



Hacettepe University Graduate School Of Social Sciences

Department of Economics

**THE ROLE OF FINANCIAL CONSTRAINTS AND CREDIT  
CONDITIONS ON FIRMS' EXPORT BEHAVIOUR: EVIDENCE  
FROM TURKISH MANUFACTURING INDUSTRY**

Fatih ERKEKOĞLU

Ph.D. Dissertation

Ankara, 2023



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## ACCEPTANCE AND APPROVAL

The jury finds that Fatih ERKEKOĐLU has on the date of 13/4/2023 successfully passed the defense examination and approves his Ph.D. Dissertation titled "The Role of Financial Constraints and Credit Conditions On Firms' Export Behaviour: Evidence From Turkish Manufacturing Industry".

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## ETİK BEYAN

Bu çalışmadaki bütün bilgi ve belgeleri akademik kurallar çerçevesinde elde ettiğimi, görsel, işitsel ve yazılı tüm bilgi ve sonuçları bilimsel ahlak kurallarına uygun olarak sunduğumu, kullandığım verilerde herhangi bir tahrifat yapmadığımı, yararlandığım kaynaklara bilimsel normlara uygun olarak atıfta bulunduğumu, tezimin kaynak gösterilen durumlar dışında özgün olduğunu, **Prof. Dr. Ayşe Yasemin YALTA** danışmanlığında tarafımdan üretildiğini ve Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Yazım Yönergesine göre yazıldığını beyan ederim.

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## ABSTRACT

ERKEKOĞLU, Fatih. *The Role of Financial Constraints and Credit Conditions on Firms' Export Behaviour: Evidence from Turkish Manufacturing Industry*, Ph.D. Dissertation, Ankara, 2023.

Global merchandise trade highly depends on the financial sector to provide different financial products. This thesis aims to understand the impact of financial constraints and credit conditions on Turkish manufacturing firms' exporter status and export intensity. This is the first firm-level investigation that concurrently illustrates the effects of credit conditions, financial constraints, and their interaction on the export performance of Turkish firms. This study uses a comprehensive dataset on the Turkish manufacturing firms between 2006 and 2018, which includes detailed information on firm characteristics and financials, and macroeconomic variables. In order to correct bias from a non-random selection of exporters, the empirical analyses rely on the Heckman two-step procedure. According to the empirical results, except for the solvency ratio, financial constraints generally do not amplify or dampen the impact of changes in credit costs. The results also highlight the importance of credit costs and access to the financial system. An increase in the cost of commercial loans negatively affects export intensity of the firms. Access to bank loans and profitability positively impact the probability of being an exporter. Nevertheless, for exporters, an increase in bank loans is associated with a lower level of export intensity. Furthermore, the solvency and ROE ratios of the firms exhibit an inverse relationship with their export intensity. These results suggest that policies that incentivize and support manufacturing exports by providing better access to finance and lower cost of credit can help improve export performance of firms.

### **Keywords**

Exports, Financial Constraints, Credit Conditions, Heckman Model.



## ÖZET

ERKEKOĞLU, Fatih. *Finansal Kısıtlar ve Kredi Koşullarının Firmaların İhracat Davranışındaki Rolü: Türk İmalat Sanayiinden Kanıtlar*, Doktora Tezi, Ankara, 2023.

Küresel mal ticareti, finans sektörünün farklı finansman ürünleri sunmasına büyük ölçüde bağımlıdır. Bu tez, finansal kısıtların ve kredi koşullarının Türk imalat sanayii firmalarının ihracatçılık durumu ve ihracat yoğunluğunun üzerindeki etkisini anlamayı amaçlamaktadır. Bu çalışma, kredi koşullarının, finansal kısıtların ve bunların etkileşimlerinin Türk firmalarının ihracat performansına etkilerini eş zamanlı olarak gösteren ilk firma bazlı araştırmadır. Bu çalışma, 2006-2018 dönemine ait Türk imalat sanayii firmalarına ilişkin firma özellikleri ve finansalları, makroekonomik değişkenler hakkında detaylı bilgiler içeren kapsamlı bir veri seti kullanmaktadır. Rastsal olmayan ihracatçı seçiminden kaynaklanan yanlılığı düzeltmek için, ampirik analizler iki aşamalı Heckman Yöntemini kullanmaktadır. Sonuçlara göre, ödeme gücü oranı haricinde, finansal kısıtlamalar genel olarak kredi maliyetlerindeki değişikliklerin etkisini güçlendirici veya sönmüleyici etkiye sahip değildir. Sonuçlar, kredi maliyetlerinin ve finansal sisteme erişimin önemini de vurgulamaktadır. Ticari kredilerin maliyetindeki artış firmaların ihracat yoğunluğunu olumsuz etkilemektedir. Banka kredilerine erişim ve özkaynak karlılığı, ihracatçı olma olasılığını olumlu etkilemektedir. Ancak ihracatçılar için, banka kredilerindeki artış, ihracat yoğunluğunun daha düşük seviyede olmasıyla ilişkilendirilmektedir. Ayrıca, firmaların ödeme gücü oranı, ihracat yoğunlukları ile ters bir ilişki sergilemektedir. Bu sonuçlar, finansmana daha iyi erişim ve kredi maliyetlerinin düşürülmesi yoluyla imalat sanayii ihracatını teşvik etmeyi ve desteklemeyi amaçlayan politikaların firmaların ihracat performansının artmasına yardımcı olacağını göstermektedir.

### **Anahtar Sözcükler**

İhracat, Finansal Kısıtlar, Kredi Koşulları, Heckman Yöntemi

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## LIST OF ACRONYMS AND ABBREVIATIONS

BAFT	: Bankers Association for Finance and Trade
BRSA	: Banking Regulation and Supervision Agency
CBRT	: Central Bank of the Republic of Türkiye
CES	: Constant Elasticity of Substitution
CPI	: Consumer Price Index
EIS	: Enterprise Information System
GDP	: Gross Domestic Product
IFSA	: International Financial Services Association
IMF	: International Monetary Fund
NACE	: Nomenclature of Economic Activities
PPI	: Producer Price Index
REER	: Real Effective Exchange Rate
SME	: Small and Medium-Sized Enterprises
TURKSTAT	: Turkish Statistical Institute
ULC	: Unit Labor Cost
WB	: World Bank
WTO	: World Trade Organization
TFP	: Total Factor Productivity

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## INTRODUCTION

Access to external finance is vital for firms to bear operating and investment expenses that cannot be covered through internal cash flows or profits. While this holds for both exports and domestic production activities, exporting stands out as an activity heavily reliant on external financing for several reasons.

First of all, as empirical and theoretical literature underlines, exporting activities incur various fixed and variable costs, such as investing in new capacity, customizing products, adhering to regulations in different regulatory environments, shipping costs, customs duties, and taxes. Secondly, exporting demands more working capital than domestic transactions because the cross-border transfer of goods usually takes longer to process than domestic sales. Finally, exporting involves multiple actors and the cross-border exchange of goods and payments, which entails additional risks associated with information asymmetry. The information asymmetry necessitates the use of insurance for transactions. The presence of these elements has all contributed to the growing importance of the credit market for international trade (Chor and Manova, 2012).

Although trade finance has become increasingly important because of the globalization of manufacturing and the extensive use of trade finance in international goods transactions, world trade has always been vulnerable to financial crises. Moreover, developing countries' trade operations are typically more adversely affected by global financial downturns than those of developed countries due to the concentration of global trade finance in a limited number of banks. Around 40 banks account for around 30 percent of global trade finance. Other financial institutions, including local and regional banks, supply the rest (WTO, 2016).

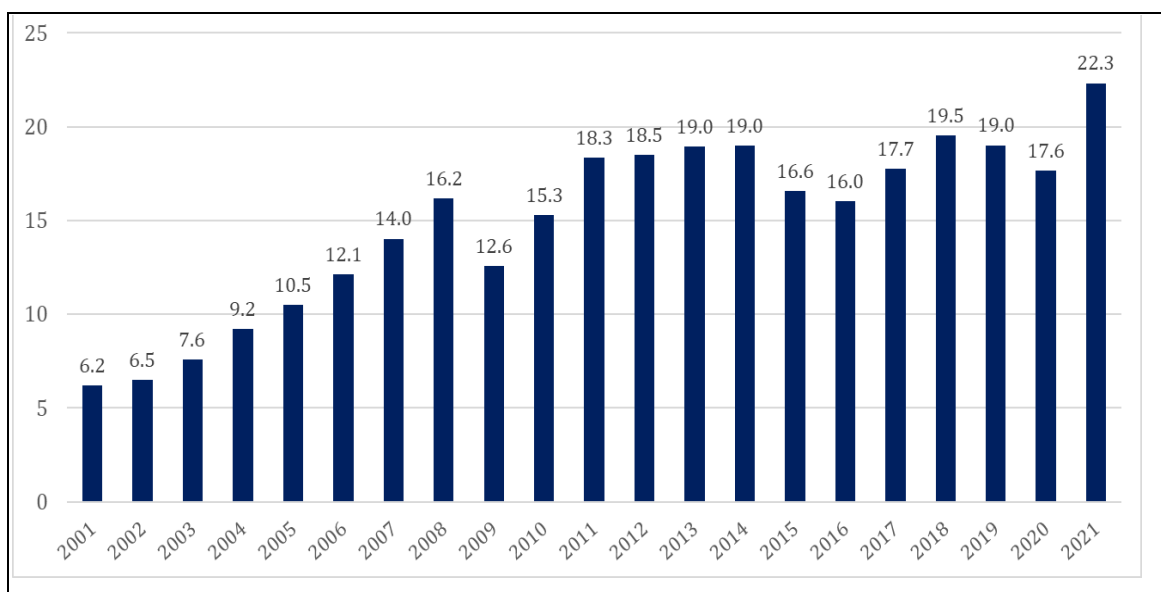
Because of the limitations of the financial institutions in developing countries, firms in those countries face additional obstacles, such as lack expertise, regulations, international networks, or foreign currency reserves. These elements impede the ability of financial institutions of developing nations to offer import and

export financing. Additionally, the lack of knowledge among traders regarding the financial tools that are available, as well as their underutilization, the potential risks involved in banking, and the overall economic conditions in these countries, may pose obstacles to the growth of the trade finance market (WTO, 2016).

The importance of financial conditions on trade in developing countries became evident during the Asian and Latin American Crises. In the aftermath of the East Asian crisis of 1997-98, trade finance products offered by banks dropped by 50% in Korea and 80 percent in Indonesia. Similarly, after the Latin American crisis of 2002, trade finance in Brazil and Argentina declined by up to 30% and 50%, respectively (Ronci and Wang, 2005).

While the Asian and Latin American Crises had a regional impact, the significant decline in the global goods trade volume after the 2008 financial crisis represents a crucial turning point in the relationship between global merchandise trade and financial markets. As shown in Figure 1, following the 2008 financial crisis, the global merchandise trade declined 22.3% in 2009. Baldwin (2009) highlights that this abrupt and severe decline marked the steepest contraction in global merchandise trade since the Second World War. Therefore, it has been called the “Great Trade Collapse”.

**Figure 1: Volume of Global Merchandize Trade (\$ Trillion)**



Source: WTO (2023)



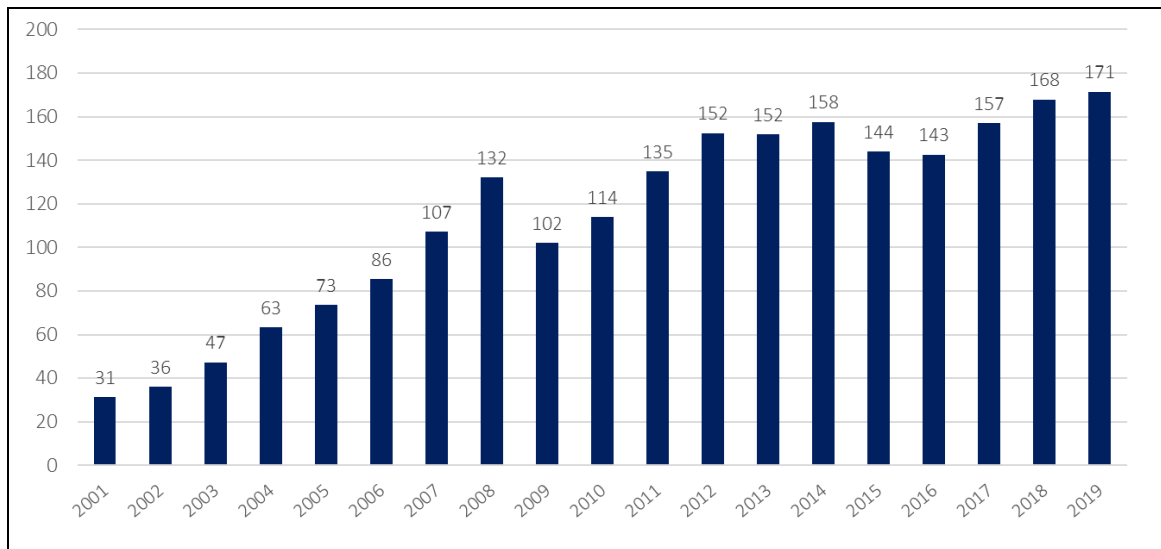
An extensive body of literature has emerged to investigate the underlying causes and implications of the “Great Trade Collapse”. The studies highlight the role of a diverse set of factors behind the contraction in trade, including demand-side elements such as postponement of purchases of non-essential goods and price reductions, as well as supply-side elements such as increased protectionism, globalization of supply chain, and credit constraints (Baldwin, 2009; Chor and Manova, 2012, Asmundson et al., 2011; Kee et al., 2013; Bussiere et al., 2013; Behrens et al., 2013).

Different empirical studies corroborating the role of credit constraints in the Great Trade Collapse emphasize the impact of increasing borrowing costs and credit risk premiums. For example, the survey of the International Monetary Fund (IMF) and the Bankers’ Association for Finance and Trade-International Financial Services Association (BAFT-IFSA) provides information about the change in volume, cost, and drivers of trade finance after the crisis. This survey reports an increase in the cost of different trade-related credit instruments between October 2008 and January 2009. While the magnitude differs across countries, the spread between the cost of funds for banks and the rates of credit or export credit insurance almost doubled (IMF-BAFT, 2009).

Figure 2 demonstrates the variation in Türkiye’s exports between 2001 and 2019. It is evident from the figure that, as a developing country with an export-oriented growth policy, the growth pattern of Türkiye’s exports is not insulated from the developments in the global financial system. Remarkably, the Great Trade Collapse significantly impacted exports of Türkiye: the exports contracted by 22.6% in 2009, and the problems encountered in global exports due to credit constraints were also observed in Türkiye. Acar (2009) surveyed 40 of Türkiye’s largest 1000 firms. 62% of the responders stated that the increase in credit costs after the crisis impeded access to pre-export financing. These firms mention that pre-export financing costs have increased by an average of 20%, whereas the cost of export financing rose by 40%. Besides, shorter maturity periods impeded exports. According to the participants, the average maturity period for export-

related loans has decreased from 104 days before September 2008 to 61 days after the crisis.

**Figure 2: Exports of Türkiye (\$ Billion)**



Source: TURKSTAT (2023)

The empirical literature on international trade reveals that exporters exhibit differences in productivity, profitability, and firm size and are affected by credit constraints. Financially sound firms with high productivity and easy access to finance are more likely to cover the fixed and variable costs that exporters face. However, the impact of financial constraints on exports of individual firms is not uniform. As Rajan and Zingales (1998) and Chor and Manova (2012) emphasize, the technological characteristics of the sectors in which firms operate determine their financing needs for their domestic and export operations and lead to divergences in the impact of credit conditions. Therefore, creating a sound policy framework to increase Turkish firms' participation and footprint in international markets requires a simultaneous and comprehensive analysis of the effects of the financial constraints and credit conditions on exports, including their interplay. The such study contributes to the growing literature on firm heterogeneity and trade, which discusses the significance of financial constraints and credit conditions on the export behavior of Turkish companies (Acar, 2009; Sayar, 2018; Demir et al., 2017; Demir and Javornik, 2020; Akarim, 2013; Gezici et al. 2018; Dincer, 2021; Sahin, 2022).

A deeper understanding of the role of financial constraints and credit conditions on Turkish firms' exports requires a closer look by breaking down the sample based on the size and technology levels of the firms, two factors revealed to have significance in firm-level export characteristics. For instance, World Bank (2022) emphasizes that access to finance is the biggest obstacle for SMEs in Türkiye to start exporting. In addition, Chor and Manova (2012) argue that technology-intensive sectors with a high dependence on external financing are less sensitive to credit conditions.

This thesis aims to understand the effects of financial constraints and credit conditions on Turkish firms' exporter status and export intensity. For this purpose, this study analyzes the relationship between six different financial constraints and the cost of credit indicators and exports of Turkish manufacturing firms using firm-level data sets between 2006 and 2018. By employing these indicators in the Heckman two-step model, this study illustrates the characteristics of exports of Turkish manufacturing firms. Dissecting the data by technology level and firm size in the study allows for uncovering heterogeneity on the role of financial constraints and credit conditions on the firm-level export dynamics.

Our study provides several contributions to the existing empirical literature on international trade. Firstly, previous research has analyzed the effect of financial constraints and credit conditions on the export performance of Turkish firms with a narrow focus on one of two. This study instead takes a more comprehensive approach by examining the effects of credit conditions and six measures of financial constraints, which are named ROE, profitability, liquidity, solvency, trade credit, and bank ratio, as well as the interaction of these financial constraints and credit conditions. By exploring the interaction between these two measures, the study presents whether financially vulnerable firms' exports are more affected by external capital costs than less vulnerable firms.

Secondly, there is a lack of firm-level studies examining the relationship between credit conditions and export dynamics. This study is the most comprehensive research conducted for Türkiye. The results of this study not only shed light on the relationship between export finance and export performance in Türkiye but

also for other developing countries where access to finance poses a similar significant constraint.

