University of Trento

School of International Studies

Essays on financial factors and firm export behavior

A dissertation submitted to the School of International Studies

in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in International Studies

Michele Bernini

January 2014

Dissertation Committee

Prof. Gabriel Felbermayr

Prof. Alessandra Guariglia

Prof. Stefano Schiavo

Acknowledgments

First of all, I would like to express my gratitude to my supervisor Professor Stefano Schiavo. His insightful comments and constant encouragement have been fundamental for completing this work. I am also very grateful to Professor Richard Kneller for advising me during my visiting period in Nottingham. Among the many people that contribute with passion to the School of International Studies, I must acknowledge the hard work of Mark Beittel and Rosaria Astarita who are two solid pillars of the PhD programme.

I would like to thank my co-authors Flora Bellone, Sarah Guillou and Tania Treibich. Not only their contribution was fundamental for my thesis, but they were also the most welcoming hosts in Nice. I must also acknowledge the financial support provided by the Groupe de Recherche en Droit, Economie, Gestion (GREDEG).

For the last two years, I was lucky enough to enjoy the friendship of Irene Costantini, Chiara Tomasi and Michele Imbruno. I am indebted to all of them for the most pleasant long-lasting memories from the time I spent in Trento and in Nottingham. I am grateful to my office mates Paula Falci, Brett Campbell, Margherita Baldarelli, and Davide Denti for creating a very pleasant working environment. Francesco Rocca, Rolando Messetti, Sandro Casal and Linda Bertoncelli are the dearest friends and the greatest house mates that a doctoral student can wish for, and I should thank them all for helping me to overcome the most stressful moments.

I am grateful to my parents, and to Valeria Petronelli for their love and unconditional support. Last but not least, I would like to thank Chiara Negrini for her generosity in sharing too much of my time with Stata.

Contents

List of Figures

List of Tables

Introduction

'New-new Trade Theory' investigates heterogeneous firms as the main units of analysis in models of international trade[1]. The emphasis of this generation of models on firm heterogeneity has been paralleled by an intense program of empirical research on the differences between exporters and non-exporters along a variety of performance measures such as total factor productivity, capital intensity and financial health[2]. More recently, the increasing availability of data on firm-level export flows has also allowed to extend this research to highlight heterogeneity across firms exporting different products and serving different destinations (e.g., Bernard et al., 2011; Mayer et al., 2011).

In addition to characterizing exporters' 'premia', the empirical trade literature includes contributions attempting to establish causal relationships between firms' characteristics and export performance (e.g., Lileeva and Trefler, 2010; Bustos, 2011). The relevance of this line of research for policy is clear. On one side, the identification of the firm-level factors that 'cause' export activity would inform policies that are aimed at promoting outward orientation of domestic companies. On the other, the identification of the ex-post effects of export participation on companies is important to evaluate the gains from trade. The aim of my thesis is to contribute to this literature, by focusing more specifically on the relationship between firms' financial factors and export behavior, and on the scope for governments to promote exports by acting through fiscal policies.

In the aftermath of the financial crisis, international trade contracted almost four times faster than world GDP[3], and a monitoring report by three international agencies

[1]For a review of the seminal models of this literature see Helpman (2006).

[2]A survey of the empirical literature is provided by Greenaway and Kneller (2007).

[3]Between the first quarter of 2008 and the first quarter of 2009 global GDP fell by 4.6%, while international exports contracted by 17% (Amiti and Weinstein, 2011).

dismisses the hypothesis that the greater plunge in trade can be explained by the intensification of protectionist measures across countries (OECD, UNCTAD and WTO, 2009). The contraction in credit supply emerges instead as the main channel trough which the crisis impacted on international trade (Chor and Manova, 2010). Moreover, a survey of European firms reveals how the crisis impacted differently on the activities of companies with different size. For instance, between 2008 and 2009 larger firms experienced less dramatic changes in exports than smaller ones (Barba Navaretti et al., 2011). Because smaller firms have typically limited liquidity and greater dependence on bank credit, this evidence points to the relevance of firm-level financial attributes for firms' vulnerability to financial shocks.

This thesis includes three main chapters that are the outcome of different research projects. All chapters stand as independent papers, but they are linked by the common focus on firm financial factors and export behavior, and by the use of microeconometric methodologies applied to firm-level data. The first two chapters investigate, respectively, the impact of export activity on firms' access to credit and the role of corporate financial structure as a determinant of exporters' ability to compete on foreign markets through quality. Hence, these works fall within the literature on financial constraints and exports. This literature includes a number of empirical studies that deal with the question of whether financial constraints hamper firms' ability to serve foreign markets (e.g., Bellone et al., 2010; Minetti and Zhu, 2011; Askenazy et al., 2011). This question derives from the idea that minimum levels of internal liquidity or access to external credit are necessary to finance the sunk costs of exporting, and it is largely inspired by models introducing financial frictions in a theoretical set up *a la Melitz* (Manova, 2008; Chaney, 2013). However, some studies produce also findings consistent with the idea that firms may improve their financial health and their access to credit as a result of their export activity (Greenaway et al., 2007; Bridges and Guariglia, 2008). The novel contribution of the first two chapters of this thesis derives from their focus on specific and under-explored channels through which export activity may affect financial constraints (Chapter 1), and through which financial factors may affect exporters' performance (Chapter 2).

