



## **Financial Constraints, Firm Characteristics and Exports: Evidence from Turkish Manufacturing Firms<sup>†</sup>**

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### **ABSTRACT**

The purpose of this study is to examine the relationship among firm exports and financial constraints and the other firm characteristics as total factor productivity (TFP), foreign demand growth, market concentration and mark-up using firm-level data of Turkish manufacturing sector for the period of 2003–2013 in terms of the heterogeneous firm trade models as the analysis unite for international trade models that have led to a comprehensive change in international trade theories since the 1990s. According to the results, the TFP affect positive on export of firms while financial constraints restrict firms' export activity. During the analyzed period, foreign demand growth, as expected, increase firms' exports while reducing market concentration. These findings of the study are important for contributing to the use of policy makers by producing healthy and reliable knowledge in the formulation of international trade and industrial policies with emphasizing impact of the firm characteristics on exports.

**Keywords:** Heterogeneous Firms, Firm Characteristics, Turkish Manufacturing Industry

**JEL Classifications:** F10, F14, L25

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### **1. INTRODUCTION**

In the globalized world of the 21<sup>st</sup> century, the international trade theories, which aim to bring a better explanation for increasing and diversifying world trade, have changed quite significantly in recent years. This change has started in the mid-1990s with widespread availability of firm-based data. Theoretical discussions in international trade are increasingly emphasizing the importance of firm level decisions in determining the causes and consequences of total trade (Bernard et al., 2007. p. 106). Heterogeneous firm models have evolved from the pioneering work of Melitz (2003), which reveals a channel that allows for the development of productivity in international trade. Heterogeneous firm models may be defined as in narrowly defined sectors including productivity level of firm and other characteristics such as financial constraints, size, profitability etc. (Alvarez and Lopez, 2005. p. 1385; Marinov et al., 2008. p. 1; Arnold and Hussinger, 2010. p. 595).

The most important factor in explaining export behavior of firms comes from financial factor and productivity differentials between firms, which make firms heterogeneous. In this context, the presence of fixed and sunk costs that the firm have to bear in order to operate in the export market, the firm's decision to enter the export market and improve export performance (Berman and Hericourt, 2010; Göksel, 2012; Chaney, 2016; Wilson and Otsuki, 2004). In the presence of financial rigidities, borrowing constraints and borrowing requirements differ between firms, and consequently the sunk costs that firms have to bear in entering export markets seem to have a significant influence on financial structures (Li and Yu, 2009). In the empirical literature, Roberts and Tybout (1997), Bernard and Wagner (2001) and Das et al. (2007) estimate the magnitude of these sunk costs in a comprehensive way, ignoring the question of how to finance these costs. Models and theoretical implications created in this framework are generally focused on

the financial constraints on export behavior of firms following Melitz (2003) model. Therefore, these studies modeled that fixed and sunk costs faced to operate in the export market are an obstacle to the entry of low-productivity firms into the export markets. The seminal studies of Chaney (2005; 2016), Manova (2008) and Muûls (2008) have employed financial constraints as a demonstration of firm level heterogeneity. Within this context, Berman and Héricourt (2010), Minetti and Zhu (2011) and Muûls (2015) reveal that firms need internal financing or external financing to meet the fixed and sunk costs. They also show that financial constraints are causing reduce the export volume and preventing them to enter export markets. In developing countries access to finance is seen as the biggest obstacle for firms to grow and invest. In addition, the literature on international trade shows that this problem is exacerbated for export activities, including large sunk costs (Kiendrebeogo and Minea, 2012. p. 4). Chaney (2005; 2016), Muûls (2008) and Manova (2008; 2010; 2013) added the financial constraints to the Melitz model and revealed the financial constraints on the role of firms on export decisions.