The third contribution of the study is methodological. The analysis of the impact of credit and financial conditions only within the sample of exporters leads to using a non-random sample, thereby causing a selection bias. Hence, unlike the previous firm-level research on the effect of credit or financial constraints on Turkish firms, the empirical analyses rely on the Heckman two-step model, which is designed to correct bias from non-randomly selected samples and truncated dependent variables.

Results of different Heckman model specifications show that changes in the cost of credit negatively and robustly affect both the probability of being an exporter and export intensity. On the other hand, the study identifies a positive relation between the probability of being an exporter and both bank ratios and the profitability ratio. Therefore, it emphasizes the role of access to finance and profitability in financing the fixed costs associated with entering export market.

Furthermore, it is shown that the export intensity of Turkish manufacturers demonstrates an inverse relation with their solvency ratio and ROE. An increase in the credit costs significantly dampens the negative relationship between solvency and export intensity, but a change in credit costs does not lead to a statistically significant change in the relationship between export intensity and other financial indicators.

In summary, the empirical findings confirm that access to finance and low-cost credit serves as a catalyst for manufacturing exports. However, except for solvency ratio, credit conditions do not have a disproportionately more negative effect on more financially constrained firms.

This research provides valuable information for policymakers that aims to design data-oriented export incentive policies. By identifying the essential role of access to finance and low-cost credit on firms' export performance, the results indicate that policymakers should prioritize facilitating access to bank finance and provide low-cost export financing tools for Turkish firms. In addition, the steps need to be

complemented by efforts to enhance the productivity of Turkish manufacturing firms and their long-term financial health.

Rest of this thesis is comprised of five chapters. Chapter 1 provides a historical perspective on international trade theory, followed by the evolution of heterogeneous firm trade models. This chapter examines how these models are augmented to comprehend the function and impact of credit and financial constraints.

Chapter 2 provides a literature review and discusses empirical studies focusing on the effects of financial and credit constraints on exports for Türkiye and other countries. This chapter also scrutinizes the variables and methodology employed in the empirical studies by analyzing their methodology, country, and period employed in those studies.

Chapter 3 explains the data and data sources used for the empirical model. In addition, it summarizes the data-cleaning process and provides descriptive information on the characteristics of the data.

Finally, Chapter 4 discusses the Heckman model and provides the empirical results. Upon introducing the models applied in estimating the impacts of credit and financial constraints, I demonstrate the effect of credit and financial constraints on firms' export behavior for overall Turkish manufacturing industry, as well as an analysis of how this behavior varies depending on the firms' size and technology level.

Chapter 5 concludes the study by summarizing the research findings and their policy implications. The chapter also draws attention to the limits of this study, and guides future research.

## CHAPTER 1

### THEORETICAL LITERATURE ON HETEROGENEOUS FIRMS IN INTERNATIONAL TRADE

One of the primary questions the international trade literature tries to answer is, "Why do countries trade?". While answering this question, old trade theory has emphasized the importance of comparative advantage. Consequently, models of old trade theory have depended on productivity and factor endowment differences to explain international trade. Although these differences enable inter-industry trade among countries, empirical evidence shows that inter-industry trade is not the only form in which trade may occur, i.e., trade can flow between countries with similar productivity and factor endowments.

The limitations of traditional trade models have prompted a search for different underlying reasons for international trade. As a consequence, early new trade models such as Krugman (1980), Helpman (1981), and Ethier (1982) departed from different assumptions of old trade theory. Instead, these models were based on increasing returns to scale and consumer preference for product diversity. Divergence from the assumptions of old trade theory in this way provided ground for the explanation of intra-industry trade (Bernard et al., 2012).

Helpman and Krugman (1987) incorporated old and new trade theories by combining horizontal product differentiation and increasing returns to scale into a model that highlights endowment-based comparative advantage. As discussed in Helpman (1999), the integrated equilibrium approach of Helpman and Krugman (1987) offers an effective account of international trade patterns if it is augmented to consider technology differences, factor price inequality, and trade costs (Bernard et al., 2007).

In both old and new trade theory, trade and its implications are typically explained through representative firms because the assumption of the existence of representative firms eases the use of the general equilibrium framework.

However, starting from the 1990s, the utilization of firm-level data has provided new insights into international trade. Most notably, firm-level analyses have provided evidence for the substantial heterogeneity in firm characteristics, thereby putting into doubt the existence of a representative firm. The studies showed that while exporters constitute only a fraction of all firms, these firms significantly differentiate from other firms (Bernard et al., 2012). Most notably, empirical studies showed that there exist exporter premia in terms of size, productivity, and skill intensity (Bernard and Jensen, 1995; Bernard and Jensen, 1999).

As the growing availability of firm-level datasets highlighted the discrepancy between the productivity of exporters and non-exporters, two potential explanations were put forward to interpret these phenomena (Wagner, 2007). The first one, the self-selection hypothesis, states that various fixed costs paid upfront to enter international markets create an entry barrier that less productive firms are unable to overcome. This theory also emphasizes that the competitive environment of international markets puts pressure on firms to attain further competencies and financial soundness before entering into foreign markets.

The second hypothesis presents the significance of learning by exporting. Two important mechanisms emerge in the learning by exporting hypothesis. First, firms have a stronger experience as they operate in different markets. This contributes to their development processes. Second, exporters' exposure to competition in different markets improves their product quality and productivity.

Among the early works accounting for firm-level heterogeneity in the empirical literature, the studies of Melitz (2003), Helpman et al. (2004), and Bernard et al. (2003) have provided the groundwork for analyzing the role of heterogeneity in the export performance of firms.

Melitz's model combines Krugman (1980) model of trade under monopolistic competition and increasing returns with the dynamic industry model of Hopenhayn (1992). By this way, the model enables the coexistence of firms with varying levels of productivity. It also explains various empirical features observed

in firm-level studies. In Melitz (2003), there is a continuum of firms where every firm produces a distinct variety in monopolistically competitive industries. Labor is the only factor of production, and it is supplied inelastically at a constant level. Before entering the market, the potential entrants to the industry are required to make a non-recoverable initial investment. After they pay the fixed entry cost, their time-invariant productivity is derived from a common distribution. Higher productivity enables the production of higher-quality goods at equal cost. Upon determination of productivity level, a firm may decide not to produce because of low productivity level and fixed cost. In addition, with constant probability, productive firms face a bad shock that forces them to exit in every period. Therefore, only firms that have above the cutoff productivity level will produce. The level of productivity and revenue are determined by the productivity level. As a representative consumer's constant elasticity demand function leads to constant markup over marginal cost, more productive firms will earn higher than less productive firms.

The open economy version of the Melitz model assumes that the world is comprised of identical countries. As in the empirical literature, firms wishing to export have to bear variable costs, such as transport costs and tariffs, and fixed costs because of market entry. The variable trade cost is modeled as iceberg cost in which exporters must ship more than one unit of good to deliver 1 unit at the export destination. Therefore, an exporting firm will charge a higher price for foreign markets.

In the Melitz model, trade liberalization results in the redistribution of profits and market shares among different firms. Domestic firms face competition not only from each other but also from foreign firms that are more productive. As labor supply is inelastic, less productive firms face increased labor demand from more productive firms. Symmetric reduction in variable trade costs or an increase in the extensive margin positively affects the export revenue of most productive firms. Some non-exporting productive firms begin to export as they find it profitable to enter new markets. However, the least productive firms exit, and the



revenue of non-exporting producers decreases as they face competition from new entrants.

Melitz's model has several ramifications for international trade. First, the model explains intra-industry trade across countries. Second, only the most productive firms can export because of international trade's fixed and variable costs. Third, trade liberalization enables only the most productive firms to enter new markets but forces the least productive firms to exit. The entry of only the most productive firms into foreign markets corroborates self-selection into export markets. Fourth, trade liberalization results in the reallocation of resources and increase overall welfare (Bernard et al., 2012).

Bernard et al. (2003) present a theoretical framework incorporating differences in technological efficiency and non-constant markups, contrasting with Melitz (2003). In Bernard et al. (2003), several producers have different levels of technological efficiency but identical technology in each country. While the inputs cannot be transported across countries, final goods can be transported at a cost. There is Bertrand competition among different suppliers in a given country, which means the price of goods is determined by the lowest-cost supplier. Therefore, the product's price is established by the marginal cost of domestic producers and trade-related costs of exporters. As trade allows the export of firms which are more productive than home country producers, trade intensifies competition in a country. More productive exporters replace less productive domestic producers. Lower trade-related costs allow more productive firms to expand their sales in foreign markets. Therefore, trade liberalization increases efficiency in the market.

Melitz (2003) and Bernard et al. (2003) analyzed the productivity differentials between exporters and non-exporters. In contrast, Helpman et al. (2004) concentrated on firms' decisions between export and foreign direct investment (FDI). They introduce heterogeneous firms into a simple multi-country, multi-sector model, in which firms experience a trade-off between proximity and concentration. Firms need to decide their mode of operation in foreign markets: exports or local subsidiary sales established by FDI. The two modes of market access, namely exporting and foreign direct investment, entail different costs for

firms. While exporting has a lower fixed cost than FDI, FDI lowers variable costs, creating a trade-off between the two modes for firms. Helpman et al. (2004) present findings similar to Melitz's model regarding the choice of serving foreign markets but extend such that among firms operating in foreign markets, FDI is limited to the most productive firms.

Different studies have augmented Melitz's model. While the presumption of constant elasticity of substitution (CES) in Melitz (2003) leads to constant markups, Melitz and Ottaviano (2008) move away from CES preferences and develop models with endogenous markups that are affected by the intensity of competition (Bernard et al., 2012). It then studies endogenous markups' effects on closed economies of different sizes and the impact of trade liberalization on these economies. In the closed economy version of the Melitz- Ottaviano model, market size affects both the equilibrium price and firm size. Larger markets lead to higher product variety and increased competition. Therefore, these markets force only more productive firms to survive. As these firms charge lower markups, the equilibrium price level is lower in these markets..

### **1.1. THE ROLE OF FINANCIAL CONSTRAINTS AND CREDIT CONDITIONS ON EXPORTS**

Although researchers have studied the role of supply-side factors and changes in demand-side factors to explain the reasons behind the drastic decline in merchandise trade immediately after the 2008 financial crisis, researchers have yet to reach a consensus on the leading cause of this significant and synchronous drop. These studies focusing on the role of supply-side assert potential risks associated with the financial system in international trade. Therefore, a body of literature has been developed to understand how financial constraints can affect firms' export behavior since 2009.

Among different theoretical works, Ahn (2011) explains why domestic and foreign trade respond at different rates to changes in credit conditions. According to Ahn (2011), higher domestic trade volumes and less accurate screening of foreign

firms make financing international trade transactions costlier than domestic trade. To evaluate the risks of foreign trade transactions, banks invest in acquiring more information about the buyers and their trading partners, a move that improves the accuracy of screening tests. However, the ultimate level of information collection is a function of the costs and benefits of investing in information acquisition. In addition, the intermediary role of banks in the letter of credit system brings another dimension to trade-related risks: bank defaults. A rise in the probability of bank default exacerbates the information asymmetry among banks. As a result, this contributes to a higher price imposed on a letter of credit. Given that the model indicates a letter of credit can be only employed in international dealings, such a supplementary adverse effect is specific to international transactions. During banking crises, an increase in uncertainty regarding the possibility of counterparty default risk leads to elevated loan costs and fees for letters of credit. Therefore, the rate of decline in exports is more significant than open account domestic sales.

Similar to Ahn (2011), Feenstra et al. (2014) examine the role of information asymmetry. The inability to discover the productivity level of individual firms leads to information asymmetry between firms and credit providers. In addition, banks cannot confirm whether loans are used to finance the cost of exports. For that reason, based on publicly known productivity distribution of firms, banks define a single profit-maximizing contract for the exporters. Given these loan payment terms, firms adjust both their level of production as well as exports. In order to claim profit maximizing level of loans, firms will declare a productivity level, which the bank does not observe. As payment terms of exports and time to ship to foreign markets are longer than domestic sales, export activity creates additional credit constraints for firms.

The research by Chaney (2016) centers on the consequences of changes in liquidity and exchange rates on trade finance. By devising a model of international trade, the study reconciles the effects of exchange rate fluctuations with trade theory. It augments the Melitz model with liquidity constraints and develops a model where more productive, larger, and not liquidity-constrained exporters self-

select into exporting. In Chaney's model, firms must accumulate sufficient liquidity to finance the cost of entry into foreign markets. Overcoming the liquidity barrier depends on the level of inherited assets from its past activities and whether the firm can generate enough cash flow from its domestic activities. Financial development allows firms to overcome barriers to exporting by easing liquidity constraints.

Furthermore, exchange rate fluctuations have two opposing effects on exports in Chaney (2016) 's model. While the depreciation of the exchange rate decreases the relative price of goods and makes firms more competitive in foreign markets, the model also accounts for erosion in the value of assets that are used to offset the fixed costs associated with exporting – leading to an adverse impact on the extensive margin of trade. The development of financial markets would dampen the influence of exchange rate fluctuations on the extensive margin of exports. Consequently, this would magnify the results of exchange rate fluctuations.

Incorporating financial frictions into Melitz (2003), Manova (2013) provides a theoretical analysis of the uneven effects of financial frictions. It analyzes how countries' financial development and sectoral financial requirements determine the export performance of firms. In the model, as in the literature, exporters have to incur fixed costs of exporting and iceberg trade costs. While firms can finance variable trade costs internally, the model setting requires a fraction of fixed costs covered through borrowing from financial markets. In order to access loans, firms must place collateral that is claimed in the event of non-payment of loans. Both the share of loans and collateral are exogenously determined, whereas the financial contractibility of countries determines affects the default rate of loans. Hence, financial contractibility, collateral size, and smaller loan size improve the credit availability of firms. In addition to deciding on entry into foreign markets, profit-maximizing firms choose their trade partners based on the same decreasing order of profitability. Manova's model is augmented to require firms to finance fixed and variable export costs through financial markets. In this way, credit constraints determine the trade performance of firms through three mechanisms: the decision of domestic production, entry into foreign markets

through export, and the level of export. Therefore, they impact both the extensive and intensive margin of exports. The theoretical model shows that the export performance of a sector in a country is positively affected by financial development of the country, whereas inversely related to the financial vulnerability of the sector. Moreover, the financial development of a country increases both the level of exports and the number of export destinations.

Mullis (2015) is a critical study examining the interplay between exports on one side and financial and credit constraints on the other. In order to describe the conduct of liquidity-constrained firms, the study develops a heterogeneous firm model, which is parallel to Melitz's (2003) model. In the setting, the economy consists of two countries: Home and Foreign. The only production factor considered is labor, and the economy is composed of two sectors. The first sector produces a single numeraire good with a price equal to 1, while each firm operating in the second sector produces differentiated but highly substitutable products, and those firms have monopoly power over the good they produce. Each consumer is endowed with a single unit of labor, and CES preferences describe their demand for goods over a continuum of differentiated goods produced in the economy. Thanks to consumers' love of variety, they will consume all varieties produced by the economy. Firms in both home and foreign countries enjoy the same technology, and the size of the market fixes the number of potential entrants to each economy. Firms must incur a fixed cost to begin exporting while their random unit labor productivity determines production cost. In order to export, a firm has to incur a fixed cost of exporting and a variable cost. The presence of market entry costs justifies the existence of the former, whereas the latter stands for trade costs. Because of the monopolistic competition and the heterogeneity of firms, when trade costs are sufficiently high, firms are divided into producers/non-producers and exporters/non-exporters.

While firms can finance the variable costs of exporting internally, the role of credit and liquidity constraints come into play for financing the fixed cost of exporting. Firms can finance the fixed cost of exporting in three ways: profit generated from domestic sales, random liquidity shocks, and money borrowed from the financial

markets by pledging tangible assets as collateral. The role played by financial markets affects the export behavior of the firm in different ways. First, as the probability of defaulting on the loan is inversely proportional to financial contract enforcement in the home country, the amount of collateral that needs to be pledged for loans and the robustness of financial institutions go in opposite directions. Exporters can only offset the low level of liquidity either by higher productivity or better access to financial markets. Second, higher firm productivity enables greater revenue, facilitating access to loans. Third, a firm operating in sectors in which tangible assets are more easily collateralizable needs to pass a lower productivity threshold to obtain external financing.

As can be understood from the implications and settings of the models, theoretical analyses of both Muuls (2015) and Manova (2013) on the effects of financing and credit conditions are more comprehensive and more closely related to our study than other models mentioned in this section. Their models are built to examine the function of liquidity and credit constraints, which is explained through the level of financial contractibility of the home country.

While financial contractibility is not directly considered in our empirical analysis, one of the principal outputs of our empirical investigation is to learn the effect of variation in the cost of credit to firm-level exports.

Two important distinctions exist between Muuls (2015) and Manova (2013). First, Manova (2013) allows firms to finance the variable cost of exports through credit markets. This setting was not previously considered in the existing theoretical literature. As we are interested in both entry into foreign markets and the level of exports, the implications of the model shed light on variations in the extensive margin of Turkish exporters. Second, similar to Chaney (2016), Muuls (2015) expresses the impact of the exchange rate on the fluctuations of exports. Two offsetting effects of exchange rate movement on exports in the models present us that the relationship between the competitiveness of the home country currency and the level of exports is not linear. In this respect, both Chaney (2016) and Muuls (2015) enable us to put our inferences on exchange rate movements in a theoretical framework.

## CHAPTER 2

### EMPIRICAL LITERATURE ON THE IMPACT OF FINANCIAL CONSTRAINTS AND CREDIT CONDITIONS ON EXPORTS

#### 2.1. THE ROLE OF FINANCIAL CONSTRAINTS ON EXPORTS

Empirical research on international trade traditionally reflects the assumption of a representative firm's existence, making the response of countries and industries the focus of their research. However, the availability of firm and plant-level data since the end of the 1980s enabled the demonstration of the vast heterogeneity among firms (Bernard and Jensen, 1995; Bernard and Jensen, 1999). The early firm-level empirical studies mostly focused on the impact of factors such as labor productivity, firm size, and firm age affecting firms' export decisions. Since the 2008 financial crisis, literature analyzing the link between financial constraints and exports has emerged. Table 1 summarizes the prominent studies in this literature.