Chapter 1 investigates whether the severity of financial constraints on firms depends

on the competitive environment, and whether firms' export activity has a positive ex-post impact on credit access. I show that, in the transition economies of Eastern Europe and Central Asia where financial frictions and information asymmetries are prevalent, firms exposed to greater domestic or foreign competitive pressure are more likely to report serious financial constraints. However, the positive correlation between indicators of competitive pressure and financial constraints holds only for non-exporters. This result is consistent with the hypothesis that credit is scarcer or more expensive for enterprises that are considered riskier borrowers, as their survival is threatened by fiercer competitive pressure. I also argue that my findings support the hypothesis that entry into exporting provides lenders with positive signals about firms' performance, and it relaxes financial constraints by offsetting the negative impact of competition on borrowers' access and costs of credit.

Chapter 2 is the result of a joint research project with Flora Bellone and Sarah Guillou. This chapter looks instead at the relationship between the corporate financial structure of French exporters and the quality of their exported varieties. Our focus is motivated by the growing empirical evidence in the trade literature that suggests the importance of output quality for firms' performance on foreign markets. A measure of export quality based on a discrete choice model of foreign consumer demand is obtained for over six thousand French firms exporting within six product categories. Once it is controlled for firm heterogeneity and reverse causality, we find that the ratio of exporters' debt over total assets is negatively correlated with our measure of export quality. However, this result holds only for exporters with insufficient internal resources to finance current expenses. We find that the negative impact of leverage on quality is consistent with models in the financial literature predicting that debt financing hampers the incentive to invest in quality upgrading activities. However, our results also suggest that this distortion may affect only firms for which high leverage is caused by insufficient internal resources, and not by a value-optimizing choice.

Chapter 3 originates from a project with Tania Treibich. It departs from the focus on financial constraints of the previous two chapters. It looks instead at the scope for promoting investment and exports of small and medium enterprises (SME) through the introduction of more favorable Corporate Taxation (CT) rates. A reduction in CT

is thought to be particularly beneficial for SME as their limited access to credit reduces their capacity of shielding profit from taxation through debt financing. In addition, lower taxation increases their internal liquidity by easing dependence from external credit and by enhancing their ability to invest. The opportunity for this research is provided by the 2001-2003 tax reform in France. This reform is exploited as a policy experiment to estimate the impact of tangible asset growth on the probability of exporting. Because a decrease in CT is expected to foster investment, we use eligibility for CT reduction and heterogeneity in effective taxation across firms as instruments for asset growth in regressions on export status. Our results suggest that a reduction in CT rates promotes SME growth, and through this channel, export entry. In particular, we find that an increase of 10% in tangible assets is associated with a 4% higher probability of exporting and with a 1.5% higher probability that a non-exporter enters permanently into exporting.

The three works included in this thesis provide new evidence on the channels mediating the relationship between financial factors and firm exports. A first message that emerges from the joint reading of the first two chapters is that the relationship between enterprises' financial attributes and export behavior is likely to be characterized by bidirectional causation. On one hand, export status may provide positive signals to lenders and ease firms' access to credit; on the other hand, liquidity constrained exporters that resort intensively to debt financing may be less capable of competing internationally through quality. Hence, a second message that emerges from the second chapter is that firms' ability to finance the sunk costs of exports is not the only reason why financial attributes matter for export performance. From a policy perspective, the last chapter provides encouraging evidence on the effectiveness of tax reductions in promoting growth and internationalization of small and medium companies, that are indeed most severely affected by financial constraints.

Chapter 1

Financial constraints, competitive pressure and export status

1.1 Introduction

Financial constraints hamper firms' current operations and future growth by limiting their access to working capital and funds for investment. Cross-country studies reveal that their prevalence decreases with the level of institutional and financial development, a finding that is consistent with the view that better legal frameworks and more efficient financial markets mitigate the distortions introduced by information asymmetries in credit transactions (Demirgüç-Kunt and Maksimovic, 1996; Laeven, 2002; Beck et al., 2005). Within individual countries, however, the relative importance of financial frictions across industries has been explained by stressing specific technological features, such as the dependence upon external finance, the tangibility of assets, and the 'transparency' of investment projects (Rajan and Zingales, 1998; Hall, 2002).

This chapter is closely related to the literature on the determinants of financial constraints as it investigates whether the competitive pressure to reduce costs and introduce new products affects both firms' credit demand and their prospects for obtaining loans on favorable conditions. By pooling firm-level survey data from the economies of Eastern Europe and Central Asia, I test whether there is a significant relationship between the competitive pressure perceived by managers and the reported severity of financial constraints. A measure of credit rationing is then constructed by

exploiting survey information on firms' credit status, and an Heckman selection model is used to investigate separately the correlation between competition, credit demand and credit supply. This study contributes to the empirical literature on trade and financial constraints with two main findings. First, it is shown that domestic competition is more strongly and positively correlated with measures of financial constraints than foreign competition. Second, I find that the positive correlation between competition and credit rationing does not hold for exporters. These results point to a particular channel through which export participation may relax ex-post firms' financial constraints: that is, by signaling lenders about the good performance and the survival prospects of borrowers. These results are also in line with previous evidence on UK firms (Greenaway et al., 2007; Bridges and Guariglia, 2008).