Although Bellone et al. (2010) reveal that financial constraints of firms cannot be directly observable, however many indicators are used in the literature to measure financial constraints. The information in the balance sheet and cash flow statement (Greenway et al., 2007; Contessi and de Nicola, 2013. p. 15), size, profitability, liquidity, debt solvency and commercial credit based on firm characteristics (Musso and Schiova, 2008; Gilchrist and Himmelberg, 1995; Cleary, 2006) and credit rating score (Muûls, 2015; Wagner, 2014) are widely used as a financial constraints indicator of the firms. However, Bellone et al. (2010) had mentioned that these measurements are one-dimensional and cause endogeneity problem. In view of the advantages and disadvantages of indicator of financial constraints in the literature, we accepted the share of firm's financing costs to total costs as the most proper indicators because of availability in Turkish dataset. When Turkish manufacturing firms analyzed, the indicator of financial constraints are becoming important since some firms are using external finance and are affected by exchange rate risk and the financing cost on export.

Although there is a large literature reviewing the importance of exports in terms of key macroeconomic variables in Turkish Economy, the numbers of academic studies within this context of heterogeneous trade models are quite limited. Since the importance of firms in international trade is obvious, the purpose of this study is to examine the relationship between firm exports and the firm characteristics such defined as financial constraints, total factor productivity (TFP), foreign demand growth, market concentration and mark-up, using firm level data of Turkish manufacturing industry for the period of 2003–2013. In this context, the paper consists of two stages. In the first stage, Turkish manufacturing industry (Nace Rev. 2, 4 digit) sectoral production function is estimated and the TFP of the firms in that sector are calculated by using the estimated production function. In the second stage, Turkish manufacturing firm's exports behavior of manufacturing industry analyzed in the context of heterogeneous firm trade models.

This paper is organized as follows. Section 2 presents a literature review. Section 3 exhibits data and economic model. Section 4 reports empirical results and section 5 concludes the paper.

## 2. LITERATURE

Heterogeneous firm models are one of the new field in international trade and there is a growing literature on financial constraints and firms' export behavior (Bellone et al., 2010; Minetti and Zhu, 2011; Muûls, 2015; Li and Yu, 2009; Manova, 2013; Chaney, 2016). From the theoretical point of view, Chaney (2005; 2016) and Manova (2008), which introduced the two important studies on heterogeneous firms, constitute an important starting point in the literature. Chaney (2016) analyzed the firms export behavior by adding the internal financing and liquidity constraints to the model of Melitz (2003). Firms are heterogeneous in terms of efficiency and liquidity. Firms with higher level productive and more liquidity are more likely to enter the export markets than the other firms. While Chaney (2005; 2016) focused on internal financing, Manova (2013) considered external financing through borrowing. Manova focuses on firms with financial developments in different countries and sectors with different degrees of financial vulnerability. Muûls (2008, 2015) added both internal and external financing to the Melitz model. He concluded that financial constraints have been obstacles to opening firms to the export market.

Theoretical and empirical studies have concluded that the financial constraint is one of the important determinants of trade flows (Manova, 2008; 2010; 2013), and have revealed that financial constraints have a negative effects on firm's export volume, product coverage and export market diversity. In the literature, the financial constraints play an important role in the initial stages of exports but do not have a permanent influence on the size of exports.

Li and Yu (2009), Tang and Zhang (2012), Héricourt and Poncet (2015), Chen and Guariglia (2013), Egger and Kesina (2013; 2014), Manova et al. (2015) and Huang and Liu (2017) for China analyzed the relationship between financial constraints and firm export. Chen and Guariglia (2013) indicated that more productive firms may access finance more easily while Héricourt and Poncet (2015), Egger and Kesina (2014) and Manova et al. (2015) concluded a negative relationship between financial constraints and firm's export. Berman and Héricourt (2010) found that firms with high productivity and low financial constraints have a positive influence on participation in the export market for nine developed countries. For French manufacturing firms, Bellone et al. (2010) indicated that exporting firms have significant financial advantages compared to domestic firms while by contrast Stiebale (2011) highlighted that there is no evidence that financial constraints affect export decisions.