While empirical studies on the heterogeneous characteristics of firms were mostly carried out mainly after the 2008 financial crisis, some studies evaluate the response of both firm-level exports and export status to changes in firm-level financial constraints even before 2008 (Campa and Shaver, 2002; Guariglia and Mateut, 2006; Greenaway et al., 2007). Among these studies, two of them, namely Campa and Shaver (2002) and Guariglia and Mateut (2006), indirectly examine the relationship between firms' financial condition and their export performance. Campa and Shaver(2002) suggest that Spanish exporters experience fewer liquidity constraints than firms that do not engage in exporting. Similarly, Guariglia and Mateut (2006) find that engaging in global activities provides a buffer against liquidity constraints for UK firms.

Greenaway et al. (2007) is one of the earliest empirical studies introducing finance constraints to the firm heterogeneity literature and checking if those constraints are one of the direct determinants of export market participation. Based on a large firm-level dataset for UK manufacturing firms from 1993-2003, the study attempts to interpret the relation between a firm's export status and financial health. The empirical model employed in the study reveals that firms that engage in exporting exhibit superior financial health compared to those that do not. However, this result is not just attributable to the self-selection of firms into exporting: export starters do not exhibit better ex-ante financial health than domestic producers when entering foreign markets. Instead, export starters have low liquidity and high leverage, which is attributed to sunk costs associated with becoming an exporter. On the other hand, once firms turn into exporters, those firms' ex-post financial health improves. This discovery can be considered as evidence of learning by exporting hypothesis: participation in exports improves the performance of firms.

Combining the data from different World Bank surveys, Berman and Héricourt (2010) studied the export performance of 5,000 firms from main producing sectors in 9 developing countries between 1999 and 2004. They use two firm-level measures of financial constraint: the ratios of total debt over total assets and cash flow over total assets. They find that the firm's productivity, quantified as the ratio of value added over the number of workers and lower financial constraints in the home country, positively impacts its export performance. Moreover, as these two factors interact positively with each other, the financial development of a country reduces the disjunction between the export performance of firms and their productivity. Although the results underline the significance of financial constraints on global trade, the effect is concentrated on entry into export markets. Therefore, it empirically demonstrates the existence of sunk costs in international trade. Once a company begins exporting, the effect of financial limitations on both the extensive and intensive margins is reduced.

A critical study examining the influence of financial constraints on factors that determine firms' export status and their export performance is Bellone et al.



(2010). The study exploits a vast firm level dataset on over 25,000 French manufacturing enterprises to comprehend the role of financial constraints on firms' decision to become exporters as well as export intensity. While doing so, their empirical model uses two measures of financial constraints which are also employed by Greenaway et al. (2007)- leverage and liquidity ratios. Additionally, accounting for the fact that these two measures might only capture a limited aspect of access to financial markets and may also suffer from potential endogeneity, the study follows a different approach and experiments with two alternative indicators of financial health based on the methodology put forth by Musso and Schiavo (2008). The study finds that financial constraints are significant binding factors for firms' entry into foreign markets, i.e., export starters exhibit better financial than non-exporters at the time of entry into export markets. However, contrary to Greenaway et al. (2007), results do not suggest post-entry enhancement of the financial health of firms entering export markets.

Using the credit rating of Belgian firms as a proxy for credit constraint, Muuls (2015) analyze the relationship between credit conditions and the trade performance of the Belgian manufacturing sector. The study combines the firm-level data of the National Bank of Belgium, which provides balance sheets, trade transactions, and credit scores of those firms provided by the credit insurance company Coface for Belgian manufacturing firms from 1999 to 2007. The analyses show that firms facing fewer credit constraints have higher trade volumes and the likelihood of being exporters. Additionally, there is a positive correlation between the firms' Coface score and the number of destinations exported and product variety. As for importers, the credit score is positively correlated with import volume, but no statistical relation between the extensive margin of imports and credit constraints has been found.

Mukherjee and Chanda (2021) examine the impact of external financing constraints on the intensive margins of manufacturing firms in India. It uses firm-level information between 2000 and 2015 and calculates firm-specific and time-varying estimates of financing constraints with a multivariate index emanated from Musso and Schiavo (2008). The study finds that there is a connection

between financing constraints and the export levels of the firms. This effect is more noticeable in sectors that have higher external financial dependence. In addition, SME exports are more adversely affected by deterioration in financial conditions.

Arndt et al. (2012) assesses the impact of different barriers to internationalization, including labor market frictions and a self-reported measure of financial constraints derived from annual IAB Establishment Panel surveys, including 16,000 establishments in Germany for 2004-2006. By employing a two-step Heckman model to analyze extensive and intensive margins of exports simultaneously, they evaluate the impact of labor market constraints, financial frictions, and low productivity on the extensive and intensive margins of firm-level exports. They did not observe a statistically significant influence of financial constraints on either the decision to engage in exporting or the level of exports.

## **2.2. THE ROLE OF CREDIT CONDITIONS ON EXPORTS**

Access to external finance is vital for firms to bear operating and investment expenses that cannot be covered through internal cash flows or profits. While this holds for both exports and domestic production activities, exporting stands out as an activity heavily reliant on external financing for several reasons. First, as empirical and theoretical literature underlines, exporting activities incur various fixed and variable costs, such as investing in new capacity, customizing products, adhering to regulations in different regulatory environments, shipping costs, customs duties, and taxes. Secondly, exporting demands more working capital than domestic sales since the cross-border transfer of goods usually takes longer to process than domestic sales, particularly when shipping by sea. Finally, as exporting involves multiple actors and the cross-border exchange of goods and payments, which entails additional risks associated with information asymmetry, these risks have necessitated the need for insurance for many international transactions and have contributed to the development of credit markets for international trade (Chor and Manova, 2012).

By providing the required funding and security to enable the movement of goods and services, financial markets bridge the gap between exporters and importers by providing credit and credit insurance. The Bank of International Settlements (BIS) has acknowledged the absence of a single data source that permits an accurate assessment of the complete structure and extent of trade finance markets (BIS, 2014). On the other hand, different multilateral organizations such as the IMF, World Bank, and WTO have stated that up to 80% of global trade is backed by financing or credit insurance in some way (Auboin, 2009).

While many studies examine the effect of financial constraints on exports, empirical studies investigating how credit constraints impact firm-level exports are limited and primarily conducted after the 2008 Global Financial Crisis. These studies presented in Table 2 mainly focus on analyzing the heterogeneous response of firms to financial shocks.

Asmundson et al. (2011) evaluate the change in banks' relationships with their customers and business practices. To understand credit constraints' contribution to the decline of merchandise trade in 2008-9, IMF and Bankers Association of Finance and Trade conducted four surveys between December 2008 and early 2010. These surveys, which assess market conditions for trade finance, show that banks embraced more rigorous risk management practices because of elevated risks. Banks also increased pricing margins because of heightened default risk and capital requirements. Across all bank size categories, particularly large ones, banks curbed their credit supply to certain countries and sectors. In order to contract counterparty risks, banks are more likely to ask for export credit confirmations or insurance. Furthermore, prices of trade finance products increased. While these findings suggest that changes in credit conditions cast a significant role in variation in global trade, there is no marked difference in the drop in merchandise trade between sectors traditionally more dependent on trade finance and the rest.

Chor and Manova (2012) is another influential paper that scrutinizes trade patterns of different industries before and after the 2008 financial crisis to identify the impact of changes in credit conditions on US imports. The study employs

industry-level US imports over the 2006-2009 period, as past empirical studies have shown that there are sectoral differences in dependence on the financial system. To describe the financial vulnerability of different sectors, the study employs three financial vulnerability measures that are widely used in growth and finance literature: the fraction of total capital expenditure not financed by internal cash flows from operations, the ratio of the change in accounts payable over the change in total assets, the share of net plant, property, and equipment in total book-value assets. Without a direct measure of cost of credit, the study uses the one-month interbank lending rate as an indicator of credit tightness in exporting countries. Empirical analyses of the study show that home country credit tightness negatively affected the export performance of industries at the height of the crisis. This impact was more noticeable in financially vulnerable industries. These findings are both significant and far-reaching in presenting that credit conditions played a significant role in the contraction of merchandise trade resulting from the global financial crisis.

Amiti and Weinstein (2011) attempt to explain the large decline in exports concerning output through deterioration in the health of banks providing export finance. Using firm-level data dating back to 1986, the study shows that a 1% decline in a Japanese bank's market-to-book value is associated with a 0.46% decrease in trade finance and a smaller 0.14% decrease in total lending. In addition, deterioration in the health of Japanese banks causes seven times more drop in exports than domestic sales. However, in the case of multinational corporations and firms that export mostly air, the drop in exports due to financial factors is smaller. This smaller drop can be ascribed to the fact that, unlike Japanese firms, the former do not have to rely on the Japanese financial system for exports, and the latter has fewer working capital requirements because of much shorter shipping times. This finding is in line with Chor and Manova (2012), which state that alternative channels intensify the role of credit constraints on exports.

Like Amiti and Weinstein (2011), Paravisini et al. (2015) analyze the consequences of funding drop in Peruvian banks on the export performance of

Peruvian firms. As Peruvian banks heavily borrowed from international markets to finance their operations, the drop in international capital in 2008 resulted in the reduction of domestic credit supply. While the study uses financial statements of Peruvian banks, custom data, and balance sheets of Peruvian firms, it calculates the elasticity of extensive and intensive margins of exports to credit shocks. According to the findings of this study, a 10% decline in credit supply in a year decreases the export volume of the following year by 1.95%, whereas the change in credit conditions does not significantly impact the extensive margin.

### **2.3. EMPIRICAL STUDIES ON TURKISH FIRMS**

While firm-level analyses on export performance in international literature date back to the 1990s, studies on the determinants of firm-level exports in Türkiye constrained mainly by data availability and access to available data resources. Researchers from the Central Bank of the Republic of Türkiye conducted early firm-level studies. Those who do not have access to the database of the CBRT had to rely on surveys and other available data resources such as Istanbul Stock Exchange (Aldan and Gunay, 2008). On the other hand, the availability of TURKSTAT and EIS dataset for researchers have encouraged firm-level studies on exports. However, most of these studies concentrate on various measures of differentials between exporters and non-exporters and the validity of self-selection and learning by exporting hypotheses (Dalgic et al., 2015a; Dalgic et al., 2015b; Dalgic and Fazlioglu, 2015; Atabek-Demirhan, 2016a).

The studies in the literature are presented in Table 3. As in developed countries, the 2008 financial crisis has motivated studies examining the consequences of financial and credit constraints on firms' export behavior in Türkiye.

As part of the World Bank's effort to understand the effect of the 2008 financial crisis on developing countries, Acar (2009) analyzes the role of the 2008 financial crisis on foreign trade of Türkiye. Although the analysis was carried out with a small sample, it provides valuable information on the causes of the sharp decline

in exports experienced by large-scale Turkish manufacturing firms. The research, which is based on a survey of 40 firms among the largest 1,000 industrial firms, shows that the crisis negatively impacted trade finance conditions of Turkish firms. Findings suggest that Türkiye's exports decreased primarily due to the contraction in foreign demand rather than foreign trade financing problems. Nevertheless, among the participants, 52 percent of Turkish firms reported that banks became more selective in giving trade credit, along with an increase in the cost of trade credit. The survey responders stated that the cost of trade finance has increased by 40 percent relative to the pre-crisis period, and the maturity of trade credit decreased.

Sayar (2018), although not using firm-level data, is closely related to this study and uses the Markov regime-switching method to investigate the relationship between Turkish exports and trade finance. As the study is conducted for the 2003-2016 period, it also allows us to observe the determinants of Turkish exports during the 2008 Financial Crisis. It tests whether supply-side or demand-side factors were responsible for the decline of exports. Markov regime-switching models show that export credits can forecast exports, but the impact of export credits on exports is asymmetrical. While export credits do not significantly affect exports during expansionary periods of Turkish exports, export credits affect exports positively during the period of contraction. Finally, the Markov regime-switching Granger causality analysis indicates that the causality from export credits to exports is more robust, especially during recession periods.

While these two papers focus on the 2008 financial crisis, Demir et al. (2017) focus on the importance of cost of trade financing instruments by examining the role of change in risk-based capital requirements of Turkish banks on exports. Türkiye's Banking Regulation and Supervision Agency (BDDK) has required Turkish banks to adopt the standardized approach of Basel II effective of July 1, 2012, which effectively changed the calculation of the cost of holding a letter of credit. Whereas risk weights associated with a letter of credit under Basel I were calculated based on where the counterparty was located (whether the counterparty bank was located in an OECD member or not), risk weights of banks

under Basel II is dependent on credit rating assigned by an agency to the counterparty bank that issues the letter of credit. While this regulatory change affected letters-of-credit-based export shares, it has not significantly affected export volume.

Another recent paper, Demir and Javornik (2020), discusses the importance of trade insurance with a focus on the impact of COVID-19 on exports. Since a letter of credit guarantees that exporter will be paid and importer does not need to make a payment until the good arrives, both parties do not face transaction risk. However, in the case of open account, the exporter is exposed to the risk of non-payment. Regarding commodities traded through cash in advance payment terms, an exporter may not fulfill their obligations even if gets paid. As the COVID-19 crisis led to a significant fall in global trade volume, they show that heightened risk of non-payment and non-delivery negatively affected global trade. This risk is particularly reflected in the share and volume of different trade insurance of products. While exports with letters of credit of documentary collection.

Unlike the other articles mentioned about Turkish firms, Akarım (2013) investigates whether financial factors affected the export probability of Turkish firms between 2000 and 2011. Using financial statements of 233 publicly listed Turkish manufacturing firms in the Istanbul Stock Exchange, the empirical model tests whether the level of the financial constraint of a firm determined by liquidity, credibility, and leverage ratios influences the export decision of Turkish firms. Similar to Bernard and Jensen (1995) 's empirical findings, empirical results of the study's logit model display differences in the attributes of Turkish exporters and non-exporters: Exporting firms have more assets and sell more than non-exporters. Moreover, they have higher credit ratings and liquidity than non-exporters. However, by employing different financial constraint measures, the research finds no association between liquidity and leverage ratios and the likelihood of being an exporter for a firm.

Gezici et al. (2018) attempt to understand the connection between financing constraints and firms' export characteristics for Turkish manufacturing firms. The balance sheets of Turkish manufacturing firms for 1996-2013 show the

differences between exporting and non-exporting firms in terms of productivity, firm size, and capital intensity. Using the methodology of Musso and Schiavo (2008), it then builds a firm-level financial vulnerability index based on the firm size, profitability, return on assets, and liquidity indicators. It finds that financial constraints for Turkish firms do not constitute a constraint to entering new markets. In general, however, a positive and statistically significant export premium exists for financing constraints.

Karamollaoğlu and Yalçın (2020) examine the impact of variations in the real effective exchange rate on firms' export behavior based on data collected at the firm-level. Similar to the analysis of Gezici et al. (2018), the study uses the Company Accounts database and the Risk Center Database, which includes the commercial debts and maturities of the companies. It shows that the depreciation of the Turkish lira causes a rise in the export share, but this effect is limited in sectors that use imported inputs heavily.

Dincer (2021) examines the export characteristics of different sectors by using the sectoral data of the Entrepreneur Information System. In this research, similar to Karamollaoğlu and Yalçın (2020) study, the growth rates of sectoral trade partners were used in the econometric model. The research findings show that sectoral growth of trade partners, R&D expenses, bank credits, and past export performance positively affect exports. In addition, it shows that the depreciation of the Turkish lira has a positive effect on the competitiveness of the companies.

Sahin (2022), which analyzes the role of heterogeneity in the financial indicators on the export characteristics of manufacturing firms in Türkiye, employs panel data set for manufacturing firms' balance sheet and trade data. Analyzing firm-level financial indicators, they find a positive relationship between firms' export performance and their profitability and liquidity ratios. It concludes that improvement in financial indicators is positively related to the export performance of Turkish companies. On the other hand, a rise in the leverage ratio negatively affects the export performance of firms.



Our paper aims to analyze the role of financial and credit constraints on the export performance of Turkish manufacturing firms, and it employs a similar approach with Chor and Manova (2012) to find a proxy for the tightness of credit conditions over time. Our research also has methodological similarities with Berman and Hericourt (2010), Gezici et al. (2018) as well as Şahin (2022) from the international trade literature in terms of measuring the financial constraints of a broad sample of firms. In terms of empirical specification of the model, our study resembles the works both Bellone et al. (2010), which emphasizes the importance of sample selection bias for investigating factors affecting the export performance of firms. However, different from these studies, we include additional financial constraints to analyze not only the effect of financial constraints but also the role of credit conditions. Furthermore, this study adopts Heckman model while Gezici et al. (2018), Şahin (2022) and Karamollaoğlu and Yalçın (2020) employ a pooled OLS, fixed and random effect and difference GMM respectively. In addition, none of these three studies have examined both export intensity and the probability of becoming an exporter together.

Our contribution to empirical literature is threefold. First, the in existing research, the consequences of financial and credit constraints on the export performance of Turkish firms are analyzed with a narrow focus on either of these constraints. In contrast, our study takes a broader approach by quantifying the concurrent effects of both constraints and exploring the interplay between them. Therefore, to the extent we know, our study is the first in Türkiye that attempts to understand whether export intensities of financially vulnerable firms are more responsive to the cost of external capital than the export intensity of less vulnerable firms. Second, in the literature, there is a limited number of studies at the firm level examining the relationship between credit interest rates and export dynamics. This study represents the most comprehensive research conducted for Türkiye in this area. Due to the scope of the data, the results of the study shed light not only on the relationship between export finance and export performance for Türkiye but also for developing countries where access to finance is a significant constraint Third, our comprehensive dataset allows us to understand the

heterogeneity in the impact of both constraints on entry into export markets and export intensity.