The analysis is conducted on survey data from the Business Environment and Enterprise Performance Surveys (BEEPS), which was administered in different waves to over 27,000 manufacturing and services firms from 27 transition economies of Eastern Europe and Central Asia[1]. The countries covered by BEEPS offer the ideal environment to study the relationship between competition and financial constraints because the industrial transformation and the integration of these economies in international trade have largely occurred in the presence of less advanced financial systems and weaker institutions. Although foreign banks control a large proportion of the banking sector, the extension of credit to small and medium enterprises has been generally held back by slower institutional reform in the protection of creditors' rights and in the creation of credit registries (EBRD, 2006). As a result, during the last decade these economies have experienced substantial variations in the intensity of competitive pressure, while all presented insufficient access to credit, especially for small and medium enterprises (SME).

BEEPS data have been previously used to study the determinants of credit rationing at the firm-level[2], by often incorporating on the right-hand side of econometric models

[1]BEEPS is part of the World Bank Enterprise Survey (WBES) program that covers a greater number of countries. However, the BEEPS questionnaire differs from the ones administered in other WBES surveys.

[2]Drakos and Giannakopoulos (2011) and Brown et al. (2011) are two recent studies that use BEEPS data to investigate the determinants of financial constraints.

a categorical variable representing the market structure in which borrowers operate[3]. However, previous studies have not exploited the specific information in the dataset regarding the importance of domestic and foreign competitive pressure for firms' decisions to reduce costs and to innovate products. This study uses this information to capture the effect of competitive pressure on financial constraints, as it is more directly related to firm-selection than the number of competitors in the market.

The paper is organized as follows. Section 1.2 reviews the literature that inspires the hypothesis that financial constraints are endogenous with respect to the competitive environment. Section 1.3 discusses different strategies to measure financial constraints, while Section 1.4 describes the dataset. Section 1.5 investigates the relationship between competition and self-reported measures of financial constraints (1.5.1), then it deals with the the effect of competition on credit supply by focusing on credit rationing (1.5.2), and on collateral requirements (1.5.3). The empirical analysis concludes by testing whether competitive pressure has a differential impact on the credit constraints faced by exporters and non-exporters (1.5.4). Section 1.6 provides robustness checks, and Section 1.7 concludes.

1.2 Conceptual framework

The hypothesis that the competitive environment is a determinant of firms' financial constraints is formulated on the basis of theoretical results and empirical evidence suggesting that the pressure to reduce costs and innovate output may affect both firms' demand for credit and banks' willingness to lend. On the demand side, competitive pressure from entrants and 'fast movers' stimulate innovation and growth of incumbent firms, as they try to escape Schumpeterian selection and to maintain their profit margins (Carlin et al., 2001, 2004; Gorodnichenko et al., 2010). When firms need external financing to fund these activities, they are more likely to be negatively affected by credit rationing and high costs of credit. In addition, firms operating in industries that are more exposed to competition have less scope for financing their operations through

[3]This variable typically assumes value 1 if firms do not face competitors, value 2 if they face between 2 and 4 competitors, and value 3 if they face 5 or more competitors.

retained earnings, as their profit margins are generally narrower than in protected sectors.

On the supply side, financial intermediaries may attach a greater risk of default to firms that are more exposed to domestic and foreign competition. When this risk cannot be completely incorporated in the price of the loan, credit rationing is a possible outcome. Stiglitz and Weiss (1981) show theoretically that if the market clearing interest rate is expected to attract a greater proportion of riskier borrowers, adverse selection and limited liability in credit contracts prevent lenders to match the demand for credit. In their model, lenders cannot price discriminate because they do not observe borrowers' individual probability of default but only their 'riskiness' distribution. Similarly in the real world, when financial intermediaries find it difficult or expensive to assess individual firms' prospects, they may adjust their credit supply on the basis of industry-level information such as openness to new competitors, the rate of technological change, and import penetration. As a result, credit rationing may be more severe in 'tough' industries, where a greater proportion of borrowing firms are expected to fail or to generate insufficient revenue to fulfill their debt obligations.

The hypothesis that the competitive environment is a relevant factor for intermediaries' decisions to extend credit finds anecdotical support in the practices of the major rating agencies. An example is provided by the following excerpt from Fitch Ratings China (2012): "Industries that are in decline, highly competitive, capital intensive, cyclical or volatile are inherently riskier than stable industries with few competitors, high barriers to entry, national rather than international competition and predictable demand levels".

