.803963***	2.224569***	3.309284***
	(0.9480434)	(1.148351)	(0.8642297)	(0.9848037)
# of observations	41,014	36,382	41,014	36,382
# of firms	4,624	4,624	4,624	4,624
within R^2	0.1253	0.1239	0.0436	0.0461
between R^2	0.5279	0.5139	0.204	0.2081
overall R^2	0.3662	0.3668	0.1345	0.1402
F-statistics	F(22,4623) = 78.62***	F(21,4623) = 73.87***	F(22,4623) = 21.23***	F(21,4623) = 18.51***
AIC	−5616.408	−6285.184	−15,034.11	−14,837.53
BIC	−5426.731	−6106.645	−14,844.43	−14,659

Robust standard errors are in parentheses. *** indicates significance at 1 % level
All variables, except Starter, are in logarithmic terms; Starter is a dummy variable that takes the values of 1 and 0. Regressions are firm-fixed effect panel models where time dummies are included.

4.3 Ex-post *improvement in financing constraints?*

As we cannot find any significant *ex-ante* differences in financing constraints faced by non-exporters and export starters, we turn our attention to the possibility that access to international markets might boost firms' financial health. Export starters can improve their financial standing and the differential with non-exporters after the export entry. The ideal test of the *ex-post* effects of export market participation would be to compare a firm's financing constraints some years after starting to export with its hypothetical financing constraints at that time had they never participated in the export market. Given the impossibility of this ideal case, we will use the propensity score matching method.

We consider a treatment model in which entry to export markets is the treatment. Export starters constitute the treated units and firms that never export are the control units. The financing constraint measure is the outcome variable in which we would like to see the difference between the two groups. Specifically, we are interested in the average treatment effect on the treated (ATT), which can be written as follows:

$$ATT = E\left[Y_{it}\left(1\right) - Y_{it}\left(0\right)|D_i = 1\right] = E\left[Y_{it}\left(1\right)|D_i = 1\right] - E\left[Y_{it}\left(0\right)|D_i = 1\right] \quad (3)$$

where $Y_{it}(1)$ is the outcome (financing constraints) of a starter firm i at t given it began exporting at a certain time; $Y_{it}(0)$ is the outcome (financing constraints) of the same firm i at t given it did not begin exporting at the stated time. $D_i = \{0,1\}$ is the indicator of treatment (starting to export) . E(.) represents the expected value operator. Obviously when $E(Y_{it}(0) \mid D_i = 1)$, the outcome for export starters if they had not started to export, cannot be observed but when $E(Y_{it}(0) \mid D_i = 0)$, the outcome for non-exporters, provided that they have not exported, is available. If we make the substitution, ATT becomes:

$$ATT = E\left[Y_{it}\left(1\right)|D_i = 1\right] - E\left[Y_{it}\left(0\right)|D_i = 0\right] \quad (4)$$

This substitution may cause a selection bias, if treated and control groups have different characteristics. This selection bias can be written as:

$$B\left(ATT\right) = E\left(Y_{it}\left(0\right)|D_i = 1\right) - E\left(Y_{it}\left(0\right)|D_i = 0\right) \quad (5)$$

The goal of propensity score matching is to eliminate or minimize this selection bias. Propensity score is defined as the probability of receiving treatment given pretreatment characteristics. Hence, we estimate a propensity score of starting to export conditional on variables that could affect the probability of entering export markets.

$$P_i(Z_i) = Pr(D_i = 1|Z_i) = E(D_i|Z_i) \tag{6}$$

where $D_i = \{0,1\}$ is the indicator of treatment (starting to export) and, Z_i is the vector of covariates on which the match is made. The propensity score $P_i(Z_i)$ is computed from a regression in which the dependent variable is a binary variable which indicates whether the firm is an export starter or not. Independent variables in this regression are pre-entry firm characteristics, including the measure of financing constraints. Having predicted propensity scores based on this regression, we can find non-exporters that are similar to export starters in the pretreatment period through matching.

Despite our attempt to minimize the selection bias through matching based on observable covariates, there may still be some selection bias left originating from unobservable firm effects. The exercise would suffer from a hidden bias, if there are certain unobservable firm characteristics that affect both the assignment into exporting category and the outcome variable simultaneously. A method for tackling time-invariant unobservable bias is to combine propensity score matching with difference-in-differences (DID). By using this approach, we can improve the quality of non-experimental evaluation results (Blundell and Costa Dias 2000). Hence, we use the DID and look at the differences in outcomes before and after starting to export for the export starters with the same differences computed for the untreated group, non-exporters.