**Table 1: Summary of Empirical Studies on the Role of Financial Constraints on Exports**

Study (Published)	Country and Period Covered	Dependent Variable	Measures of Financial Constraints	Empirical Methodology	Core Findings
Campa and Shaver (2002)	Spain 1990-19998	Investment/Sales	Cash flow	Tobit	Spanish exporters experience fewer liquidity constraints than firms that do not engage in exporting.
Guariglia and Mateut (2006)	UK 1980-2000	Change in inventories	Short-term bank borrowing/Total short-term borrowing Tangible assets/Total assets Total real assets	GMM	Engaging in global activities provides a buffer against liquidity constraints for UK firms.
Greenaway et al. (2007)	UK 1993-2003	Export Status	Liquidity Leverage	Pooled Probit Random-effects Probit Fixed-effects Probit GMM Dynamic random-effects Probit Dynamic GMM	Although exporters display better health than non-exporters, there is no significant difference in financial health of domestic producers and exporters at the time of their entry into export markets.
Berman and Hericourt (2010)	9 Countries 1998-2004	Value of Exports Exports/Sales Export Status	Total assets / Total debt Cash Flow/Total Assets	OLS Regression	Better financial health is not an indicator of future exporter status or export size of a firm.
Bellone et al. (2010).	France 1993-2005	Musso and Schiavo (2008) index Liquidity Export Status Export Intensity	Liquidity Leverage Musso and Schiavo (2008) index	Random Effects Panel Data Heckman two step model	Financial constraints hinder export participation

<b>Study (Published)</b>	<b>Country and Period Covered</b>	<b>Dependent Variable</b>	<b>Measures of Financial Constraints</b>	<b>Empirical Methodology</b>	<b>Core Findings</b>
Arndt et al. (2012)	Germany 2004-2006	Exports Export Status	Self-reported by a firm	Heckman selection model	There is no relation between a company's self-reported financial constraint and internationalization.
Muuls (2015)	Belgium 1999-2007	Total Exports Number of Destinations Exporter Status Number of Products Exporter status	Coface Score	Fixed-effect OLS regression Linear Probability Conditional Logit	Less credit constrained firms exports more and, are more likely to engage in exporting.
Mukherjee and Chanda (2021)	India 2000–2015	Value of Exports	Musso and Schiavo (2008) index Liquidity Leverage	GMM	There is an association between financing constraints and export levels of the firms. This effect is more pronounced in sectors that have higher external financial dependence

**Table 2: Summary of Empirical Studies on the Role of Credit Conditions on Exports**

Study (Published)	Country and Period Covered	Dependent Variable	Measures of Credit Conditions	Empirical Methodology	Core Findings
Asmundson et. al. (2011)	2007-2009	-	Trade Finance	Survey	Prices of trade finance products increased. But there is no marked difference in drop in merchandise trade between sectors traditionally more dependent on trade finance and the rest.
Amiti and Weinstein (2011)	Japan 1986-1999	Foreign bills Exports Domestic sales Exports/Domestic sales	Market-to-Book Value of banks	IV OLS	Decline in the health of Japanese banks has a seven times more negative impact on their customers' exports compared to domestic sales.
Chor and Manova (2012)	November 2006 - October 2009	Exports	Interbank Rate	Fixed Effect	Exports of financially vulnerable industries were more responsive to changes in the cost of external capital than exports of less vulnerable industries, and the level of response rose during the financial crisis.
Paravisini et al. (2015)	Peru 2007-2009	Exports	Credit to exporting firms	IV	Although credit conditions positively affected the collapse of Peruvian exports during the 2008, it is not the largest determinant.

**Table 3: Summary of Empirical Studies on Turkish Firms**

Study (Published)	Country and Period Covered	Dependent Variable	Measures of Financial Constraint and Credit Conditions	Empirical Methodology	Core Findings
Aldan and Gunay (2008)	Türkiye 1989-2003	Exporter Status		DID Probit	Exporters are more productive and capital intensive than non-exporters
Acar (2009)	Türkiye 2008-2009		Increase in the Cost of trade finance (Self reported by participants)	Survey	Trade finance cost has increased by 40 percent relative to pre-crisis period. Along with increase in the cost, the maturity of trade credit decreased.
Akarim (2013)	Türkiye 2000-2011	Exporter Status	Liquidity Credibility Leverage	Logit	Exporting firms have more assets and sells more than non-exporters. Moreover, they have higher credit rating and liquidity than non-exporters. However, there is no direct relation between financial constraints and export probability of a firm.
Dalgic et al. (2015a)	Türkiye 2003-2011	TFP Exporter Status		DID PSM	Two-way traders (both exporters and importers) are the best performing firm group among traders. They are followed by only-importers and only-exporters accordingly. Therefore, self-selection effect is stronger for only-importers than only-exporters in Türkiye.
Dalgic and Fazlioglu (2015)	Türkiye 2003-2010	Sales Labor Productivity TFP Capital Intensity Average Wage		OLS Fixed Effect GMM	Diversifications in terms of product and market positively effects the productivity measures of firms. Diversified firms are also more able to employ capital intensive production. Diversification of imports contributes to firm performance more than that of exports. Moreover, diversification on a country basis is more effective than product diversification.

Study (Published)	Country and Period Covered	Dependent Variable	Measures of Financial Constraint and Credit Conditions	Empirical Methodology	Core Findings
Dalgic et al. (2015b)	Türkiye 2003-2010	Sales Number of employees labor productivity TFP Capital intensity Wage per employee		OLS	Exporting to high income countries lead to more productivity gains than middle low-income countries. Learning-by-exporting effect is stronger in firms exporting to high income countries.
Demir et al. (2017)	Türkiye 2009-2012	Trade-credit export share	Country of letter of credit issuing counterparty bank	DID	While there is a negative relation between increase in risk weights and exports, the effect is not statistically significant.
Gezici et al. (2018)	Türkiye 1996-2013	Exporter Status Measure of Financing Constraint	Musso and Schiavo (2008) index	Pooled OLS Propensity DID	Financing constraints for Turkish firms do not constitute a barrier to enter new markets. In general, however, there is a positive and statistically significant export premium for financing constraints.
Sayar (2018)	Türkiye 2003-2016	Exports of Türkiye		Markov Regime Switching	During times of economic expansion in Türkiye, the availability of credit does not seem to have a significant impact on the export performance of firms. However, in periods of economic contraction, the trade volume constraints exports.
Karamollaoglu and Yalçın (2020)	Türkiye 2002-2010	Export shares	Collateral ratio Dollarization ratio Leverage ratio	Difference GMM	Depreciation of the Turkish lira causes an increase in the export share, but this effect is limited in sectors that use imported inputs heavily.
Dincer (2021)	Türkiye 2006-2018	Exports	Profitability	IV-2SLS System GMM	Sectoral growth of trade partners, bank credits and past export performance positively affect exports. Similarly, the depreciation of the Turkish lira increases exports.
Sahin (2022)	Türkiye	Exports	Leverage Liquidity ROE ROA	Fixed effect and Random effect model	There is a positive relation between improvement of financial indicators and exports

## CHAPTER 3

### DATA AND PRELIMINARY ANALYSIS

Since this study examines the impact of credit conditions and financial constraints on the export performance of Turkish firms between 2006 and 2018, we rely on various databases.

All variables used in the analyses are listed in Table 4. This study has two dependent variables, as it will examine the effects of financial constraints and credit conditions on the likelihood of becoming an exporter and export intensity. Our dependent variables are the log of exports over net sales and the binary outcome equal to one if a company exports. For our model, we have identified several independent and control variables which were chosen from the related literature. Independent variables reflect firm-level financial constraints and credit constraints. Other variables control the factors that impact the firm's export performance at the firm, sector, and country levels.

#### 3.1. FIRM LEVEL DATA

The study relies on firm-level data on the financial status, foreign trade performance, employment, establishment, and closure of firms. These datasets are not publicly available and kept by various government institutions in Türkiye.

Two potential obstacles to this study were matching data from different institutions and accessing confidential data held by different institutions from a single point. However, our main data source, the “Enterprise Information System (EIS)” (Girişimci Bilgi Sistemi-EIS), stores and consolidates administrative data from various public institutions and organizations in accordance with established guidelines and provides a single access point for all datasets.



The administrative records stored in the EIS include annual balance sheets, corporate tax and income statements, foreign trade transactions, intellectual property, R&D statistics, social security, and firm registry records, which belong to all enterprises operating in Türkiye except for those operating in the financial or public sector. Most of these records belong to the post-2006 period and are updated by partner institutions annually. The analyses utilize the EIS to obtain data on the firm registry, firm balance sheet, and export information.

**Table 4: Variable Names and Their Data Sources**

<b>Definition</b>	<b>Data Source</b>
Exports	EIS (the Ministry of Trade)
NACE Economic Activity Code	EIS (the Revenue Administration)
Technology Level	EIS (the Revenue Administration)
SME Status	EIS (the Revenue Administration)
Age of Firm	EIS (the Revenue Administration)
Weighted Average Interest Rates for Commercial Loans	CBRT
Real Effective Exchange Rate	CBRT
Industrial Production Index	TURKSTAT
Producer Price Index	TURKSAT
Global Export Demand Coefficient	EIS (the Ministry of Trade)+ Worl Development Indicators (World Bank)
Financial Constraint Indicators	EIS (the Revenue Administration)

### **3.1.1. Firm Registry**

The firm registry dataset of EIS, which the Revenue Administration provides, provides ample information about the operations of firms. The dataset contains information about 4-digit NACE (Rev. 2) economic activity codes, total quarterly wages, SME status, technology level, the average number of workers each

quarter, year of establishment, and liquidation. It includes all enterprises in Türkiye, some of which may not be economically active (Akcigit et al., 2020).

The Firm Registry dataset is our data source for three variables used in our empirical specification: productivity, age, and economic activity code of a company. The net sales over the average number of workers measure productivity. While both labor productivity and TFP estimated based on Levinsohn and Petrin (2003) are widely used as an indicator of firm-level productivity in international trade literature, we opted for labor productivity for simplicity. The literature notes that the increase in the productivity has a positive effect on the possibility of being an exporter.

The age of a firm is used to gauge firms' propensity to participate in export markets and is widely utilized as a control variable and instrument in the literature (Sahin, 2022; Berman and Héricourt, 2010). As Wagner (2015) states, by initially serving domestic markets, firms are expected to gain relevant experience and accumulate enough capital to cover the fixed costs of exports. As covering export costs and gaining enough experience to be competitive in international markets takes years, the research suggests a positive relationship exists between a firm's age and its likelihood of being an exporter. Therefore, this research includes age in the models that measure the impact of factors influencing the likelihood of becoming an exporter.

Different studies examining the impact of financial constraints on exports, such as Chor and Manova (2012) and Manova (2013), state that there is a cross-industry variation in firm characteristics that is attributed to technological factors beyond the control of each firm. Therefore, as widely practiced in the literature, we included control variables based on industry classification (2-digit NACE). Aside from creating control variables for each industry, firms' economic activity codes help us detect changes in the firm's operations.

### **3.1.2. Balance Sheet**

Except for the financial and public sectors of Türkiye, The Revenue Administration maintains the financial statements (balance sheet and income statements) of all Turkish firms.

According to Turkish Tax Procedure Law, first-class merchants engaged in commercial activities must keep books on a balance sheet principle. Therefore, incorporated and unlimited firms whose economic activity (sales, purchases, gross proceeds) exceeds certain thresholds must submit their annual balance sheet and income statement for tax purposes in Türkiye. Firms in the second category may also voluntarily report these financial records.

The balance sheet dataset of EIS includes all balance sheets submitted between 2006 and 2019. It includes more than 14.4 million rows of observations. Each row of data shows the balance sheet details of a firm for a specific reporting period. For our calculations, we specifically used the following information from the Balance sheet dataset: net income, shareholders' equity, total assets, short-term liabilities, and long-term liabilities.

### **3.1.3. Exports**

Information about exports is customs declarations kept by the Ministry of Trade for goods entering or leaving Türkiye. The data which is comprised of 146 million rows provides information about on the source country, destination country, value of goods in US dollars, quantity of goods, 12-digit commodity code (HS-12) of the good traded between 2006-2020.

The administrative record, which is integrated into the EIS database, does not only contain records of the goods entering or leaving the free circulation area of Türkiye. Using the source and destination country code information of

transactions, we omitted observations belonging to transit trade and the year 2020.

## **3.2. MACROECONOMIC DATA**

### **3.2.1. Weighted Average Interest Rates for Commercial Loans**

Since the research focuses on the impact of the cost of credit on Turkish exports, a measure reflecting credit costs of credit for Turkish firms is essential. As Export-Import Bank of Türkiye is the leading credit provider for trade finance, one may consider the weighted cost of trade credit provided by Eximbank as the best proxy for the exporters' credit cost. However, this measure is not reported by Exim Bank. Some studies like Chor and Manova (2012) in the literature have solved this problem by applying a broad measure of cost of external finance, such as one-month interbank rate.

This study chooses to use weighted average interest rates for commercial loans lent in Turkish Lira as a proxy to reflect credit costs in Türkiye. The superiority of this indicator over the interbank rate lies in the fact that it does not indirectly reflects the costs of commercial loans borne by firms. Moreover, SMEs rely not only on trade credit instruments provided by banks to finance their exports but also actively use different forms of commercial loans.

On the basis of the Banking Regulation and Supervision Agency (BRSA) Uniform Chart of Accounts and the instructions of the CBRT, the deposit, development, and investment banks in Türkiye are required to prepare "KT200H" form and submit it to the CBRT. The weekly flow data allows regular and timely monitoring of fluctuations in commercial loan interest rates, including export credits, import credits, export guaranteed investment loans, other investment loans, business loans, and other commercial loan types (CBRT, n.d.a).

### 3.2.2. Real Effective Exchange Rate

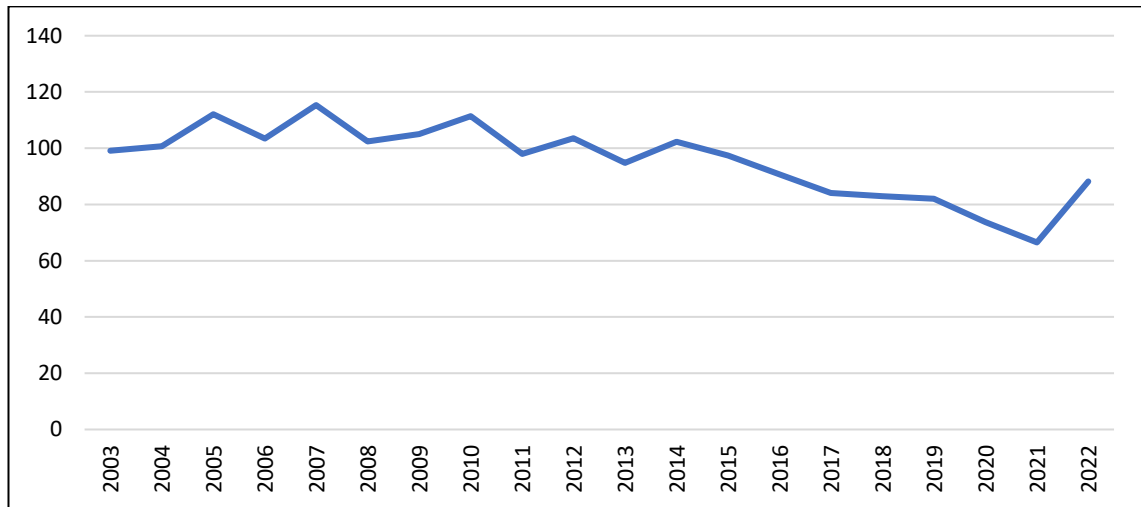
We also include real effective exchange rate (REER) as another control variable to our models as the index provides information of the evolution of price competitiveness of a country with respect to its trading partners (Stein et al., 2018).

CBRT calculates the REER by taking the weighted geometric average of the prices in Türkiye relative to the prices of its main international trade. Therefore, it can be formulated as follows:

$$REER = \prod_{i=1}^N \left[ \frac{P_{TUR}}{P_i * e_{i,TUR}} \right]^{w_i} \quad (3.1)$$

where,  $w_i$  denotes country  $i$ 's weight in REER index of Türkiye. Weight indices of each country is calculated according to manufacturing trade date.  $P_{TUR}$  is the price index in Türkiye,  $P_i$  is the price index in country  $i$ .  $e_{i,TUR}$  is the nominal exchange rate of country  $i$  relative to Turkish Lira (TL), and  $N$  represents the number of countries included in the analysis. Depending on the price indices used in REER formula, CBRT calculates three REER indices: Consumer (CPI), Producer Price Index (PPI) and Unit Labor Cost (ULC) based real effective exchange rates. In the analysis, the REER calculated by using domestic PPI deflator is employed (CBRT, n.d.b). Figure 3 illustrates the variation in the real effective exchange rate.

Based on the generic formula above, one can say that a depreciation of Türkiye's real effective exchange rate can make exports cheaper and is expected to make more attractive to foreign buyers, is subsequently expected to lead to increase in export volume of Türkiye. Aside from this effect, Chaney (2016) discusses the existence of an alternative channel on the effect of exchange rate on exports. Therefore, depreciation of REER leads to erosion in the value of Turkish firms' assets that are used to finance the fixed cost of exporting – leading to negative effect on extensive margin of trade.

**Figure 3: Real Effective Exchange Rate**

Source: CBRT (2023)

### 3.2.3. Industrial Production Index

Since this research is interested in the impact of credit and financial constraints on the share of exports, controlling factors disproportionately affect exports is essential. As Chor and Manova (2012) state, if both local producers and exporters face similar expenses when creating and producing a product, then they may be equally affected by credit constraints. Nonetheless, exporters may experience a greater impact due to the extra costs of producing and delivering goods to foreign markets. To control for conditions of the manufacturing sector, technology differences, factor price inequality, and sector-specific effects on production, we used sectoral industrial production indices released on NACE 2-digit level..