Beyond the intuitive association between competition and borrowers' risk of failure, 'New-new Trade Theory' provides the toolkit for predicting more rigorously the impact of domestic and foreign competition on the distribution of firms' return and on their probability of failure. In Melitz (2003) trade liberalization causes the exit of the least productive firms because domestic exporters bid-up input prices. In Melitz and Ottaviano (2008), on the other hand, firm selection depends on the pro-competitive effect of trade. New trade opportunities are also found to promote technological upgrading, that has been identified as a further channel through which exporters improve their

position on the domestic market at the expenses of the least efficient firms (Bustos, 2011). In the light of these theoretical insights, it should be expected that financial intermediaries consider exporters as safer borrowers because they are less likely to be driven out of the market by domestic or foreign competitors.

New insights into the determinants of financial constraints have also come from the empirical literature on firm heterogeneity and trade. Although most studies on the relationship between financial constraints and trade focus exclusively on the effect of financial factors on firms' foreign operations[4], some contributions have also tested the reverse hypothesis that international activities affect firms' financial constraints. Empirical studies that find a beneficial impact of export entry on firms' financial health explain this result by referring to exporters' greater ability to diversify credit supply, their greater resilience to idiosyncratic demand shocks, and the role of international activities in signaling efficiency to financial intermediaries (Greenaway et al., 2007; Bridges and Guariglia, 2008). The opposite view that exporters face tighter constraints than non-exporters is based on the assumption that borrowers' international activities represent a greater risks for lenders (Feenstra et al., 2011). Other authors, however, argue that financial constraints matter for the selection of firms that access foreign markets, but that international engagement does not have any ex-post effect on firms' financial constraints (Bellone et al., 2010).

1.3 Measuring financial constraints

The growing availability of micro data has made possible to investigate financial constraints in relation to firm heterogeneity. Since the seminal work of Fazzari et al. (1988), the standard empirical strategy for studying financial constraints at the firm-level has been to estimate investment equations augmented with different measures of cash flow on different samples of firms sharing some similar attributes. Holding the assumption that only the investment choices of financially constrained firms are conditioned by the availability of liquid resources, investment cash-flow sensitivity is interpreted as

[4]Some examples are Chaney (2013), Manova (2008), Amiti and Weinstein (2011), Askenazy et al. (2011) and Minetti and Zhu (2011).

a symptom of financial constraints. Indeed, this sensitivity signals a violation of the well-known theoretical result that with perfect capital markets investment is independent from the source of financing (Modigliani and Miller, 1958). Studies based on this approach have identified dividend policies, age, size, and ownership structures as some of the firm-level factors associated with financial constraints (Fazzari et al., 1988; Devereux and Schiantarelli, 1990; Schiantarelli and Sembenelli, 1996).

However, cash flow-sensitivity as an indirect measure of financial constraints has been questioned, because it relies on the assumption that firms' current revenue is uncorrelated with future investment opportunities (Kaplan and Zingales, 1997). Indeed, if this assumption does not hold, the positive correlation between investment and cash flow does not reveal financial constraints, but it rather indicates that higher current sales increase firms' expected return from investment. This critique has fostered the emergence of new strategies to study the determinants of financial constraints and their impact on firms. For example, Musso and Schiavo (2008) construct a time-varying index to measure financial constraints based on different firm-level characteristics such as size, profitability, liquidity, cash flow, solvency, and trade credit.

Alternatively, survey data that provide specific information on firms' access to credit offer the opportunity to investigate financial constraints without relying on particular assumptions on investment behavior, and they can be used to test the relationship between financial constraints, firms' characteristics, and the business environment in which they operate. In particular, the World Bank Enterprise Surveys (WBES) provides a rich source of comparable survey data for developing and emerging economies. These data have been widely used to investigate the macroeconomic and institutional factors that explain differences across countries in terms of firms' access to credit, but also to identify the firm-level characteristics that are more often associated with financial constraints. A general conclusion of these studies is that those factors that worsen information asymmetries in credit transactions also reduce firms' access to credit: small and opaque firms, young firms with short track records, and less profitable companies are indeed found to be affected by tighter credit constraints (Beck et al., 2006, 2008; Brown et al., 2007; Drakos and Giannakopoulos, 2011).

1.4 Data

The Business Environment and Enterprise Performance Surveys (BEEPS) has been implemented as a joint initiative of the European Bank of Reconstruction and Development (EBRD) and of the World Bank Group to assess the barriers encountered by firms in the transition economies of Eastern Europe and Central Asia (including Turkey). The first wave of surveys was conducted in 1999/2000 and the fourth and last one in 2008/2009. The survey questionnaire has been changed over time, and not all the variables are comparable across waves. To increase the consistency of the dataset, this study pools together data from the second, third and fourth waves of BEEPS, obtaining a dataset with 25,086 firms, of which 6,890 were interviewed in more than one year. The firms in the dataset are representative of 27 countries and 45 industries in manufacturing and services[5].

Data were collected during face-to-face interviews with the executives of the sampled firms. Interviewees' position within the firm was recorded, and for the panel component of the dataset it is possible to know if the same person was repeatedly interviewed across waves. This information is particularly valuable when controlling for interviewees' unobserved characteristics in robustness checks with panel models. BEEPS also include a rich set of information about firms' characteristics such as origin, ownership structure, number of employees, sales in the previous fiscal year, age and export status that can be used to control for firm-level heterogeneity in cross-sectional models.