We will define the pre-entry and post-entry firm characteristics as the averages of the covariates in each period. Pre-entry characteristic for a firm that starts to export at time *t* is defined as the average of firm characteristics at time *t-1* and *t-2*. The post-entry characteristic is defined as the average of firm characteristics at time $t + 1$ and $t + 2$. For non-exporter firms, the median year for each non-exporter firm is taken as time *t* (a similar solution is adopted in ISGEP 2008; Silva 2011). Our outcome variable is the two versions of the Score variable, used above. As we are using the DID method to deal with time-invariant unobservable bias, we compare difference in pre- and post-entry outcomes for the export starters with the same differences computed for the non-exporters. Specifically, the difference in outcomes for each group is computed as the difference between post and pre-entry Scores.[7]

The following specification provides the basis for our estimation of propensity scores:

$$\begin{aligned} Starter_i = {} & \alpha + \beta_1 Size_{pre} + \beta_3 Productivity_{pre} + \beta_4 Profitability_{pre} \\ & + \beta_5 R\&D_{pre} + \beta_6 (K/L)_{pre} + B_7 Score_{pre} + \gamma S + \delta T + \varepsilon_i \end{aligned} \tag{7}$$

where STARTER is a dummy variable that takes the value of 1 if the firm is an export starter and zero if the firm is a non-exporter. The subscript (*pre*) implies the pre-entry firm characteristics. The propensity to export is expected to depend on the pre-entry size, productivity, profitability, R&D expenditures, capital intensity and score. *S* and *T* stand for industry and time dummies, while ε_i is the error term. Propensity score matching is primarily a cross section analysis, without a time dimension. Estimating propensity scores for every year within each cohort of export starters would cause a serious loss of efficiency, since the number of starters in each cohort is quite low. To better take advantage of the panel data, we use the pooled sample and insert time dummies into the specification to capture time-fixed effects.

In this set up, propensity scores are estimated by running the above specification as a logit model.[8] Among various approaches to the matching algorithm, we choose the default nearest neighbor matching option, where an export starter is matched with the non-exporter that has the closest propensity score. Table 4 presents the results for ATT from the propensity score DID analysis with 452 export starter and 418 non-exporters. As a way of checking the robustness of our analysis, we present ATTs for three outcome variables; each tested for two different Score measures.[9]

Table 4: ATTs from PSM-DID.

	Post - Pre	**(t + 2)-(t-2)**	**(t + 2)-(t-1)**
Constraint A	0.534***	0.548***	0.417**
	(0.114)	(0.207)	(0.195)
Constraint B	0.931***	1.077***	1.149***
	(0.247)	(0.369)	(0.397)

Note: All robust standard errors are in parentheses. *** indicates 1 %, ** indicates 5%.

ATT is significantly positive for both measures of Score and for all three time horizons. The results for the main outcome variable ($Score_{post}$ - $Score_{pre}$) is in the first column. The magnitude of the improvement is much larger for the broad measure of Score. The same pattern is observable in the second and third columns where the outcome variables are constructed as ($Score_{t+2}$ - $Score_{t-2}$) and ($Score_{t+2}$ - $Score_{t-1}$) respectively. Our results strongly support the hypothesis that *ex-post* financial conditions of export starter firms are significantly better than those of non-exporters.

Our results from section 4.1 are in line with the literature in the sense that exporting firms face lower financing constraints and there is a positive and statistically significant export premium for financing constraint in general. This general finding is also in agreement with the limited empirical work for Turkey and the MENA region, specifically with Kiendrebeogo and Minea (2017) on Egypt and Demirhan (2015) on Turkey. When we test for *ex-ante* differences between export starters and non-exporters with regards to financing constraints, unlike Demirhan (2015), we cannot confirm the self-selection hypothesis. The difference between our measures of constraints and the one used by Demirhan (2015) is the likely source of this difference in our findings. And finally in section 4.3 we find significant evidence for the *ex-post* improvement in financing constraints as confirmed by Demirhan (2015). As noted by Wagner (2014) the way financing constraints are measured differs widely across empirical studies on this topic. While we understand that alternative measures may be used to capture otherwise unobservable financing constraints, with the ranking based score we develop our measures go beyond direct use of balance sheet information or subjective assessments collected in surveys and better approximate the credit market experts' view on the creditworthiness of a firm. Based on our measures, starting to export improves the financial standing of firms compared to those that do not export.

5 Concluding Remarks

There is a growing empirical literature on the differences between exporting and domestic-market oriented firms. A main finding of this literature is that exporting firms on average exhibit better performance compared with non-exporting ones. A more recent part of this literature focuses on the link between financial factors and exporting behavior and finds that financing constraints are lower for exporting firms. Our work contributes to this literature by analyzing the link between financing constraints and export behavior using a rich firm-level data set for the Turkish manufacturing industry for 1996–2013, with the use of multidimensional indices for financing constraints. Overall, results indicate that while financing constraints do not pose a significant obstacle to enter export markets, entering export markets reduces the constraints faced by Turkish manufacturing firms. Our empirical analysis also reveals that firms with facing lower constraints are larger, more profitable and more productive.