A small number of studies in the literature focus on the relationship between financial constraints, firm characteristics and export in manufacturing industry using firm level data in Turkey. Akarım (2013) tested the effect of financial factors on firms' export decisions by using panel logit model for the years 2000–2011, taking into consideration in manufacturing industry

sector registered to Istanbul Stock Exchange Market. Akarim measures financial constraints with two indicators: The leverage ratio defined as the share of total liabilities in total assets and the current ratio calculated as the share of current assets in short term debts. According to the results of the study, there is no relationship between financial constraints and firms' export behavior. On the other hand, there is a relationship between firm size, financial constraints and exports. Larger firms engage into more exporting activity and thus the likelihood of export of firms increases when the financial constraints increase the indebtedness rate. Demirhan (2016) examined the impact of financial constraints on firm's export behavior in the Turkish manufacturing industry between the 1989–2010 periods using the Central Bank of the Republic of Turkey Company Accounts dataset. She used the ratio of bank credits to total liabilities as a financial constraint and found that exporting firms are more productive and has less financial constraints.

### 3. DATA AND ECONOMIC MODEL

The data employed in the study about the firms operating in Turkish manufacturing industry are taken from the data sets of Annual Industry and Service Statistics and Foreign Trade data set compiled by Turkish Statistical Institute (TURKSTAT). The data set given in the study includes that firms are operated for at least three consecutive years in the Turkish manufacturing industry.

The growth rates of the countries exported by the firms are taken from the International Finance Statistics database. The data set covers the period from 2003 to 2013. To examine the relationship between the firm export, the financial constraint and other characteristics of firm for manufacturing industry of Turkish economy in terms of heterogeneous firm models, we use four models following Li and Yu (2009), who add financial constraints to the model of Melitz (2003):

- *Model 1:*  $ex_{it} = \alpha + \beta_1 fincons_{it} + \beta_2 TFP_{it} + v_t + \varepsilon_t$
- *Model 2:*  $ex_{it} = \alpha + \beta_1 fincons_{it} + \beta_2 TFP_{it} + \beta_3 marketcons_{it} + v_t + \varepsilon_t$
- *Model 3:*  $ex_{it} = \alpha + \beta_1 fincons_{it} + \beta_2 TFP_{it} + \beta_3 marketcons_{it} + \beta_4 fdg_{it} + v_t + \varepsilon_t$
- *Model 4:*  $ex_{it} = \alpha + \beta_1 fincons_{it} + \beta_2 TFP_{it} + \beta_3 marketcons_{it} + \beta_4 fdg_{it} + \beta_5 markup_{it} + v_t + \varepsilon_t$

Where  $i$  is the firm and  $t$  represents year. The variables  $ex$ ,  $fincons$ ,  $TFP$ ,  $marketcons$ ,  $fdg$  and  $markup$  stand for firm's real export, financial constraints, TFP, market concentration, foreign demand growth and mark-up, respectively. Table 1 presents the definitions of the variables.

For calculation firm based TFP, we estimated sectoral production function using Levinsohn-Petrin (2003) method, which is a semi-parametric method. The value added is used as dependent variables in TFP calculation. Number of employees and capital stock are used as independent variables. There is no capital stock data at firm level in the survey, therefore the capital stocks of the firms are calculated by the Perpetual Inventory Method. Financial constrains ( $fincons$ ) is computed the share of total financial expenditure to total cost. The mark-up measures the share of total sales revenue

**Table 1: Definition of data**

Variable	Definition
Export	Firm's real export value
TFP	Total factor productivity
Financial constraint	Total Financial Expenditure/Total Cost
Foreign demand growth	Firm's foreign demand growth is calculated by the assumption that the firm may make export into different countries. The share of the firms total export in the exporting countries (market) weighted by the real growth rates of the countries
Mark-up	Total Sales Revenue/Total Cost
Market concentration	$GH_{ij}^{country} = 100 * \left[ \sum_{j=1}^n \left[ \frac{X_{ij}}{Xi} \right]^2 \right]^{1/2}$

TFP: Total factor productivity

to total cost. Firm's real exports, financial constraints and market concentration series are converted into the natural logarithm. We use the capital goods price index for investments, the energy price index for electricity expenditure, sectoral export price index for export. The value added of the firms, firm's sales, firm's incomes, firm's total expenditure are deflated using domestic producer price index which is measured at the four-digit as 2003 based year. This index extracted from TURKSTAT.