The empirical analysis of this paper is mostly based on categorical variables with values reflecting interviewees' responses to survey questions related to financial constraints and competition. Table 1.13 in the Appendix reports the wording of the relevant questions and the coding of the possible answers, while Table 1.14 presents summary statistics for all the variables included in our empirical models. The main variables of interest for this study can be divided in two sets.

The first set includes two self-reported indicators of financial constraints: *Access* and *Cost*, measuring the extent to which firms consider access and cost of financing as obstacles for their current operations and future growth. Both these variables are

[5]Throughout this chapter industries are defined at the 2-digit level of aggregation.

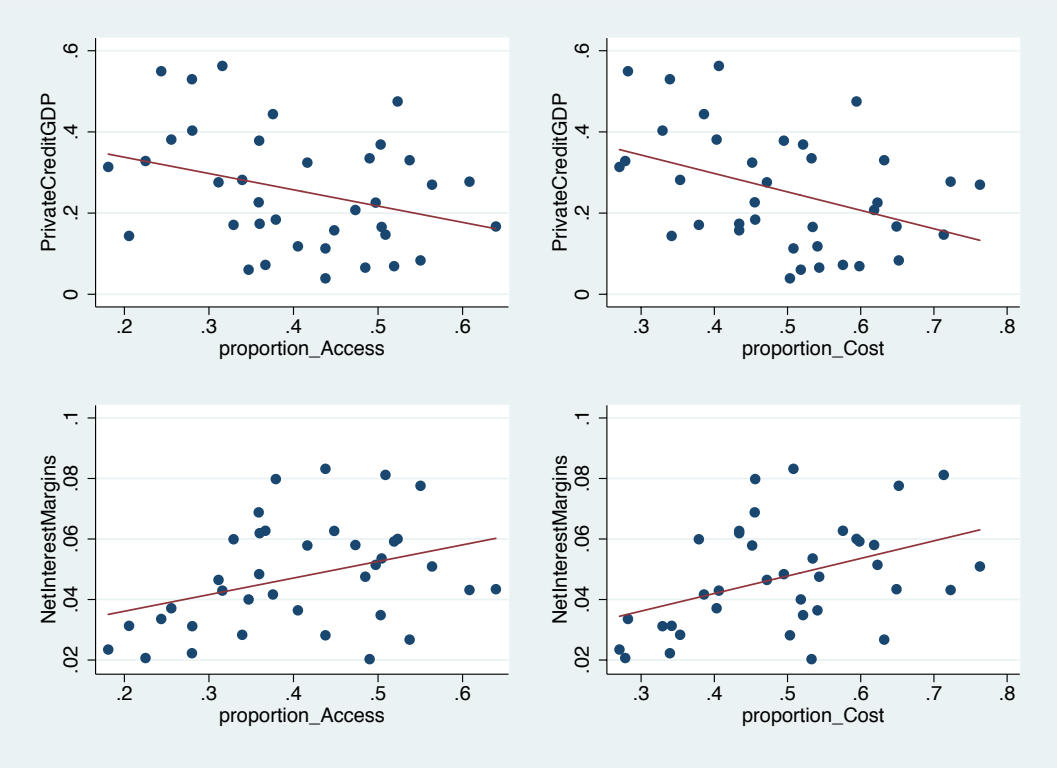
categorical, and they assume values ranging from 1 to 4, where the lowest and the highest values indicate respectively the least and most serious financial constraints. The advantage of using self-reported measures instead of a priori indicators of financial constraints is that they do not rely on assumptions about firms' behavior. For example, it is not necessary to assume that cash-flow is independent from investment opportunities as it is necessary when measuring financial constraints with investment-cash flow sensitivity (Kaplan and Zingales, 1997). Moreover, self-reported measures are more suitable when the sample includes many small firms from emerging and developing economies, for which detailed account data are not available or may not be reliable (Claessens and Konstantinos, 2006).

However, the use of self-reported indicators may be affected by subjectivity bias. This can be a serious problem in cross-country studies. Indeed, firms might evaluate their current situation in the light of their past experience. For example, in the context of transition economies, companies that used to enjoy softer budget constraints during past economic regimes might report tighter financial constraints as a result of market reforms in the financial sector. As a consequence, firms that have similar access to credit can evaluate their situation differently if they operate in transition economies with different reform history. To verify whether *Access* and *Cost* reflect objective constraints across countries, I test the correlation between the proportion of respondents declaring access and cost of external finance as a major obstacle and two macroeconomic measures of financial development from the World Bank Financial Structure Database (WBFS) (Beck et al., 2000) as it is done by Gorodnichenko and Schnitzer (2010).