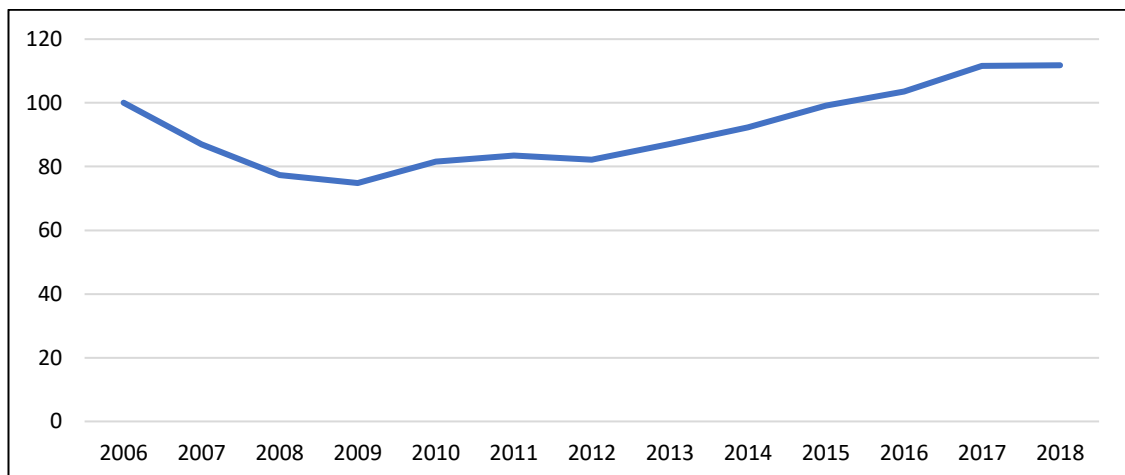
### 3.2.4. Producer Price Index

Given that our data span is 13 years, we deflated all the nominal values included in the calculation using the NACE 2-digit sectoral producer price indices (PPI) obtained from the Turkish Statistical Institute.

### 3.2.5. Global Export Demand Coefficient

The foreign market potential of a country's exports is closely tied to its ability to access the international market, making this a critical factor for exports. The export basket and the production of differentiated goods with varying prices are both factors that enhance the international market entry. Conversely, impediments and charges related to international trade negatively impact the entry of products into the foreign market. Previous research in the field has established a positive relationship between the growth rate of foreign markets and the home country's export performance (Rahmaddi and Ichihashi, 2012; Breinlich and Tucci, 2008; Allard 2009). Although various studies (Kara and Sarıkaya, 2014; Bozok et al., 2015; Binatlı and Sohrabji, 2009; Şahinbeyoğlu and Ulaşan, 1999; Aydın et al., 2007; Aydın et al., 2015; Togan and Berument, 2007) have all reported a wide range of coefficients on the impact of fluctuations in Türkiye's trade partners' growth rates on the country's export-import coverage ratio, they all concur that there is a positive relationship between Türkiye's export performance and the growth rates of its trade partners. (Dincer, 2021).

**Figure 4: Global Demand to Turkish Exports (2006=100)**



As a proxy for international demand for Turkish products, the “global export demand coefficient” is calculated as the weighted sum of the gross domestic product of trade partners of Türkiye in which weights are adjusted according to

those countries' share in exports of Türkiye. For the estimation of this parameter, GDP of Türkiye and its trading partners are obtained from WDI database of the World Bank. Each country's annual share of exports are calculated from declarations of the Ministry of Trade. Figure 4 presents the evolution of the global export demand coefficient.

### 3.3. FINANCIAL CONSTRAINT INDICATORS

The analysis employs six financial constraint indicators frequently used in the literature to assess the health of firms. These are namely: profitability, liquidity, return on equity, solvency, trade credit, and bank ratio.

The profitability provides information about a firm's ability to invest in export related activities, and a sharp decline in a firm's profitability indicates financial distress. Therefore the study includes return on equity (ROE) and return on assets (ROA-Profitability) as an indicator of a firm's ability to generate profits (IMF, 2001).

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Shareholders' Equity}}$$

$$\text{Return on Assets} = \frac{\text{Net Income}}{\text{Total Assets}}$$

The study employs two other financial constraint measures used by both Musso and Schiavo (2008) and Mukherjee and Chanda (2021): solvency and liquidity. The solvency ratio captures a firm's capacity to fulfill its long-term financial obligations such as debts and liabilities. maintaining a healthy solvency ratio helps firms to invest in export related activities, including marketing and logistics.

The liquidity ratio measures a company's capacity to satisfy its short-term financial obligations, such as operating expenses and debt repayments. Due to fluctuations in demand and currency exchange rates, exporters need to ensure sufficient cash flow to withstand the pressures of the international market.



Moreover, exporters must quickly adapt to changes in the global market and adjust their strategies accordingly.

$$\text{Solvency} = \frac{\text{Profit after tax} + \text{depreciation}}{\text{short-term liabilities} + \text{long-term liabilities}}$$

$$\text{Liquidity} = \frac{\text{Current assets} - \text{short-term debt}}{\text{total assets}}$$

The four ratios mentioned so far are widely used in finance and trade literature to assess the financial soundness of firms. Moreover, international trade literature has utilized distinct financial constraint indicators that consider the unique features of international trade activities.

Firms regularly receive trade credit from their buyers and suppliers, providing them with an alternative to bank funding. Hence, access to (buyer-supplier) trade credit (TCRED) of Fisman and Love (2003) is used to represent a company's ability to depend on informal forms of credit rather than institutional financing (Fisman and Love, 2003). It indicates the proportion of total assets financed through credit, calculated as the ratio of accounts payable over total assets.

$$\text{TCRED} = \frac{\text{account payable}}{\text{total assets}}$$

The availability of bank loans may have a noticeable impact on the export performance of firms, creating heterogeneity across the industry (Sahin, 2022). Hence, as a final indicator of financial constraint, the study includes the ratio of bank loans to total liabilities, which indicates firms' dependence on commercial loans.

### **3.4. DATA CLEANING AND DESCRIPTIVE STATISTICS**

While the whole dataset provides comprehensive information on different characteristics of Turkish firms, using firm-level data for the analysis requires extensive effort in the data preparation phase. A review of the dataset shows that

the dataset includes observations not belonging to a calendar year period. For some observations, the balance sheet either covers less than one year or the period does not start in January, or both. In addition, for all balance sheet statements of 2013, the reporting period is missing. Very few duplicate observations also exist.

The empirical analysis omits observations whose accounting period is not a full calendar year and all observations of active firms in 2013, which presented the balance sheet at least once, not for the full calendar. Because accounting periods do not correspond to the full calendar year for most of the balance sheets for 2019, that year is removed from the analysis. After this filtering, the dataset includes more than 1.8 million observations.

The dataset on exports contains individual records of each export transaction, which allows the calculation of annual export revenue for each firm. As export transactions are recorded in US Dollars, the export figures are converted to Turkish Lira and merged with the balance sheet dataset. In addition, to accurately assess price changes and ratios across time, all prices are deflated by the sectoral producer price indices.

An important matter was that the economic activity codes reported by firms change over time. Once a firm alters its self-reported 2-digit economic activity code, the study assumes a new firm is included in the sample. The distribution of observations based on NACE 2-digit activity code for 2018 is listed in Table 5. The table indicates that the activities of the firms operating in the manufacturing industry in Türkiye are concentrated in sectors with low and medium-low technology levels.

Table 6 provides information about the sample size and export performance of in-sample firms. As reported in the literature, exporting firms in Türkiye are a fraction of the total sample. Only 15.6% of manufacturing firms included in the analysis had reported exports. This figure is lower than the rates reported in previous studies by Dalgic and Fazlioglu (2015a) and Dalgic and Fazlioglu

(2015b). The discrepancy can be attributed to the scope of the data because those studies include Turkish manufacturing firms with more than 20 employees.

**Table 5: The Distribution of Observations Based on NACE Activity Code**

<b>NACE Activity code</b>	<b>Number of Observations in 2018</b>
C10-Manufacture of food products	22,297
C11-Manufacture of beverages	615
C12-Manufacture of tobacco products	32
C13-Manufacture of textiles	12,582
C14-Manufacture of wearing apparel	20,350
C15-Manufacture of leather and related products	4,431
C16-Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	5,592
C17-Manufacture of paper and paper products	2,952
C18-Printing and reproduction of recorded media	6,131
C19-Manufacture of coke and refined petroleum products	278
C20-Manufacture of chemicals and chemical products	5,012
C21-Manufacture of basic pharmaceutical products and pharmaceutical preparations	513
C22-Manufacture of rubber and plastic products	11,846
C23-Manufacture of other non-metallic mineral products	9,740
C24-Manufacture of basic metals	4,009
C25-Manufacture of fabricated metal products, except machinery and equipment	26,515
C26-Manufacture of computer, electronic and optical products	1,323
C27-Manufacture of electrical equipment	6,132
C28-Manufacture of machinery and equipment n.e.c.	13,770
C29-Manufacture of motor vehicles, trailers and semi-trailers	3,595
C30-Manufacture of other transport equipment	1,093
C31-Manufacture of furniture	13,565
C32-Other manufacturing	5,693

Another noteworthy issue regarding export data is the export performance of the firms included in the analysis. In-sample firms realized only 54.2% of manufacturing industry exports in Türkiye. The difference indicates that some

manufacturing firms may rely on intermediaries, such as export agents and trading firms, for their export activities. These firms facilitate the export of the manufacturers by handling tasks such as finding customers, shipping, customs clearance, regulatory compliance, and logistics.

**Table 6: Annual Distribution of Exports and Companies**

Year	Value of Exports (million USD)	Number of Exporters	Number of Non-Exporters
2006	42,848	17,242	93,890
2007	55,752	18,530	102,884
2008	71,329	19,338	107,394
2009	53,623	19,587	109,104
2010	60,411	20,089	109,257
2011	73,344	20,671	112,388
2012	75,063	21,505	115,187
2013	76,929	23,343	120,899
2014	78,016	25,147	124,754
2015	70,836	25,669	131,007
2016	70,206	26,716	136,164
2017	76,789	24,863	143,163
2018	83,411	26,287	151,779

Table 7 provides descriptive evidence of the size, productivity and financial health differentials of the Turkish manufacturing industry. Exporters outperform domestic-only producers in all metrics reported in the table. Exporters have 9.46 times more total assets than non-exporters. In addition, the median number of employees of the exporters is 4.75 times, and labor productivity is 2.1 times higher than the non-exporters. These results verify the findings of Karamollaoğlu and Yalçın (2020), Aldan and Gunay (2008): Turkish exporters display higher levels of employment and labor productivity than the non-exporters.

The difference in their solvency ratio indicates that exporters have an advantage over non-exporters when it comes to making long-term investments for exports. Conversely, liquidity ratios reveal a similarity between exporters and non-

exporters. Therefore, the results imply that exporters are marginally more resilient to short-term shocks than non-exporting firms.

The descriptive analysis shows that exporters in Türkiye have better access to trade credit than non-exporters. When the bank ratio ratios of exporting and non-exporting firms are compared, there is also significant disparity in access to banking finance between firms that export and those that do not. Studies in the literature reveal that a strong banking sector and access to bank finance positively affect export performance. Both empirical studies and surveys indicate that for firms in Türkiye, access to the banking system is a significant barrier to exporting (WTO, 2021).

**Table 7: Median Values of Explanatory Variables for Exporters and Non-Exporters**

	<b>Exporters</b>	<b>Non-Exporters</b>
Labor Productivity	333,216	177,324
Number of Workers	24.75	5.50
Total Assets	6,519	689
Annual Wage	76,750	19,144
ROE	0.1003	0.0805
Profitability	0.0264	0.0168
Bank Ratio	0.1173	0.0000
Liquidity	1.3240	1.3122
Solvency	0.0513	0.0258
Trade Credit	0.1987	0.1316
Number of Observations	288,987	1,557,870

Table 8 examines the correlation among the firm-level and macroeconomic variables. The Industrial Production Index and the global demand variable show a high positive correlation. Conversely, there is high and negative correlation among the real effective exchange rate, the global demand variable, and the industrial production index. but no strong correlation exists between the financial constraint indicators and the macroeconomic variables.

**Table 8: Correlation Matrix of Explanatory Variables**

	Pr(Exporter=1)	Profitability	Log (Labor Prod.)	L.Log (Labor Prod.)	Real Interest Rate	Liquidity	ROE	Bank Ratio	Industrial Production Index	Global Export Demand	Log(REER)	L.Log(REER)	Solvency	Trade Credit	Age of Firm
Pr(Exporter=1)	1.00														
Profitability	0.00	1.00													
Log (Labor Prod.)	0.24	0.00	1.00												
L.Log (Labor Prod.)	0.24	0.00	0.78	1.00											
Real Interest Rate	0.02	0.00	0.00	-0.01	1.00										
Liquidity	0.00	0.00	0.00	0.00	0.00	1.00									
ROE	0.00	0.08	0.00	0.00	0.00	-0.00	1.00								
Bank Ratio	0.05	0.00	0.04	0.04	0.00	0.00	0.00	1.00							
Industrial Production Index	-0.03	0.00	0.04	0.04	-0.46	0.00	0.00	0.00	1.00						
Global Export Demand	0.01	0.00	0.09	0.09	-0.50	0.00	0.00	0.00	0.79	1.00					
Log(REER)	0.01	0.00	-0.01	-0.03	0.66	0.00	0.00	0.00	-0.79	-0.80	1.00				
L.Log(REER)	0.01	0.00	-0.01	-0.02	0.50	0.00	0.00	0.00	-0.69	-0.78	0.69	1.00			
Solvency	0.00	0.06	0.00	0.00	0.00	0.11	0.79	0.00	0.00	0.00	0.00	0.00	1.00		
Trade Credit	0.00	-0.05	-0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	1.00	
Age of Firm	-0.03	0.00	-0.02	-0.02	0.00	0.00	0.00	0.00	0.04	0.03	-0.02	-0.02	0.00	0.00	1.00

## CHAPTER 4

### EMPIRICAL MODEL AND RESULTS

#### 4.1. HECKMAN SELECTION MODEL

Analysis of the role of financial constraints and credit conditions on the selection for export and the intensity of firm-level exports requires estimating two interlinked models. It is necessary to use the Heckman two-step model due to non-random sample selection and truncated dependent variables to properly analyze the factors that determine exporter status and export intensity. In the first stage, the study identifies the factors affecting firms' decision to become exporters. Conditional on being an exporter, it then investigates which factors determine the size of exports.

Using the Heckman model requires consideration of the model's inherent characteristics. The stability of the Heckman selection model relies strongly on the proper specification of a model and a dataset that supports the model's assumptions. However, if the model is not correctly specified or the dataset does not hold the assumptions of the Heckman selection model, the model may become unstable (Stata, n.d.).

The preliminary analyses' results indicated non-convergence when using Heckman MLE. The non-convergence arises from the fact that MLE of the standard Heckman selection model assumes that errors of selection equation and regression are normally distributed simultaneously. To overcome this problem, Heckman (1979) proposed a two-stage method that relaxes this assumption and gives consistent covariance estimates (Stata, n.d.).

In the first stage of Heckman's (1979) two-stage model, the latent variables  $z$  and  $y$  are determined as observed or not observed, where  $y$  is observed if  $z$  equals 1. In the second stage, the model estimates the expected values of  $y$  given that they are observable, incorporating the  $z$  dummy variable, a normally distributed latent

variable ( $z^*$ ), and an error term ( $u_2$ ). In other words, if  $z$  is equal to 1, then  $y$  is observed, and a second latent variable ( $y^*$ ) is also realized with the error term ( $u_1$ ). Hence, a generalized Heckman model can be written as:

(i) Selection equation (first stage)

$$z_j^* = w_j\gamma + u_{2j} \quad (4.1)$$

$$z_j = \begin{cases} 1 & \text{if } z_j^* > 0 \\ 0 & \text{if } z_j^* \leq 0 \end{cases} \quad (4.2)$$

Dependent  $y_j$  is only observed when  $z_j=1$ .

(ii) Regression equation (second stage)

$$y_j^* = x_j\beta + u_{1j} \quad (4.3)$$

$$(u_1, u_2) \sim [0, 0, 1, \sigma, \rho] \quad (4.4)$$

In these equations, error terms of selection and regression equations,  $u_1$  and  $u_2$ , are both normally distributed with 0 mean, standard deviations of 1 and,  $\sigma$  respectively. Both of the error terms are uncorrelated with  $z_j$  and  $y_j$  respectively.  $\rho$  denotes the correlation coefficient between two error terms.

$$E(y|w, u_2) = x\beta + \rho u_2 \quad (4.5)$$

$$E(y|w, u_2) = x\beta + \rho E(u_2|w, z) \quad (4.6)$$

$$(y|w, z=1) = x\beta + p\lambda(w\gamma) \quad (4.7)$$

When  $p = 0$  in the equations mentioned above, there is no correlation between the error term  $u_1$  in the first stage and the error term  $u_2$  in the second stage. However, if  $p \neq 0$ , there exists a correlation between  $u_1$  and  $u_2$ , which leads to selection bias. On the other hand,  $p=1$  i.e. the correlation between  $u_1$  and  $u_2$  is equal to one, both the selection and regression equations are jointly determined by the same set of variables. If this holds true, then estimation models can be simplified into the Tobit model (Doğan, 2015).