Table 2 contains descriptive statistics for the data set used in the study. During the period under investigation, firms are classified whether they export or not. For the period of 2003–2013, while firms operating in both domestic and export market are defined as exporting firms, firms operating in only domestic markets are defined as non-exporters. The Table 2 indicates that, on the average, exporters are bigger than the non-exporters in terms of sales and employment. On the other hand, the exporters seem to be more capital intensive than non-exporters. The share of financial expenditure in total costs is slightly higher in exporters than in non-exporters.

### 4. EMPIRICAL RESULTS

To examine impact of the financial constraints and the characteristics of firms on firm's export, firstly, Turkish manufacturing industry (Nace Rev. 2, 4 digit) sectoral production function was estimated by a semi-parametric method of Levinsohn-Petrin (2003) method. Then, the TFP of the each firms operating in the sector, which also shows heterogeneity of the firms, was calculated using the estimated production function. Table 3 shows the results of Levinsohn-Petrin (2003) estimates of a Cobb Douglas Production function in the manufacturing industry in which includes 74 sub-Sectors.

After estimating firms level TFP, in the second stage, the relationship among financial constraints, TFP, market concentration, foreign demand growth, mark-up and firm exports were tested by unbalanced panel data methods. Table 4 shows the analysis results for Turkey's manufacturing industry. According to the results, the

**Table 2: Descriptive statistics**

Variable	All			Exporters			Non-exporter		
	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD
ln (revenue)	150556	15.251	1.426	82786	15.732	1.410	67770	14.663	1.208
ln (value added)	150556	13.673	2.462	82786	14.100	1.413	67770	13.152	1.905
ln (capital stock)	150556	14.144	2.028	82786	14.710	1.949	67770	13.452	1.905
ln (employment)	150556	4.082	2.427	82786	4.305	0.979	67770	3.808	0.671
Financial constraint	150556	0.021	0.034	82786	0.025	0.035	67770	0.016	0.031
TFP	150556	8.426	1.183	82786	8.544	1.264	67770	8.281	1.057
Mark-up	150556	1.034	0.245	82786	1.039	0.216	67770	1.028	0.275