The country-level measures of financial development used for this exercise are the ratio of private credit over GDP ($PrivateCreditGDP$) and the margin between borrowing and lending rates ($NetInterestMargins$). The first measure is a rough indicator of credit supply at the country level, while the second is expected to correlate negatively with competition and efficiency in the banking sector. When constraints are measured by *Access*, the correlation between the proportion of financially constrained firms at the country-year level and private credit over GDP is -0.48. Again, the correlation between the proportion of firms reporting the highest level of *Cost* and the country av-

erage margin between lending and borrowing rate is 0.38[6]. This exercise suggests that both *Access* and *Cost* reflect objective differences in financial constraints, since countries with greater levels of financial development are associated with lower proportions of constrained firms. Figure 1.1 provides a graphical illustration of these correlations.

Figure 1.1: Financial development and self-reported financial constraints



Notes. PrivateCreditGDP and NetInterestMargins on the y-axis are respectively the proportion of private credit on GDP, and the net interest margin between borrowing and lending rates at the country level. The variables on the x-axes are the proportion of firms that in each country-year report $Access > 2$ and $Cost > 2$. PrivateCreditGDP and NetInterestMargins are constructed on the basis of information taken from the World Bank Financial Structure Database (updated in November 2010) (Beck et al., 2000).

The second set of variables includes indicators that capture different aspects of the competitive environmnent: *CostDom* and *CostFor* measure the importance of domestic and foreign competition on firms' decisions to reduce production costs, while *ProdDom* and *ProdFor* gauge competitors' influence on firms' efforts to develop new goods and services. All these variables assume four possible values ranging from 1 to 4, where 4 corresponds to the highest level of competitive pressure on the firm. *Elast* is the

[6]Financially constrained firms are defined as those reporting that the access or the cost of finance is a major obstacle to their operations. Both correlations are significant at the 5% level.

expected response of consumers' demand to 10% increase in price of the main product of the firm, while *ImportComp* measures more directly the importance of import penetration in firms' domestic market.

The pairwise coefficients of correlation between these variables are reported in Table 1.16 in the Appendix. The correlation between *CostDom* and *ProdDom* (0.71), and between *CostFor* and *ProdFor* (0.81) is strong, anticipating some econometric difficulties in identifying separately the effects of competitive pressure on costs and products when both these variables are included as regressors. Therefore, these information are aggregated to create two indices of domestic and foreign competition that will be used when high collinearity inflates the variance of the estimates:

$$IndexDom = \frac{(CostDom + ProdDom) - 2}{8 - 2}$$

$$IndexFor = \frac{(CostFor + ProdFor) - 2}{8 - 2}$$

because each individual competition variable ranges between 1 and 4, these indices assume a finite set of values between 0 and 1. The highest value 1 is associated with the 'toughest' competitive environments, where firms need both to reduce costs and to innovate products to survive on the market.

1.4.1 Constraints and competition: firms' characteristics

In a paper based on the 1999/2000 wave of BEEPS, Carlin et al. (2004) argue that the main advantage of studying transition economies is that their competitive environment has been largely shaped by exogenous policies implemented during the early stages of the liberalization process. Hence, these economies approximate the desirable features of a large scale natural experiment, ideal to test the effects of competition on firm behavior. Since our study refers to later stages of the transition process, the 'natural experiment argument' might have been somehow weakened by the endogenous evolution of the competitive environment within industries, but it is still reasonable to assume that financial factors did not play a major role in shaping the competitive pressure at the industry level. Nevertheless, this is not sufficient to guarantee the exogeneity of the competition variables on the right-hand side of empirical models on the indicators of financial constraints. Indeed, after pooling together both the

Table 1.1: Explained variance of the main variables

	Access	Cost	CostDom	CostFor	ProdDom	ProdFor	ImportComp	Elast
Country	.049	.070	.072	.066	.065	.055	.067	.028
Time	.000	.000	.004	.000	.004	.002	.000	.001
Industry (ISIC 3-digit)	.015	.022	.029	.098	.026	.102	.094	.040
Industry-Time	.018	.023	.034	.100	.029	.100	.090	.040
Country-Time	.062	.082	.080	.073	.072	.061	.072	.034

Notes. The table reports the adjusted R^2 obtained by regressing each variable in columns on different sets of dummy variables corresponding to the dimensions of the database reported in rows.

cross-country and cross-industry dimensions of the dataset it is necessary to control for policies that might have had a simultaneous impact on firms' access to finance and on the competitive environment. This section begins describing the relative importance of country, industry and time factors in explaining variations in the self-reported measures of financial constraints and competition.

Table 1.1 reports the adjusted R^2s obtained by regressing the main variables of interest on different sets of dummies capturing respectively country, industry and time fixed effects. Among these 'macro' dimensions, the cross-country one explains individually the greatest share of the variance in *Access* (4.9%), *Cost* (7%), *CostDom* (7.2%) and *ProdDom* (6.5%). Instead, regressions including only industry dummies have relatively more explanatory power than those with country dummies if regressed on the variables of foreign competition and price elasticity of demand: $CostFor$ (9.8%), $ProdFor$ (10%), $ImportComp$ (9.4%) and *Elast* (4%)[7]. For these variables, the greater importance of industry-level over country-level factors may depend on the fact that some industries are less exposed to foreign competition, as a greater share of their products (or services) cannot be traded internationally.