## 4.2. EMPIRICAL MODEL

We simultaneously investigate the impact of credit conditions and financial constraints on exporter status and export intensity utilizing a two-step Heckman selection model. In the model, the selection equation is characterized by:

$$\begin{aligned} \Pr(Y_{it}>0) = & \alpha_0 + \sum \alpha_{1i} * \text{FINCONS}_{it} + \sum \alpha_{2i} * \text{FINCONS}_{it} * \text{CREDIT}_t + \alpha_3 * \text{CREDIT}_t \\ & + \alpha_4 * \Pr(Y_{i(t-1)}>0) + \alpha_k * X_{it} + \alpha_l * X_{i(t-1)} + u_{1t} \end{aligned} \quad (4.8)$$

Our corresponding regression equation for the export level is given by:

$$\begin{aligned} \ln(Y_{it}) = & \beta_0 + \sum \beta_{1i} * \text{FINCONS}_{it} + \sum \beta_{2i} * \text{FINCONS}_{it} * \text{CREDIT}_t + \beta_3 * \text{CREDIT}_t \\ & + \beta_m * X_{it} + \beta_n * X_{i(t-1)} + u_{2t} \end{aligned} \quad (4.9)$$

where  $i$  indexes firms,  $t$  shows time (years),  $\Pr(Y_{it}>0)$  is probability of being exporter in a given year,  $\ln(Y_{it})$  is the logarithm of ratio of exports over sales,  $\text{FINCONS}_{it}$  are financial constraint indicators,  $\text{CREDIT}_t$  is the measure of credit constraint, and  $X_{it}$  are control variables and dummy variables.

As a measure of financial constraints, we employed six ratios: ROE, profitability, liquidity, solvency, trade credit and bank ratios. We added real effective exchange rate, labor productivity, industrial production index, global export demand coefficient and age of firm as control variables. To isolate the sector, size and technology level-specific components of export performance, we added sector, size and technology level dummies.

In the Heckman Model, most of the times a potential solution may be identified if certain variables have a significant impact on the probability of observation but do not affect the outcome being analyzed. Therefore, we include age of a firm as a variable in the selection equation.

Because our dependent variable, export over sales ratio, is measured in logs, the magnitude of coefficient estimates of the regression equation needs to be analyzed as elasticities or percentage changes. For the dummy variables,

coefficients represent the percentage increase in exports for firms that move from one group to another. For the linear variables, coefficients reflect the percentage change in exports with respect to one unit increase in the explanatory variable. On the other hand, for independent variables measured in logs, coefficient in the regression equation reflects the elasticity of export intensity, i.e. how many percent export intensity changes if the variable increases by 1%.

Three variables (namely, Industrial Production Index, Global Export Demand Coefficient, and Real Effective Exchange Rate), which are determined to be used in the model to control for competitiveness and production conditions in Türkiye, are employed separately to avoid collinearity. All the calculations are performed using STATA.

### **4.3. EMPIRICAL RESULTS**

This chapter presents the results obtained from the four sets of econometric models applied to the entire sample. In the base model set, real effective exchange rate is used as one of the control variables. In the alternative model specifications, the lag of the real effective exchange rate, the industrial production index, and one of the global export demand coefficients are included in rotation.

Both our baseline model and alternative models are used to understand the impact of financial constraints and credit conditions on both firms' export intensity as well as propensity to become an exporter. Other macroeconomic and firm level control variables employed in the models capture different factors that affect the firms' export performance. Moreover, the model is utilized to explore the varying impacts of macroeconomic and firm-specific variables across distinct categories, and the estimation outcomes are reported.

### 4.3.1. Results of the Base Model

The empirical analysis initially employs the real effective exchange rate as a control variable and runs seven different Heckman models defined in equations 4.8 and 4.9 for the sample. The research alternately includes one of the six financial constraint indicators in the estimations in six models. In addition, it estimates the coefficient parameters by including all financial constraint indicators. Table 9 presents coefficient estimates of both selection and regression equations for the models that include either all financial constraints or one of these: trade credit, ROE, or bank ratio. Table 10 shows the results of the three remaining models.

P-values of the Wald test in all Heckman model specifications indicate that the coefficient estimates of the regression equations are not jointly zero, meaning that the models have explanatory value. In simpler terms, the test statistics confirm that the models are effective. Besides, the correlation of errors of the selection equations and the regression equations " $\rho$ "s are negative in all specifications thus, unobserved factors that increase the probability of exporting are likely to decrease export intensity..

#### 4.3.1.1. Results of the Selection Equation

Although the interpretation of coefficient estimates of the probit regression, which measures the effects of regressors on the probability of being an exporter is not straightforward, the sign of the coefficient estimates provides the direction of the relation between the regressors and the dependent variable. Examining the effects of financial constraint indicators on the probability of becoming an exporter demonstrate that only the bank ratio and profitability positively affect becoming an exporter. The finding on the positive impact of access to bank loans confirms Atabek-Demirhan (2016b), which also uses bank ratio for their empirical model

and states that the export behavior of Turkish firms (both entry into export and survival) strongly depends on access to bank loan due to lack of development of alternative financial instruments. Similarly, WTO (2022) reports the importance of access to bank financing for Turkish firms to participate in the global value chain. The result is also in line with the literature, which has shown that both financial development and access to finance facilitate the expansion of firms' businesses in new export markets, requiring significant expenses for activities including but not limited to product design, marketing, and distribution (Hasan and Sheldon, 2016; Manova et al., 2015; Berman and Hericourt, 2010).

The results about the relationship between profitability and the likelihood of being an exporter align with the theoretical literature. The literature posits that highly profitable firms are better positioned to start exporting due to the fact that there are different fixed costs associated with becoming an exporter. However, there exists a lack of consensus in the empirical literature on the effect of profitability on firms' decision to become exporters. While Kox and Rojas-Romagosa (2010), Atabek-Demirhan (2016a) found that more profitable firms self-select into exporting, the results of Atabek-Demirhan (2016b), Temouri et al. (2011) Vogel and Wagner (2010) document that less profitable firms self-select into exporting.

The coefficient estimates for ROE, another financial constraint measure related to a firm's profitability, reflect the absence of a unanimous conclusion in the empirical literature on the role of profitability. In addition, the results show that the liquidity ratio does not have a clear relationship with a firm's likelihood of being an exporter, which is consistent with the findings of Akarims (2013) for publicly listed Turkish companies. However, this contradicts the findings of Greenaway et al. (2007) and Miravittles et al. (2018), which demonstrate that higher levels of liquidity are associated with a greater probability of being an exporter.

Similar to the liquidity ratio, there is no statistically significant relation between the solvency of a firm and the likelihood of it becoming an exporter. In addition, no robust relation is detected between the dependent variable of the selection equation and access trade credit which demonstrates firms' capacity to utilize informal financing methods. The preference for financial instruments that prevent

mutual information asymmetry may explain the lack of significance for the trade credit ratio.

The negative coefficient of the cost of credit implies that the probability of becoming an exporter is inversely related to the real interest rate of commercial loans. This result is identified with the inclusion of bank ratio, our indicator of access to finance, in our model. This finding is consistent with the results of Monteiro and Moreira (2022), which demonstrates that an increase in credit costs reduces the probability of Portuguese firms becoming exporters and even strengthens the exit of existing exporters from international markets. Additionally, the estimation results indirectly support another conclusion of Monteiro and Moreira (2022) that the decline in exports primarily occurs in products with high dependence on bank credit.

Examination of the interaction between financial constraints and credit conditions on the likelihood of firms becoming exporters reveals no significant relationship. Unlike Chor and Manova (2012), this result suggests that credit conditions do not dampen or boost the impact of financial constraints.

The models show a positive and statistically significant relationship between being an exporter in the previous year and the probability of being an exporter. This relation suggests that sunk costs play a factor in firms' export decisions. However, in previous studies on Türkiye's manufacturing industry, it has been observed that firms' experiences in export markets depreciate rapidly. There is no significant difference between the probability of a firm that has never exported before and a firm that exported three years ago to become an exporter. (Atabek-Demirhan, 2016a). Additionally, the literature suggests that firms' export continuity also exhibits heterogeneity. Specifically, a number of studies emphasize that the positive relationship between export experience and the likelihood of becoming an exporter increases with firm size (Berthou and Vicard, 2015; Freund and Pierola; 2013; Eaton et al. 2007).

Another significant relationship observed in the selection equation results is the inverse relationship between firm age and the likelihood of becoming an exporter.

While research on the relationship between the probability of exporting and the propensity to become an exporter is scarce, Wagner (2015) states that firms are expected to acquire sufficient expertise and accumulate adequate capital to offset the fixed costs of exporting by initially catering to domestic markets. Since it can take several years for firms to cover their export costs and accumulate enough experience to compete effectively in international markets, there is generally a positive correlation between a firm's age and the likelihood of becoming an exporter. Although older firms have enough resources to gain a foothold in international markets, as Ursic and Czinkota (1984) note, the decision of firms to export is also related to the characteristics of the company management. At the same time, it has been observed that young firms prefer to turn to foreign markets because of the cost of competing with established players in the domestic market.

The analysis reveals a statistically significant and positive relationship between the lag of labor productivity and the likelihood of becoming an exporter. According to the analysis results, firms that increase their labor productivity in the previous period are more likely to become exporters. This finding is consistent with the literature that examines the differences between firms that are exporters and those that are not. The literature attributes productivity differences to two reasons. According to the learning-by-exporting hypothesis, firms will enhance their level of productivity as they become exporters since they enter a competitive environment after becoming exporters. On the other hand, according to the self-selection hypothesis, highly productive firms can become exporters because they are ready for international markets and can afford the necessary fixed costs. When the association between export and productivity is considered, the finding is consistent with the self-selection hypothesis, whose existence is confirmed for Turkish firms by Atabek-Demirhan (2016a) and Dalgic et al. (2015b).

The findings point out a rather odd relation between the real effective exchange rate and the probability of becoming an exporter in the selection model. The positive coefficient of REER indicates that appreciation of the Turkish Lira is associated with an increase in the number of exporters. Whereas there are studies in the export literature that show a positive link between exchange rate

competitiveness and both intensive and extensive margin of exports, some studies emphasize the role of the hysteresis effect, i.e. firms entering into export markets do not make short-term decisions based solely on exchange rates due to the fixed costs they face. According to those studies, the exchange rate in the current period may not be the primary decision factor for firms going international. Instead, non-price competition may play a role in entry dynamics (Atabek-Demirhan, 2016b). On the other hand, Chaney (2016) defines two opposing effects of exchange rate fluctuations. While the depreciation of the exchange rate decreases the relative price of goods and makes firms more competitive in foreign markets, the model also accounts for erosion in the value of assets that are used to finance the fixed costs associated with exporting – leading to a negative effect on the extensive margin of trade.

#### 4.3.1.2. Results of the Regression Equation

The results of the regression equations, which estimate the impact of the regressors on the export intensity, differ from those of the selection equations. The most notable example is the coefficient estimates of bank ratio and labor productivity. While a positive and significant relationship was observed for both variables in the selection equation, there is an opposite and significant relationship between both variables and the export intensity. In the case of labor productivity, 10% increase in the previous year is associated with a 1.71-2.16% decrease in the share of exports on sales.

While the findings on the relationship between labor productivity and export intensity contradict many earlier studies, Rodriguez-Pose (2013) finds a similar relationship for Indonesian firms and argues that the inverse relationship may result from the firms' low technology levels. However, this statement does not appear to hold for the firms in Türkiye because when the analysis is repeated according to different technology levels, negative relation holds for all technology levels.

A negative and statistically significant connection exists between the firms' export intensity, and solvency, return on equity (ROE) but no significant relation is observed between profitability and our dependent variable. A comparison of the findings on two alternative profitability indicators with those of earlier studies reveals conflicting conclusions about the relationship between export and profitability. The finding about the impact of ROE is in line with Mihci and Akkoyunlu Wigley (2002), which shows that negative correlation between the exports and mark-up rate at the manufacturing industry level after Türkiye's accession into the Customs Union. Notwithstanding, Şahin (2022) found a positive impact of profitability, solvency, and ROE on export volume. Conversely, Grazzi (2012) suggests that no positive relationship exists between export and profitability.

The coefficient estimates of the remaining two financial constraint indicators indicate no significant relationship between the company's export intensity, liquidity ratio, and trade credit ratio. Therefore, the company's ability to meet short-term obligations and access to trade credit has not been found to have a positive impact on increasing firms' export intensity. Similarly, all financial constraints, except for solvency ratio, do not increase or diminish the impact of the cost of credit on the export intensity. As for the solvency ratio, the inverse relation between the solvency ratio and export intensity is dampened when there is an increase in real interest rate of commercial loans.

Results reveal that 10 point increase in the real interest rate of commercial loans leads to a 7.9% increase in the export intensity. This is consistent with the literature, as export is a more finance-intensive activity than domestic trade. For example, Monteiro and Moreira (2022) empirically showed that Portuguese firms adjust their exports through extensive and intensive margins in the face of changes in credit costs. Similarly, Chor and Manova (2012) have shown a negative relationship between credit costs and exports.



**Table 9: Estimation Results of the Base Model-Part 1**

	All Constraints		Trade Credit		ROE		Bank Ratio	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.5114***		2.5105***		2.4744***
Log(Labor Prod (t-1))	-0.1705***	0.1099***	-0.2164***	0.1205***	-0.1851***	0.1259***	-0.2059***	0.1067***
Log(REER)	-0.42967	3.0657***	-1.1699***	-1.9601***	-0.9900***	-1.9405***	-0.1378	3.0540***
Real Interest Rate	-0.7931**	-2.0697***	0.0116	2.9314***	-0.2063	2.9175***	-1.0228***	-2.0843***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000	-0.0009	-0.0000				
Trade Credit* Real Interest Rate	0.0134	0.0000	0.0110	0.0000				
ROE	-0.0001***	-0.0000			-0.0000	0.0000		
ROE*Real Interest Rate	0.0003*	0.0001			0.0000	-0.0000		
Bank Ratio	-0.4947***	0.5904***					-0.3650***	0.5628***
Bank Ratio*Real Interest Rate	0.1317	-0.1028					0.0773	-0.0022
Profitability	0.0000	0.0000**						
Profitability* Real Interest Rate	-0.0000	0.0000*						
Liquidity	0.0000	-0.0000						
Liquidity*Real Interest Rate	-0.0001	0.0006						
Solvency	-0.0000***	0.0000						
Solvency*Real Interest Rate	0.0004***	-0.0003						
Wald (chi2)	11322.57***		10963.16***		10621.96***		11225.7***	
Rho	-0.4353		-0.4173		-0.4266		-0.4240	
Observations	994,858	994,858	1,009,649	1,009,649	1,003,252	1,003,252	1,001,989	1,001,989

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 10: Estimation Results of the Base Model-Part 2**

	All Constraints		Profitability		Liquidity		Solvency	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.5114***		2.5102***		2.5103***
Log(Labor Prod (t-1))	-0.1705***	0.1098***	-0.2164***	0.1205***	-0.2144***	0.1206***	-0.2141***	0.1206***
Log(REER)	-0.4297	3.0657***	-1.1674***	-1.9598***	-1.1009***	-1.9413***	-1.1386***	-1.9365***
Real Interest Rate	-0.7931**	-2.0697***	0.0118	2.9312***	-0.0275	2.9100***	-0.0328	2.9090***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000						
Trade Credit*Real Interest Rate	0.0134	0.0000						
ROE	-0.0001***	-0.0000						
ROE*Real Interest Rate	0.0003*	0.0001						
Bank Ratio	-0.4947***	0.5904***						
Bank Ratio*Real Interest Rate	0.1317	-0.1028						
Profitability	0.0000	0.0000**	-0.0000	-0.0000				
Profitability* Real Interest Rate	-0.0000	0.0000*	-0.0000	0.0000				
Liquidity	0.0000	-0.0000			0.0000	-0.0000		
Liquidity*Real Interest Rate	-0.0001	0.0006			-0.0001	0.0000		
Solvency	-0.0000***	0.0000					-0.0000***	-0.0000
Solvency*Real Interest Rate	0.0004***	-0.0003					-0.0000***	0.0000*
Wald (chi2)	11322.57***		10963.3***		10927.69***		12265.65	
Rho	-0.43531		-0.4200		-0.4194		-0.4204	
Observations	994,858	994,858	1,009,649	1,009,649	1,001,041	1,001,041	1,001,988	1,001,988

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

When examining the role of the real effective exchange rate on export intensity, a negative but not statistically significant relationship is detected. The negative coefficient is muted by the simultaneous addition of different financial constraints into the model, most notably bank ratio. According to Karamollaoğlu and Yalçın (2020), the competitive advantage of exchange rate depreciation in Türkiye may not be significant because the cost of production, more specifically, high import dependence, and balance sheet channels could balance it out or make it less effective.

#### **4.3.2. Estimation Results of Alternative Models**

This study alternately employs three new control variables to test the robustness of the base model results. The study acknowledges the potential problem of exchange rate pass-through affecting exports at both extensive and intensive margins. The analysis, therefore, replaces the current real effective exchange rate variable used in the base model with the previous year's real effective exchange rate. Table 11 presents the estimation results for the models that include all financial constraints and one of the trade credit, ROE, or bank ratios, whereas Table 12 provides the results of the models that incorporate the profitability, liquidity, or solvency ratios.

According to Table 11 and 12, the direction and statistical significance of the coefficient estimates of the financial constraint indicators and the interaction terms between financial constraints and credit costs variables overlap with the base model. In addition, although the impact of credit conditions on the likelihood of becoming an exporter is similar to that of the base model, a statistically significant and opposite-directional relationship between export intensity and credit costs has not been observed.

In order to control the impact of sector-specific production dynamics, the research exploits the industrial production index as a control variable in the analysis. Table 13 presents the estimation results for the models that incorporate all financial

constraints and one of the trade credit, ROE, and bank ratios. Meanwhile, Table 14 shows the estimation results for the models that incorporate the profitability, liquidity, and liquidity solvency ratios.

The results obtained after adding the industrial production index to the model are consistent with the findings of the base model. Access to finance, measured by bank ratio and profitability, has positive and statistically significant effects on the likelihood of being an exporter. In contrast, there is an inverse relationship between ROE, bank ratio, solvency, and export intensity. Moreover, in line with the base model, the empirical study determines the negative impact of credit costs on the likelihood of being an exporter and export intensity.