TFP: Total factor productivity

**Table 3: Production function estimated results by Levinsohn-Petrin method in the manufacturing industry sub-sectors**

Nace 2	ln_L	S.E.	ln_K	S.E.	Observation	Number of firms	Wald test
1013	0.719	0.043	0.119	0.063	1069	164	2.26 (0.13)
1039	0.738	0.045	0.244	0.017	2661	409	0.07 (0.79)
1041	0.530	0.061	0.158	0.061	619	105	127.33 (0.00)
1051	0.795	0.031	0.162	0.016	1617	256	7.53 (0.00)
1061	0.691	0.002	0.115	0.002	2019	311	50.97 (0.00)
1071	0.737	0.017	0.049	0.021	4144	749	2126.44 (0.00)
1072	0.722	0.103	0.214	0.100	677	133	370.88 (0.00)
1082	0.573	0.128	0.256	0.005	2020	334	1.60 (0.20)
1091	0.680	0.067	0.131	0.013	906	137	11.98 (0.00)
1107	0.544	0.104	0.248	0.016	692	104	6.13 (0.01)
1310	0.756	0.012	0.077	0.015	3103	496	2463.58 (0.00)
1320	0.646	0.016	0.189	0.072	3991	721	3.40 (0.06)
1330	0.776	0.007	0.105	0.048	3295	565	8.42 (0.00)
1391	0.634	0.015	0.144	0.045	4102	822	52.11 (0.00)
1394	0.775	0.039	0.137	0.040	1273	203	0.12 (0.79)
1396	0.872	0.143	0.287	0.047	982	210	2.82 (0.09)
1399	0.672	0.015	0.209	0.029	1408	284	6.89 (0.80)
1413	0.772	0.001	0.087	0.003	12797	2.690	993.69 (0.00)
1414	0.795	0.015	0.117	0.018	8581	1.828	1514.06 (0.00)
1420	0.715	0.147	0.167	0.062	179	48	1.91 (0.16)
1431	0.821	0.003	0.191	0.001	1214	180	10.46 (0.00)
1439	0.747	0.021	0.208	0.119	1804	352	0.10 (0.75)
1512	0.625	0.028	0.216	0.000	1399	255	32.17 (0.00)
1520	0.730	0.008	0.092	0.056	2309	402	7.62 (0.67)
1623	0.728	0.013	0.129	0.011	2533	473	4263.57 (0.00)
1721	0.828	0.057	0.122	0.072	1632	272	0.16 (0.68)
1812	0.814	0.041	0.165	0.300	2353	440	0.08 (0.77)
2016	0.702	0.008	0.125	0.066	1042	180	3.82 (0.05)
2059	0.623	0.077	0.099	0.016	906	161	21.01 (0.00)
2120	0.710	0.010	0.151	0.000	891	134	53.13 (0.00)
2219	0.731	0.013	0.149	0.022	1623	269	11.03 (0.00)
2222	0.703	0.018	0.165	0.028	4171	739	162.48 (0.00)
2223	0.663	0.016	0.218	0.010	2300	469	482.53 (0.00)
2229	0.544	0.096	0.144	0.020	2227	450	16.47 (0.00)
2312	0.703	0.044	0.201	0.013	1307	209	9.90 (0.00)
2332	0.843	0.014	0.087	0.029	2334	339	2.48 (0.00)
2342	0.635	0.003	0.157	0.003	473	80	1.80 (0.17)
2352	1.080	0.276	0.151	0.001	631	83	0.70 (0.40)
2361	0.812	0.014	0.185	0.022	3557	637	0.13 (0.71)
2370	0.788	0.006	0.217	0.011	2688	474	1.35 (0.24)
2399	0.726	0.004	0.036	0.007	398	74	5.07 (0.00)
2410	0.629	0.018	0.252	0.032	891	150	5.28 (0.02)
2420	0.643	0.066	0.334	0.036	551	112	0.60 (0.43)
2433	0.635	0.101	0.332	0.046	366	98	0.05 (0.82)
2442	0.896	0.053	0.188	0.045	1515	248	128.07 (0.00)
2451	0.696	0.180	0.193	0.040	859	158	0.61 (0.43)
2453	0.752	0.097	0.123	0.029	782	127	0.98 (0.32)
2512	0.667	0.012	0.269	0.120	4421	918	0.22 (0.64)
2561	0.881	0.025	0.226	0.027	777	176	2150.70 (0.00)
2562	0.734	0.021	0.220	0.043	752	222	4.02 (0.04)
2573	0.780	0.063	0.425	0.043	1069	164	3.33 (0.06)

(Contd...)



Table 3: (Continued)

Nace 2	ln_L	S.E.	ln_K	S.E.	Observation	Number of firms	Wald test
2599	0.756	0.037	0.269	0.002	1451	236	0.43 (0.51)
2594	1.012	0.097	0.162	0.006	541	103	3.50 (0.06)
2599	0.721	0.030	0.102	0.020	1484	314	11.73 (0.00)
2712	0.855	0.115	0.161	0.032	1774	319	0.00 (0.94)
2732	0.837	0.031	0.211	0.016	1066	195	10.36 (0.00)
2740	0.694	0.130	0.173	0.031	1174	215	0.66 (0.41)
2751	0.592	0.012	0.144	0.030	1519	284	36.84 (0.00)
2814	0.717	0.041	0.152	0.038	2200	393	0.00 (0.98)
2829	0.718	0.011	0.164	0.016	4155	825	709.60 (0.00)
2830	0.791	0.005	0.107	0.008	834	135	4.67 (0.03)
2841	0.816	0.013	0.151	0.013	1014	201	30183.06 (0.00)
2894	0.768	0.037	0.194	0.003	3400	665	4.57 (0.03)
2896	0.705	0.179	0.275	0.111	184	45	0.00 (0.94)
2910	0.500	0.173	0.389	0.063	226	33	1.01 (0.31)
2920	0.792	0.075	0.091	0.043	792	166	85.15 (0.00)
2932	0.707	0.010	0.187	0.002	5320	871	71.46 (0.00)
3012	0.699	0.006	0.226	0.056	1100	244	1.42 (0.23)
3102	0.703	0.099	0.133	0.041	650	162	7.80 (0.00)
3103	0.754	0.045	0.165	0.026	1981	408	1.22 (0.26)
3109	0.721	0.034	0.102	0.015	4594	902	97.04 (0.00)
3212	0.751	0.022	0.095	0.045	1056	175	1.15 (0.28)
3299	0.690	0.021	0.199	0.018	2164	393	7.42 (0.00)