However, none of the dimensions reported in table 1.1 explains individually more than 11% of the variance of the main variables of interests, confirming that firm-level variations dwarf differences across countries, time and industries. The limited importance of the cross-country dimension suggests that country-level policies or macroeconomic factors may have had a very different impact on access to finance and on the competitive pressure of individual firms. Instead, the relatively small contribution

[7]Industries are defined at the 3-digit level of ISIC aggregation.

of industry dummies may suggest that 3-digit ISIC industries are not disaggregated enough to capture most of the technological aspects that affect financial constraints (e.g., dependence from external finance), or the fact that these aggregations imperfectly identify groups of firms competing among each others.

The predominant firm-level component in the variation of these variables, confirms that firm-level measures of financial constraints and competition capture more fine-grained aspects than are missed by adopting industry-level measures. The tradeoff implicit in the use of firm-level variables based on survey questions is that part of their variation is due to the noise introduced by interviewees' subjective evaluation, or to the effect of firm-level factors affecting managers' perception of financial constraints and competition. When using these indicators in regression analysis it is therefore necessary to control for firm-level characteristics that are associated with higher probability to report more or less intense competition and financial constraints. The remaining part of this section characterizes the profile of those firms reporting the highest and the lowest values in the main categorical variables, so that to guide the selection of firm-level controls that should be included in econometric specifications.

Table 1.2, shows the distribution of firms reporting the lowest and the highest scores of *Access*, *Cost*, *CostDom* and *CostFor* divided by origin, size and age. Along these dimensions, the sample is mainly composed by de-novo private firms (77%), firms with less than 50 full-time employees (70%) and firms that had been operative for more than 5 years and less than 21 (70%)[8]. In the subsample of firms reporting access to finance as a major obstacle (*Access*=4), SME and de-novo private enterprises are relatively more numerous than in the whole sample. While the relationship between firm size and financial constraints is expected, the overrepresentation of de-novo private firms and the underrepresentation of ex-SOE suggests the persistence of soft budget constraints for some of the privatized enterprises. Instead, the age distribution of the financially constrained enterprises is not significantly different from that of the unconstrained firms[9]. The picture is similar for the group of firms declaring that high cost of external

[8]De-novo private firms are firms created after the beginning of the transition process that have been private since their establishment.

[9]More formally the Kolmogorov-Smirnov test for equality of distributions fails to reject the null hypothesis that age distribution between financially constrained and unconstrained firms is the same.

Table 1.2: Breackdown of the sample by firm-type

	Whole Sample	Access =		Cost =		CostDom =		CostFor =	
		1	4	1	4	1	4	1	4
Firm's origin									
Privatized SOE	15.65	17.13	14.26	15.55	15.06	17.73	14.87	14.88	18.66
Private from start-up	77.07	75.79	80.23	76.22	79.35	73.23	78.92	79.46	72.50
Private subsidiary SOE	1.87	2.05	1.32	2.29	1.29	1.91	1.84	1.94	1.87
Joint venture foreign	4.44	5.03	3.13	4.87	3.44	6.14	3.26	2.93	5.99
Other	0.97	1.00	1.06	1.07	0.89	1.00	1.10	0.79	0.98
Firm's size									
SME (less than 49 employees)	69.59	66.63	73.98	68.31	72.58	65.12	70.33	74.54	59.37
Large (between 50 and 249)	19.64	20.08	17.73	19.12	18.74	19.88	19.83	17.06	24.97
Very large (over 249)	10.77	13.29	8.29	12.58	8.68	14.99	9.84	8.40	15.67
Firm's age (years)									
Less than 5	12.70	12.06	12.33	12.35	11.53	13.16	11.44	13.71	9.25
Between 5 and 20	70.28	69.52	70.28	69.63	70.27	64.89	72.26	69.43	69.77
Over 20	17.18	17.66	18.15	18.02	18.20	21.93	16.30	18.86	20.98

Notes. The table reports the column percentage of firms by origin, size and age among those associated with the same value of the variables in the headings of the table.

financing is a major problem (*Cost*=4), but differences from the original distribution are smaller.

Firms perceiving high pressure from domestic sources (*CostDom=4*) do not differ significantly for origin and size from the rest of the sample, even thus age matters, and firms with 5 to 20 years of activity are more likely to report high levels of pressure than 'younger' and 'older' firms. Indeed, this age class includes most of those firms created after the beginning of the reform process, that have initially enjoyed dominant positions on the market and that are now facing greater competition from new entrants (Vagliasindi, 2001). Instead, the subsample of firms reporting high competitive pressure from foreign sources is very different from the previous one. In this group privatized-SOE, larger and older firms are clearly overrepresented. Since *CostFor* is positively and significantly correlated (.27) with the dummy variable *DirectExporter*, firms are more likely to report higher scores of *CostFor* when they operate on foreign markets. Indeed the larger size of the firms belonging to this subgroup and their higher average productivity is consistent with the stylized facts of the micro-literature on trade (ISGEP, 2008).