When exploring the relationship between the industrial production index and exports, a negative relationship is observed between sectoral industrial production and the probability of firms becoming exporters. This relationship reveals that, in the face of contraction in industrial production in Türkiye, producers prefer to turn towards international markets. Additionally, while the direction of causality is the subject of a different study focusing on the export-led growth hypothesis, a positive and significant relationship has been identified between the level of industrial production and the intensity of firms' exports.

As a final robustness check, the empirical analysis utilizes another critical control variable in the investigation: The global export demand coefficient, i.e., the weighted average of GDPs of Türkiye's export partners. The inclusion of this parameter is inspired by the fact that international trade literature emphasizes the significant relationship between the economic size of export partners and country-level export performance. Table 15 displays the estimation results for the models that include all financial constraints and either trade credit, ROE, or bank ratio. On the other hand, Table 16 demonstrates the estimation results for the models that include either profitability, liquidity, or solvency.

The selection and regression equations' results present similarities with the baseline model. Additionally, the growth in export markets does not significantly affect firms' probability of becoming exporters. On the other hand, the results

verify the positive and significant relationship between the economic size of export partners and firms' export intensity. In the literature on heterogeneous firms, both Lawless (2010) and Bernard et al. (2007) examines the effects of foreign demand on the extensive and intensive margins and show the positive impact of external demand on both the export volume and the number of exporting firms. The results of the last set of analyses are consistent regarding the intensive margin but differ from these studies regarding the extensive margin.

### **4.3.3. Estimation Results for SMEs**

The results presented in the previous section are obtained by adding various control variables for the size of the firms, economic activity code, and technology levels. However, it is necessary to divide the sample based on firm characteristics to demonstrate outcome variations based on company characteristics accurately. Hence, this section splits the sample according to firms' SME status and then analyzes the results for the two sub-samples.

We initially utilize the previously used model structure to which the real effective exchange rate was added. However, rho values of the models are outside the range of -1 and 1, and this finding questions the validity of the results.

As discussed previously, one of the most significant disadvantages of the Heckman models is that the reliability of the models strongly depends on both the data distribution and the model specification. Therefore, we alternatively used the model specification that included the global export demand coefficient as one of the control variables. Table 17 presents the results for the two subsamples which incorporates all financial constraint indicators.

The results of the two models demonstrate that the p-value of the Wald test statistic is 0. Additionally, the correlation coefficient is negative and greater than -1. Both statistics support that the results for the SME subsample are valid. On

Table 11: Estimation Results of the Model 2 (Log(REER<sub>t-1</sub>))-Part 1

	All Constraints		Trade Credit		ROE		Bank Ratio	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.5114***		2.5105***		2.4744***
Log(Labor Prod (t-1))	-0.1705***	0.1098***	-0.2164***	0.1205***	-0.1851***	0.1259***	-0.2059***	0.1067***
Log(REER(t-1))	-1.1580	8.2616***	0.0313	7.8997***	-0.5558	7.8622***	-0.3712	8.2301***
Real Interest Rate	0.3163	-9.9847***	-1.1998	-9.5284***	-0.4575	-9.4729***	-0.6671	-9.9691***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000	-0.0009	-0.0000				
Trade Credit*Real Interest Rate	0.0134	0.0000	0.0110	0.0000				
ROE	-0.0001***	-0.0000			-0.0000	0.0000		
ROE*Real Interest Rate	0.0004*	0.0001			0.0000	-0.0000		
Bank Ratio	-0.4947***	0.5904***					-0.3650***	0.5628***
Bank Ratio*Real Interest Rate	0.1317	-0.1028					0.0773	-0.0022
Profitability	0.0000	0.0000**						
Profitability*Real Interest Rate	-0.0000	0.0000*						
Liquidity	0.0000	-0.0000						
Liquidity*Real Interest Rate	-0.0001	0.0000						
Solvency	-0.0000***	0.0000						
Solvency*Real Interest Rate	-0.0004***	-0.0000						
Wald (chi2)	11322.57***		10963.16***		10621.96***		11225.7***	
Rho	-0.4353		-0.4173		-0.4266		-0.4240	
Observations	994,858	994,858	1,009,649	1,009,649	1,003,252	1,003,252	1,001,989	1,001,989

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 12: Estimation Results of the Model 2 (Log(REER<sub>t-1</sub>))-Part 2

	All Constraints		Profitability		Liquidity		Solvency	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.5114***		2.5102***		2.5103***
Log(Labor Prod (t-1))	-0.1705***	0.1098***	-0.2164***	0.1205***	-0.2144***	0.1206***	-0.2141***	0.1206***
Log(REER(t-1))	-1.1580	8.2616***	0.0318	7.8991***	-0.0742	7.8421***	-0.0884	7.8394***
Real Interest Rate	0.3163	-9.9847***	-1.1979	-9.5274***	-1.0299	-9.4544***	-1.0539	-9.4469***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000						
Trade Credit*Real Interest Rate	0.0134	0.0000						
ROE	-0.0001***	-0.0000						
ROE*Real Interest Rate	0.0004*	0.0001						
Bank Ratio	-0.4947***	0.5904***						
Bank Ratio*Real Interest Rate	0.1317	-0.1028						
Profitability	0.0000	0.0000**	-0.0000	-0.0000				
Profitability*Real Interest Rate	-0.0000	0.0000*	-0.0000	0.0000				
Liquidity	0.0000	-0.0000			0.0000	-0.0000		
Liquidity*Real Interest Rate	-0.0001	0.0000			-0.0001	0.0000		
Solvency	-0.0000***	0.0000					-0.0000***	-0.0000
Solvency*Real Interest Rate	-0.0004***	-0.0000					-0.0000***	0.0000*
Wald (chi2)	11322.57***		10963.3***		10927.69***		12265.65***	
Rho	-0.4353		-0.4173		-0.4194		-0.4204	
Observations	994,858	994,858	1,009,649	1,009,649	1,001,041	1,001,041	1,001,988	1,001,988

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 13: Estimation Results of the Model 3 (IPI)-Part 1

	All Constraints		Trade Credit		ROE		Bank Ratio	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4721***		2.5111***		2.5102***		2.4742***
Log(Labor Prod (t-1))	-0.1709***	0.1102***	-0.2168***	0.1208***	-0.1855***	0.1263***	-0.2064***	0.1070***
Industrial Prod. Index	0.0029***	-0.0021***	0.0033***	-0.0024***	0.0032***	-0.0024***	0.0031***	-0.0021***
Real Interest Rate	-0.8567***	-1.5361***	-1.1620***	-1.4472***	-1.0199***	-1.4299***	-1.0356***	-1.5527***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000	-0.0009	-0.0000				
Trade Credit*Real Interest Rate	0.0132	0.0000	0.0109	0.0000				
ROE	-0.0001***	-0.0000			-0.0000	0.0000		
ROE*Real Interest Rate	0.0004*	0.0001			-0.0000	-0.0000		
Bank	-0.4927***	0.5892***					-0.3630***	0.5617***
Bank Ratio*Real Interest Rate	0.1095	-0.0935					0.0541	0.0069
Profitability	0.0000	0.0000**						
Profitability*Real Interest Rate	-0.0000	0.0000*						
Liquidity	0.0000	-0.0000						
Liquidity*Real Interest Rate	-0.0002	0.0000						
Solvency	-0.0000***	0.0000						
Solvency*Real Interest Rate	0.0004***	-0.0000						
Wald (chi2)	11339.02***		10984.01***		10641.6***		11244.19***	
Rho	-0.4354		-0.4173		-0.4267		-0.4240	
Observations	994,858	994,858	1,009,649	1,009,649	1,003,252	1,003,252	1,001,989	1,001,989

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1



Table 14: Estimation Results of the Model 3 (IPI)-Part 2

	All Constraints		Profitability		Liquidity		Solvency	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4721***		2.5111***		2.5099***		2.5100***
Log(Labor Prod (t-1))	-0.1709***	0.1102***	-0.2168***	0.1208***	-0.2148***	0.1210***	-0.2145***	0.1210***
Industrial Prod. Index	0.0029***	-0.0021***	0.0033***	-0.0024***	0.0033***	-0.0023***	0.0033***	-0.0024***
Real Interest Rate	-0.8567***	-1.5361***	-1.1595***	-1.4469***	-1.0996***	-1.4321***	-1.1384***	-1.4275***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000						
Trade Credit*Real Interest Rate	0.0132	0.0000						
ROE	-0.0001***	-0.0000						
ROE*Real Interest Rate	0.0004*	0.0001						
Bank	-0.4927***	0.5892***						
Bank Ratio*Real Interest Rate	0.1095	-0.0935						
Profitability	0.0000	0.0000**	-0.0000	-0.0000				
Profitability*Real Interest Rate	-0.0000	0.0000*	-0.000000	0.0000				
Liquidity	0.0000	-0.0000			0.0000	-0.0000		
Liquidity*Real Interest Rate	-0.0002	0.0000			-0.0001	0.0000		
Solvency	-0.0000***	0.0000					-0.0000***	-0.0000
Solvency*Real Interest Rate	0.0004***	-0.0000					-0.0000***	0.0000*
Wald (chi2)	11339.02***		10984.16***		10948.62***		2286.13***	
Rho	-0.4353		-0.4174		-0.41958		-0.4205	
Observations	994,858	994,858	1,009,649	1,009,649	1,001,041	1,001,041	1,001,988	1,001,988

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 15: Estimation Results of the Model 4 (Global Export Demand)-Part 1**

	All Constraints		Trade Credit		ROE		Bank Ratio	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.5113***		2.5104***		2.4744***
Log (Labor Prod (t-1))	-0.1712***	0.1099***	-0.2171***	0.1206***	-0.1858***	0.1260***	-0.2066***	0.1068***
Global Export Demand	0.0000***	-0.0000	0.0000***	-0.0000*	0.0000***	-0.0000*	0.0000***	-0.0000
Real Interest Rate	-0.8113***	-1.5557***	-1.1154***	-1.4711***	-0.9781***	-1.4547***	-0.9842***	-1.5721***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000	-0.0009	-0.0000				
Trade Credit*Real Interest Rate	0.0132	0.0000	0.0108	0.0000				
ROE	-0.0001***	-0.0000			-0.0000	0.0000		
ROE*Real Interest Rate	0.0004*	0.0001			0.0000	-0.0000		
Bank	-0.4925***	0.5901***					-0.3627***	0.5626***
Bank Ratio*Real Interest Rate	0.0864	-0.0989					0.0286	0.0015
Profitability	0.0000	0.0000**						
Profitability*Real Interest Rate	-0.0000	0.0000*						
Liquidity	0.0000	-0.0000						
Liquidity*Real Interest Rate	-0.0002	0.0000						
Solvency	-0.0000***	0.0000						
Solvency*Real Interest Rate	-0.0000***	0.0000*						
Wald (chi2)	11336.98***		10981.23***		10637.44***		11243.14***	
Rho	-0.4354		-0.4173		-0.4267		-0.42404	
Observations	994,858	994,858	1,009,649	1,009,649	1,003,252	1,003,252	1,001,989	1,001,989

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 16: Estimation Results of the Model 4 (Global Export Demand)-Part 2

	All Constraints		Profitability		Liquidity		Solvency	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.5113***		2.5101***		2.5103***
Log (Labor Prod (t-1))	-0.1712***	0.1099***	-0.2171***	0.1206***	-0.2151**	0.1207***	-0.2148***	0.1207***
Global Export Demand	0.0000***	-0.0000	0.0000***	-0.0000*	0.0000***	-0.0000*	0.0000***	-0.0000*
Real Interest Rate	-0.8113***	-1.55570***	-1.1129***	-1.4708***	-1.0530***	-1.4558***	-1.0915***	-1.4512***
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0005***
Trade Credit	-0.0011	-0.0000						
Trade Credit*Real Interest Rate	0.0132	0.0000						
ROE	-0.0001***	-0.0000						
ROE*Real Interest Rate	0.0004*	0.0001						
Bank	-0.4925***	0.5901***						
Bank Ratio*Real Interest Rate	0.0864	-0.0989						
Profitability	0.0000	0.0000**	-0.0000	-0.0000				
Profitability*Real Interest Rate	-0.0000	0.0000*	-0.0000	0.0000				
Liquidity	0.0000	-0.0000			0.0000	-0.0000		
Liquidity*Real Interest Rate	-0.0002	0.0000			-0.0001	0.0000		
Solvency	-0.0000***	0.0000					-0.0000***	-0.0000
Solvency*Real Interest Rate	-0.0000***	0.0000*					-0.0000***	0.0000*
Wald (chi2)	11336.98***		10981.41***		10946.06***		12284.21***	
Rho	-0.4354		-0.4173		-0.4195		-0.4205	
Observations	994,858	994,858	1,009,649	1,009,649	1,001,041	1,001,041	1,001,988	1,001,988

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

the other hand, the results of the model ran for the subsample that includes large-scale firms model are not valid since rho the correlation coefficient of both error are terms is originally less than -1.

A review of the results of the selection equation for the SME sub-sample reveals that they are consistent with the full-sample results. There is a positive effect of profitability ratio and bank ratio on the probability of firms being exporters. On the other hand, credit costs have a negative and statistically significant effect both on the probability of being an exporter and the export intensity. The interaction of financial constraint indicators with credit cost does not exhibit a statistically significant effect on exporter status.

The regression equation results for SMEs similarly resemble the full sample results. The analysis detects a negative and significant coefficient estimate for ROE, bank ratio, and solvency in the regression equation, but no significant relationship is found for other financial constraint indicators. Furthermore, among the interaction terms between financial constraint indicators and credit costs, only the product of the solvency ratio and the credit cost is statistically significant.

#### **4.3.4. Estimation Results for Different Levels of Technology**

This section of the study attempts to understand the variation of the results across different technology levels. For that reason, the study classifies firms into three categories: low-tech, medium-tech, and high-tech. Then it repeats the analyses conducted in the previous section for each technology level. Table 18 presents these analyses' results and those obtained for the entire sample.

The Wald test statistics of the analyses display a p-value of 0, and the Heckman models' correlation coefficients are negative and greater than -1. These outcomes signify our models' soundness and permit coefficient estimates' interpretation.

A critical finding among the coefficient estimates of various financial constraint indicators in the selection equations is that the bank ratio remains statistically significant across all models. However, the findings cannot establish a connection between the profitability ratio and the likelihood of being an exporter when we categorize the entire sample based on technology levels. Furthermore, an inverse relationship exists between the liquidity ratio and the likelihood of being an exporter for medium-technology and high-technology firms.

The relationship between credit costs and export entry varies for different technology levels. While high-technology firms are not adversely affected by increased credit costs, credit costs have a negative and statistically significant impact on the entry of medium- and low-technology firms into the market. However, no such effect is generally observed when reviewing the contribution of credit costs to the impact of financial constraints. Only the correlation coefficient between liquidity and credit costs is positive and significant for medium-technology firms.

The results of the regression model also support the existence of heterogeneity. A negative and statistically significant correlation exists between bank ratio and export intensity across all technology levels. However, the negative and significant correlation between solvency and ROE with export intensity is only present in medium-technology firms. In addition, the positive and significant relationship between the trade credit ratio indicates firms' access to informal credit and the export intensity of low-technology firms.

Regarding the impact of credit costs on export intensity, the effect of credit costs on export intensity is not statistically significant for low-tech firms. In contrast, this relationship is negative and significant for medium-technology industries and positive and significant for high-tech firms.

Whenever we detect a statistically significant effect of all financial constraint indicators except for bank ratio, the interaction between those financial constraint indicators and credit costs is statistically significant. For low-tech firms, the increase in credit costs dampens the positive effect of access to trade credits on

export intensity. In medium-tech firms, the increase in credit costs has strengthened the inverse relationship between solvency and export intensity while dampening the relationship with ROE.

Past research indicates that knowledge of the financing methods of exports may assist in further comprehension of the outcomes presented above. For example, Demir and Javorcik (2020) and Demir and Javorcik (2018) reveal that firms adjust trade financing terms according to macroeconomic factors. However, since there was no data available on financing methods in the database used for the study, research including financing methods could not be conducted.