In terms of policy implications, our findings do not necessarily lend themselves to easy and direct policy conclusions. However, at the very least, our results suggest that government policies such as subsidies or easy credit opportunities through Eximbank may not be sufficient to boost exports as our overall results imply that financing constraints do not always pose significant obstacles to export market participation. If financing constraints are not largely binding for export market participation, then research (and policy) should focus on other factors that may be preventing export market entry. While other studies of the Turkish economy verify that low productivity is an important hurdle in export market participation, our study complements this by showing that it is not the financing constraints that discourage firms from starting to export. Most of the strong export performance of the 2002–2014 period has been the result of existing exporting firms increasing their exports rather than entry into export markets by new exporters (World Bank 2014:6). The same report provides evidence that "Turkey's exports grow the fastest when new firms start exporting or existing firms introduce new products." (World Bank 2014:8) As higher productivity, and larger size have been found to be the most critical aspects in starting to export, policies focusing on increasing the productivity of small- and medium-size enterprises and encouraging their growth would eventually prepare the conditions for them to start exporting, which in turn would lead to growth of exports.

Our findings might have implications for other MENA countries, such as Jordan, Egypt, Lebanon, Morocco and Tunisia. Similar to our conclusions above, Fakih and Ghazalian (2014), who examine the factors influencing the export behavior of manufacturing firms in the MENA region, emphasize the role of policies that enhance productivity and economies of scale in production. Their analyses show that information and communication technologies are particularly important in the enhancement of firm productivity to encourage exports in the MENA region. In that vein, a World Bank report prepared by Jaud and Freund (2015) emphasizes the importance of size by showing that the exporter firms of the MENA are significantly smaller, on average, relative to

the exporters from other regions. In this report, the case of Tunisia's FAMEX program is suggested to be a good example of export promotion policies, with its focus on small- and medium-scale enterprises (SMEs).

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Notes

1 Özlü and Yalçın (2010) find that financially constrained firms in the Turkish economy tend to substitute trade credits for bank loans during the periods of monetary contraction.
2 The data set is compiled by the Central Bank of the Republic of Turkey. The Bank does not make the data set publicly available due to confidentiality issues. However, an aggregated version of the data is available at www.cbrt.gov.tr and researchers can access the data set on site at the Bank.
3 Firms are required to report their financial statements to the banks that they have accounts or credit relations with. In turn, banks are legally mandated to report these statements to the Central bank. A major disadvantage of the data set is that financial statements of the private firms in the data set are not audited.
4 In order to calculate these ratios, we take our sample totals and divide them by the aggregate manufacturing employment and gross sales statistics for the whole economy. Aggregate data comes from the *Annual Industry and Service Statistics* by the Turkish Statistical Institute (www.tuik.gov.tr).
5 Since the firm effects considered in the firm-fixed effect panel model already capture industry specific differences, intuitively it is expected to be a better fit. For this reason, we conduct our analysis in the next section (4.2) by utilizing a firm-fixed effect model framework, instead of a pooled OLS with industry specific effects.
6 Our main difference from ISGEP (2008) methodology lies in our conceptualization of export starters. ISGEP (2008) requires 7 years during which an export starter is to export continuously for at least 4 years after not exporting for at least 3 years. We chose a shorter time horizon in order not to lose too many firms and observations.
7 Since entry into export markets does not happen in one specific year, for every starter we have a different treatment year. In each year from 1998–2012, we have a cohort of export starters and non-exporters.
8 Estimations are made using the "*teffects psmatch*" command of Stata 14. This command implements the method developed by Abadie and Imbens (2012) to derive robust standard errors for ATT. As discussed in Abadie and Imbens (2008), standard errors for treatment effects should be adjusted for the fact that propensity scores are estimated. Simply using bootstrap estimators would not provide reliable standard errors.
9 One observation was dropped as it violated the overlap assumption of the matching method.

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Appendix

A Variable descriptions

Size	Log of number of employees
Productivity	Real net sales per employee *
Profitability	Earnings before interest and taxes as a percentage of net sales
R&D	R&D expenditures as a percentage of operating expenses
Capital intensity (K/L ratio)	Real capital stock per employee.* Capital stock is computed as tangible fixed assets net of depreciation and land
Score	See Section 2 for the construction of the index. The following variables from the data set are used:
Firm size	Total assets
Return on assets	Earnings before tax as a percentage of total assets
Liquidity	Current assets as a percentage of current liabilities
Solvency ratio	Equity over liabilities

* *TURKSTAT manufacturing price index is used to convert to real values.*