S.E denotes standard error. For constant return to scale, Wald test:  $H_0$ : Firms demonstrate constant return to scale

Table 4: Manufacturing industry analysis results (dependent variables: Export)

Variables	FE_1	RE_1	FE_2	RE_2	FE_3	RE_3	FE_4	RE_4
fin.cons.	-0.006	-0.010	-0.008	-0.013	-0.008	-0.013	-0.008	-0.012
s.d.	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
prob.	0.070	0.000	0.010	0.000	0.010	0.000	0.010	0.000
TFP	0.249	0.382	0.231	0.351	0.231	0.351	0.224	0.360
s.d.	0.014	0.011	0.013	0.010	0.013	0.010	0.014	0.011
prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
market con.			-2.167	-2.665	-2.165	-2.662	-2.166	-2.660
s.d.			0.040	0.022	0.040	0.022	0.040	0.022
prob.			0.000	0.000	0.000	0.000	0.000	0.000
fdg					1.202	1.157	1.203	1.155
s.d.					0.114	0.108	0.114	0.108
prob.					0.000	0.000	0.000	0.000
markup							0.057	-0.071
s.d.							0.030	0.024
prob.							0.060	0.000
Sector effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	82786		82786		82786		82786	
r2_o	0.032	0.042	0.296	0.154	0.294	0.156	0.293	0.156
r2_b	0.022	0.123	0.348	0.454	0.346	0.454	0.344	0.455
r2_w	0.048	0.120	0.160	0.382	0.162	0.382	0.162	0.383
F	38.99		147.30		147.55		145.97	
	(0.00)		(0.00)		(0.00)		(0.00)	
Hausman	2069.510		3975.730		3878.070		3885.400	
	(0.00)		(0.00)		(0.00)		(0.00)	

Hausman test shows that there is no statistical difference between the fixed effects estimator and the random effects estimator for the four models. In other words, in all models the constants estimator is consistent.

According to results, the negative and significant coefficients of financial constraints for four models are consistent with the

heterogeneous firm trade models. In other words, the increase in the share of financing costs in the total costs negatively affects firm's export. TFP is significant and positive in all models. There is a negative and significant relationship between market concentration and the firm's exports. If firms diversify the number of export markets, they reduce their sensitivity to external shocks and spread the risk. On the other hand, an increase in market

diversity will cause firms to face additional sunk costs in export markets, but firms with high productivity will be able to pay these costs. The foreign demand growth and mark-up are positively correlated with exports as expected.

## 5. CONCLUSION

This paper has analyzed the relationship among the financial constraints and the other characteristic of exporting firms (TFP, foreign demand growth, market concentration and markup) as a function of firm exports for the Turkish manufacturing industry between 2003 and 2013. The evidence from firm level data in Turkish manufacturing industry show that TFP affects positively export of firms while financial constraints restrict firm's export activity. These findings have been important in terms of policy makers whose main goals are to increase exports focusing on the financial structures of exporting firms. Since financial constraints have a negative impact on firm's export in Turkish manufacturing industry, policy makers should focus on stretching the barriers to firms' access to financing and suggestion to reduce the difficulties they face due to increased credit costs. The period under consideration, foreign demand growth, as expected, increases firms' exports while reducing market concentration. In this context, the general view on export market diversification for Turkish economy confirms firm level results. Furthermore, the paper shows that firms have even a little price competition in export market using their markup power. These findings of the study are important for contributing to the use of policy makers by producing healthy and reliable knowledge in the formulation of international trade and industrial policies with emphasizing impact of the firm characteristics on exports.

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