Table 17: Estimation Results Based on SME Status

	All Constraints		SME		Large Firms	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.4690***		2.3242***
Log (Labor Prod (t-1))	-0.1712***	0.1099***	-0.1703***	0.1081***	-0.3516***	0.0019
Global Export Demand	0.0000***	-0.0000	0.0000***	-0.0000	0.0000	0.0000
Real Interest Rate	-0.8113***	-1.5557***	-0.7741***	-1.5792***	4.4159	-2.8037
Age of Firm		-0.0005***		-0.0007***		-0.0001
Profitability	0.0000	0.0000**	0.0000	0.0000**	0.7859	0.2669
Profitability*Real Interest Rate	-0.0000	0.0000*	-0.0000	0.0000*	-11.8658	5.1304
Liquidity	0.0000	-0.0000	0.0000	-0.0000	-0.0011	0.0194
Liquidity*Real Interest Rate	-0.0002	0.0000	-0.0001	0.0000	-0.2667	-0.0987
Solvency	-0.0000***	0.0000	-0.0000***	0.0000	-0.0615	-0.0355
Solvency*Real Interest Rate	-0.0000***	0.0000*	0.0004***	-0.0000	-0.2174	-0.1096
Trade Credit	-0.0011	-0.0000	-0.0011	-0.0000	-1.0287**	0.1540
Trade Credit*Real Interest Rate	0.0132	0.0000	0.0136	0.0000	-8.9911	2.1307
ROE	-0.0001***	-0.0000	-0.0001***	-0.0000	0.0140	0.0216
ROE*Real Interest Rate	0.0004*	0.0001	0.0004*	0.0001	0.0063	0.2937
Bank	-0.4925***	0.5901***	-0.5692***	0.5880***	0.1680	0.4874***
Bank Ratio*Real Interest Rate	0.0864	-0.0989	0.3689	-0.2758*	-3.1171	2.4204
Wald (chi2)	11336.98***		9724.47***		249.17***	
Rho	-0.4354		-0.4328		-1	
Observations	994,858	994,858	961,419	961,419	8,910	8,910

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 18: Estimation Results for Different Technology Levels

	All Constraints		Low Tech		Medium Tech		High Tech	
	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation	Regression Equation	Selection Equation
Export Dummy (t-1)		2.4723***		2.5175***		2.4320***		2.3740***
Log (Labor Prod (t-1))	-0.1712***	0.1099***	-0.1335***	0.1259***	-0.2179***	0.0928***	-0.2737***	0.0797***
Global Export Demand	0.0000***	-0.0000	0.0000*	0.0000	0.0000***	-0.0000**	0.0000***	0.0000
Real Interest Rate	-0.8113***	-1.5557***	-0.2701	-1.3898***	-1.1454***	-1.6743***	7.2717**	-0.0187
Age of Firm		-0.0005***		-0.0005***		-0.0005***		-0.0001
Profitability	0.0000	0.0000**	-0.0000	0.0000	0.0000*	0.0000	0.2877	0.0022
Profitability*Real Interest Rate	-0.0000	0.0000*	0.0000	0.0000	-0.0002*	-0.0000	-5.5509	0.1008
Liquidity	0.0000	-0.0000	0.0000	-0.0000	0.0001	-0.0001***	0.0125*	-0.0042**
Liquidity*Real Interest Rate	-0.0002	0.0000	-0.0003	0.0000	0.0007	0.0007***	-0.1266	0.0266
Solvency	-0.0000***	0.0000	0.0000	0.0000	-0.0001***	0.0000	-0.0203	0.0051
Solvency*Real Interest Rate	-0.0000***	0.0000*	0.0005	-0.0000	-0.0012***	0.0000	0.0800	-0.0749
Trade Credit	-0.0011	-0.0000	0.0768**	-0.0001	-0.0009	-0.0000	0.0723	-0.1008
Trade Credit*Real Interest Rate	0.0132	0.0000	-0.7784**	0.0010	0.0108	0.0000	1.3448	0.0684
ROE	-0.0001***	-0.0000	-0.0000	-0.0000*	-0.0001**	-0.0000	-0.0005	-0.0045
ROE*Real Interest Rate	0.0004*	0.0001	0.0001	0.0003	0.0015***	-0.0000	0.2479	0.0061
Bank	-0.4925***	0.5901***	-0.4608***	0.5625***	-0.4919***	0.6168***	-0.5666***	0.6330***
Bank Ratio*Real Interest Rate	0.0864	-0.0989	-0.5238	-0.2270	0.5382	0.0268	-1.9472	-0.3889
Wald (chi2)	11336.98***		7665.21***		3237.77***		218.76***	
Rho	-0.4354		-0.4207		-0.4495		-0.5503	
Observations	994,858	994,858	529,382	529,382	456,709	456,709	8,731	8,731

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1



## CONCLUSION

The 2008 financial crisis spurred studies examining the theoretical and empirical relationship between firms' export behavior and their financial and credit conditions (Sayar, 2018). Efforts to comprehend the underlying reasons and consequences of the Great Trade Collapse primarily motivated this trend in the heterogenous firm literature. Studies have revealed that credit costs harm the export performance of companies. Furthermore, financial barriers can hinder a firm's ability to engage in export activities (Manova, 2013; Chor and Manovoa, 2012).

Lack of access to firm-level data limited the past research on the export performance of Turkish firms. As a result, the literature on Turkish firms lags behind the international literature. Nevertheless, multiple studies have explored the connection between firms' financial health, credit conditions, and export behavior over the past years. These investigations have so far revealed a positive relationship between firms' financial constraints and credit conditions and Turkish firms' export performance (Acar ,2009; Sayar, 2018; Demir et al., 2017; Demir and Javornik, 2020; Akarım, 2013; Gezici et al. 2018; Dincer, 2021; Sahin, 2022).

This research aims to understand the influence of financial constraints and credit conditions on Turkish firms' exporter status and export intensity. Previous research has focused on analyzing the impact of either financial or credit constraints on the export performance of Turkish firms. As a departure from prior studies, this is the first investigation that looks at credit conditions and financial constraints together and how they interact to affect the export performance of Turkish firms at the firm level. While doing that, the study attempts to understand whether financial constraints influence the effects of changes in credit costs on export performance. Therefore, it can provide insights into the relationship between firms' financial vulnerability, external financing costs, and export performance. In addition, the dataset used in the study permits detecting

heterogeneity in the impact of both constraints on entry into export markets and export intensity.

To this end, this study utilizes the most comprehensive firm-level data on Turkish manufacturing firms and macroeconomic variables, a panel of 1,846,870 firm-year observations. It employs six widely-used measures of financial constraints from existing literature to analyze the impact of financial vulnerability on Turkish manufacturing firms' export performance. These constraints, sourced from Turkish manufacturing firms' annual balance sheets, are profitability, liquidity, solvency, return on equity, trade credit, and bank ratio. In addition, the weighted average of real interest rates for commercial loans permits gauging the effects of credit constraints. In terms of empirical methodology, the study employs the Heckman selection model to account for concerns about the non-random properties of the data.

The descriptive analysis confirms the existence of exporter premia in terms of size, wage, and productivity. On average, exporters are larger, more productive, and pay higher wages to their employees. Similarly, improving financial constraint indicators is positively associated with firms' export status. These findings are in line with Dalgic et al. (2015b), Karamollaoğlu and Yalçın (2020).

The results of the Heckman model indicate that changes in the real cost of credit negatively affect the intensity of exports of Turkish manufacturing firms. This relation is mainly robust to using different control variables and including interaction terms between financial constraint indicators and the real cost of credit.

As for financial constraint indicators, access to bank loans and profitability positively impact being an exporter. However, there is a significant and negative relation between the increase in bank loans and firms' export intensity. The negative relation indicates that firms prioritize domestic market production when obtaining bank loans.

The export intensity of Turkish manufacturers demonstrates an inverse relation with their solvency and ROE. The interaction term between credit is also negative

and statistically significant. On the other hand, neither the likelihood of firms' becoming exporters nor their export intensity is statistically significantly and robustly correlated with access to trade credit and liquidity ratio, which measures their ability to satisfy their short-term financial obligations. The same relation holds true for the interaction terms between these four constraints and the real cost of commercial loans.

The technology level of a firm's industry is a significant source of heterogeneity in the role of financial constraints and credit conditions. The liquidity ratio has an inverse relationship with the probability of being an exporter for medium-technology and high-technology firms. Similarly, solvency and ROE negatively and statistically significantly impact export intensity in medium-technology firms. Conversely, the trade credit ratio positively and significantly correlates with export intensity in low-technology firms.

The impact of credit costs on export intensity varies depending on the technology levels of the firms. Credit costs do not have a statistically significant effect on export intensity for low-tech firms, but a negative and statistically significant impact for medium-tech firms and a positive and significant impact for high-tech firms.

Examining the impact of different macroeconomic control variables used in this study reveals a negative and statistically significant relationship between firms' labor productivity and their export intensity. This association is consistent across alternative model structures and firms with different technology levels. While this finding requires further research, Rodríguez-Pose et al. (2013), which found a similar relationship for Indonesian firms, note that productivity gains enhance only firms' internationalization. This observation holds for Turkish firms: across all technology levels, improvement in labor productivity increases firms' chances of being an exporter with a high statistical degree of significance.

When the effect of the exchange rate competitiveness on firms' export intensity is examined, we observe a negative but muted relation between export intensity and real exchange rate. Karamollaoğlu and Yalçın (2020) state that this

observation is consistent with most empirical research on Turkish manufacturers and attributes to the substantial proportion of foreign exchange-denominated expenses, including a significant amount of FX-denominated costs such as imported inputs and a high degree of dollarization of liabilities.

Estimation results also show that firms' export performance is positively and statistically significantly impacted by changes in the GDPs of Türkiye's trade partners. Diversity exists across different technology levels, with high technology sectors exhibiting the most statistically responsive to the growth of Türkiye's economic partners.

This study has several policy implications by identifying the factors that drive firms to become exporters and the challenges they face in entering foreign markets. Most notably, the study demonstrates to policymakers the impact of export credits on firms' export intensity and the variation across different technology levels of firms. The findings of this research will be valuable in developing data-driven policies to incentivize and sustain manufacturing exports. As Sayar (2018) argues, improving the availability of low-cost and long-term export financing solutions can enhance Turkish firms' competitiveness in foreign markets. The guarantee support provided by the Credit Guarantee Fund for Eximbank loans is a positive step taken toward this direction. At the same time, measures taken to contain financial fragility and inflation will reduce market volatility, thereby contributing positively to exports.

Secondly, the study recognizes access to banking and finance as a considerable barrier to entry into export markets. The negative impact of this barrier to becoming an exporter is particularly pronounced among high and medium-technology firms. Hence, any effort to increase the technology intensity of exports should be complemented by improving firms' access to finance.

Thirdly, the export intensity of firms exhibits no statistically significant relationship with the firm-level profitability indicators but a negative relationship with the firms' solvency ratio, which measures the ability to repay debts in the long term. These

findings reveal that Turkish firms must prioritize mitigating risks against fulfilling their long-term obligations.

While not the direct focus of this study, the results of the empirical analysis on the impact of macroeconomic variables have policy implications. The positive relation between labor productivity and propensity to become exporters suggests that policies to address manufacturing firms' participation in exports should also consider the significance of the productivity constraints. Based on this finding, efforts to enhance the manufacturing sector's digital transformation will also indirectly encourage firms' internationalization.

The analysis has four limitations. First, since export over sales is only observed when the company chooses to become an exporter, the study depends on the Heckman two-step method. While the Heckman two-step model solves sample selection bias, the validity of estimation results and the stability of the models strongly are highly influenced by two factors: appropriate specification of the model and whether the dataset holds the model's assumptions. During the research, these factors prevented the use of the Heckman model on several subsamples. Second, it is essential to note that the research relies on the balance sheet information that firms report to the Revenue Administration. Both anecdotal evidence and different studies indicate that small businesses may engage in tax evasion by misrepresenting items on their balance sheets. Determining the extent of these practices is not an easy task, but Senvar and Hamal (2022) have suggested that 29% of manufacturing SMEs in their sample manipulated their financial statements. Third, while the sample of the empirical research comprises all firms that submitted their balance sheets, the in-sample firms realized merely 54.2 % of manufacturing industry exports in Türkiye.

In terms of the direction of future research, we observe two equally important channels. First, this research measures the effects of commercial loans only through variation in the cost of Turkish lira-denominated loans. Access to the database recording Turkish firms' FX-denominated debts would significantly improve the robustness of the results by allowing us to observe the impact of access to foreign currency loans. Second, the current study only considers the

exports made directly by Turkish firms operating in the manufacturing sector. However, these exports only correspond to 54.5% of Türkiye's manufacturing industry exports. The inclusion of the exports through intermediaries, which may be tracked by "Declaration of Purchase-Declaration of Sale Forms," greatly enhance the reliability and validity of the findings.

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## APPENDIX1. ETHICS COMISSION FORM

	<b>HACETTEPE UNIVERSITY GRADUATE SCHOOL OF SOCIAL SCIENCES ETHICS COMISSION FORM FOR THESIS</b>
<b>HACETTEPE UNIVERSITY GRADUATE SCHOOL OF SOCIAL SCIENCES ECONOMICS DEPARTMENT</b>	
Date: 20/04/2023	
Thesis Title: THE ROLE OF FINANCIAL CONSTRAINTS AND CREDIT CONDITIONS ON FIRMS' EXPORT BEHAVIOUR: EVIDENCE FROM TURKISH MANUFACTURING INDUSTRY	
My thesis work related to the title above:	
<ol style="list-style-type: none"> <li>1. Does not perform experimentation on animals or people.</li> <li>2. Does not necessitate the use of biological material (blood, urine, biological fluids and samples, etc.).</li> <li>3. Does not involve any interference of the body's integrity.</li> <li>4. Is not based on observational and descriptive research (survey, interview, measures/scales, data scanning, system-model development).</li> </ol>	
I declare, I have carefully read Hacettepe University's Ethics Regulations and the Commission's Guidelines, and in order to proceed with my thesis according to these regulations I do not have to get permission from the Ethics Board/Commission for anything; in any infringement of the regulations I accept all legal responsibility and I declare that all the information I have provided is true.	
I respectfully submit this for approval.	
Date and Signature	
<b>Name Surname:</b> FATİH ERKEKOĞLU <b>Student No:</b> N13248696 <b>Department:</b> ECONOMICS <b>Program:</b> ECONOMICS (ENGLISH) <b>Status:</b> <input type="checkbox"/> MA <input checked="" type="checkbox"/> Ph.D. <input type="checkbox"/> Combined MA/ Ph.D.	
<b><u>ADVISER COMMENTS AND APPROVAL</u></b>	
<hr style="width: 20%; margin: 0 auto;"/> Prof. Dr. Ayşe Yasemin Yalta	





**HACETTEPE ÜNİVERSİTESİ**  
**SOSYAL BİLİMLER ENSTİTÜSÜ**  
**TEZ ÇALIŞMASI ETİK KOMİSYON MUAFİYETİ FORMU**

**HACETTEPE ÜNİVERSİTESİ**  
**SOSYAL BİLİMLER ENSTİTÜSÜ**  
**İKTİSAT ANABİLİM DALI BAŞKANLIĞI'NA**

Tarih: 20/04/2023

Tez Başlığı: FİNANSAL KISITLAR VE KREDİ KOŞULLARININ FİRMALARIN İHRACAT DAVRANIŞINDAKİ ROLÜ: TÜRK İMALAT SANAYİİNDEN KANITLAR

Yukarıda başlığı gösterilen tez çalışmam:

1. İnsan ve hayvan üzerinde deney niteliği taşımamaktadır,
2. Biyolojik materyal (kan, idrar vb. biyolojik sıvılar ve numuneler) kullanılmasını gerektirmemektedir.
3. Beden bütünlüğüne müdahale içermemektedir.
4. Gözlemsel ve betimsel araştırma (anket, mülakat, ölçek/skala çalışmaları, dosya taramaları, veri kaynakları taraması, sistem-model geliştirme çalışmaları) niteliğinde değildir.

Hacettepe Üniversitesi Etik Kurullar ve Komisyonlarının Yönergelerini inceledim ve bunlara göre tez çalışmamın yürütülebilmesi için herhangi bir Etik Kurul/Komisyon'dan izin alınmasına gerek olmadığını; aksi durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

Tarih ve İmza

**Adı Soyadı:** FATİH ERKEKOĞLU  
**Öğrenci No:** N13248696  
**Anabilim Dalı:** İKTİSAT  
**Programı:** İKTİSAT (İNGİLİZCE)  
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**DANIŞMAN GÖRÜŞÜ VE ONAYI**

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## APPENDIX2. ORIGINALITY REPORT



**HACETTEPE UNIVERSITY  
GRADUATE SCHOOL OF SOCIAL SCIENCES  
Ph.D. DISSERTATION ORIGINALITY REPORT**

**HACETTEPE UNIVERSITY  
GRADUATE SCHOOL OF SOCIAL SCIENCES  
ECONOMICS DEPARTMENT**

Date: 10/05/2023

Thesis Title : THE ROLE OF FINANCIAL CONSTRAINTS AND CREDIT CONDITIONS ON FIRMS' EXPORT BEHAVIOUR:  
EVIDENCE FROM TURKISH MANUFACTURING INDUSTRY

According to the originality report obtained by my thesis advisor by using the Turnitin plagiarism detection software and by applying the filtering options checked below on 10/05/2023 for the total of 92 pages including the a) Title Page, b) Introduction, c) Main Chapters, and d) Conclusion sections of my thesis entitled as above, the similarity index of my thesis is 23 %.

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I respectfully submit this for approval.

Date and Signature

**Name Surname:** FATİH ERKEKOĞLU

**Student No:** N13248696

**Department:** ECONOMICS

**Program:** ECONOMICS (ENGLISH)

**Status:**  Ph.D.  Combined MA/ Ph.D.

### ADVISOR APPROVAL

APPROVED.

Prof. Dr. Ayşe Yasemin Yalta



**HACETTEPE ÜNİVERSİTESİ  
SOSYAL BİLİMLER ENSTİTÜSÜ  
DOKTORA TEZ ÇALIŞMASI ORJİNALLİK RAPORU**

**HACETTEPE ÜNİVERSİTESİ  
SOSYAL BİLİMLER ENSTİTÜSÜ  
İKTİSAT ANABİLİM DALI BAŞKANLIĞINA**

Tarih: 10/05/2023

Tez Başlığı : FİNANSAL KISITLAR VE KREDİ KOŞULLARININ FİRMALARIN İHRACAT DAVRANIŞINDAKİ ROLÜ: TÜRK İMALAT SANAYİİNDEN KANITLAR

Yukarıda başlığı gösterilen tez çalışmamın a) Kapak sayfası, b) Giriş, c) Ana bölümler ve d) Sonuç kısımlarından oluşan toplam 92 sayfalık kısmına ilişkin, 10/05/2023 tarihinde tez danışmanım tarafından Turnitin adlı intihal tespit programından aşağıda işaretlenmiş filtrelemeler uygulanarak alınmış olan orijinallik raporuna göre, tezimin benzerlik oranı % 23 'tür.

Uygulanan filtrelemeler:

- 1-  Kabul/Onay ve Bildirim sayfaları hariç
- 2-  Kaynakça hariç
- 3-  Alıntılar hariç
- 4-  Alıntılar dâhil
- 5-  5 kelimedenden daha az örtüşme içeren metin kısımları hariç

Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Çalışması Orijinallik Raporu Alınması ve Kullanılması Uygulama Esasları'm inceledim ve bu Uygulama Esasları'nda belirtilen azami benzerlik oranlarına göre tez çalışmamın herhangi bir intihal içermediğini; aksinin tespit edileceği muhtemel durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

Tarih ve İmza

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UYGUNDUR.

Prof. Dr. Ayşe Yasemin Yalta