Table 1.3: Productivity differences across groups of respondents

	Access=1	**Access=4**
Number of firms (share of responses)	3,459 (25%)	2,026(14%)
Mean lProd (Std. Dev.)	9.654 (1.188)	9.595(1.179)
t-test of difference in means:	p-value=0.073	
Kolmogorov-Smirnov test for equality of distributions	p-value=0.248	
	Cost=1	**Cost=4**
Number of firms (share of responses)	2,517 (18%)	2,634(18%)
Mean lProd (Std. Dev.)	9.628 (1.216)	9.611(1.149)
t-test of difference in means:	p-value=0.607	
Kolmogorov-Smirnov test for equality of distributions	p-value=0.288	
	CostDom=1	**CostDom=4**
Number of firms (share of responses)	1,734 (12%)	3,042 (21%)
Mean lProd (Std. Dev.)	9.349 (1.193)	9.849(1.189)
t-test of difference in means:	p-value=0.000	
Kolmogorov-Smirnov test for equality of distributions	p-value=0.000	
	CostFor=1	**CostFor=4**
Number of firms (share of responses)	4,697 (34%)	1,498 (10%)
Mean lProd (Std. Dev.)	9.389 (1.163)	10.030(1.180)
t-test of difference in means:	p-value=0.000	
Kolmogorov-Smirnov test for equality of distributions	p-value=0.000	

Notes. *lProd* is the log of labor productivity computed as the annual sales of the firm in thousand USD over the number of employees.

Lastly, I investigate if there are significant differences in the distribution of labor productivity between firms associated with low or high categories of the variables measuring financial constraints and competition. This step is necessary to verify if high reported values of these indicators were driven by the bad performances of the respondents[10]. Table 1.3 reports the mean value of *lProd* for groups of firms associated with the lowest and the highest categories of the variables of interest, and Kolmogorov-Smirnov statistics on their distributions[11]. Financially constrained firms do not appear

[10]Restricted access to credit can be both a consequence and a cause of low productivity. Again, firms with lower productivity may perceive greater pressure from competitors to reduce costs and introduce new products.

[11]*lProd* is calculates as the logarithm of the ratio between annual sales in ,000 USD (deflated by

significantly different in terms of productivity from financially unconstrained firms. On the contrary, firms reporting the highest levels of domestic and foreign pressure are found to be significantly more productive that those reporting low pressure. This evidence is sufficient to rule out the hypothesis that low productivity explains simultaneously managers' reports of high competition and serious financial constraints. Moreover, the fact that firms exposed to more intense competition have on average higher levels of productivity is consistent with the prediction of efficiency sorting in 'tough' markets (Melitz and Ottaviano, 2008).

1.5 Empirical analysis

The objectives of the following analysis are threefold: to test whether financial constraints are more serious for firms operating in industries with intense competitive pressure, to identify the channels that may explain the relationship between competitive pressure and credit supply, to verify whether such a relationship is different for exporters and non-exporters.

In 1.5.1, I test the hypothesis that greater competition is associated with firms' propensity to report higher values of *Access* and *Cost*. The variable *Access* identifies those firms that experience problems in obtaining the desired amount of credit, but it does not provide information on the role played by demand and supply factors. Similarly, *Costs* identifies firms for which the cost of external financing is a major obstacle, but it does not inform if these firms are charged relatively higher interest rates compared to other firms, or if instead they realize lower return to capital. This is why in subsection 1.5.2 additional information from the BEEPS questionnaire are used to disentangle the role of demand and supply factors in explaining the results obtained in the first stage. More specifically we test whether competitive pressure on firms is associated with a higher proportion of rejected loan applications, or if it rather affects their expectations about being able to obtain credit on favorable terms. Subsection 1.5.3 investigates collateral requirements as a specific channel through which competitive pressure translates into more difficult access to credit. Subsection 1.5.4

an index of PPP) over the number of full-time employees.

concludes the empirical section by testing whether the relationship between competition and credit rationing holds similarly for exporters and non-exporters.

1.5.1 Competitive pressure and perceived financial constraints

Assume that the observable discrete variable $y_{istc} = m$, where $m \in [1, 2, 3, 4]$, is a monotonically increasing function of a continuous latent variable y^*_{istc}[12]. The relationship between the observable and the latent variable can be written as:

$$y_{istc} = g(y^*_{istc}, \bar{y}_1, \bar{y}_2, \bar{y}_3) = \begin{cases} 1, & \text{if } y^*_{istc} < \bar{y}_1; \\ 2, & \text{if } \bar{y}_1 \leq y^*_{istc} < \bar{y}_2; \\ 3, & \text{if } \bar{y}_2 \leq y^*_{istc} < \bar{y}_3; \\ 4, & \text{if } y^*_{istc} \geq \bar{y}_3; \end{cases}$$

where $\bar{y}_1, \bar{y}_2, \bar{y}_3$ are unobservable thresholds. Let y_{istc} measure the severity of firms' financial constraints. In a cross-section of firms, high values of y_{istc} either signal those firms demanding more credit than the maximum amount that banks are willing to lend, or those demanding as much credit as the others but with less access to bank loans. In the first case, financial constraints arise from high demand for credit, in the second case from limited credit supply.

In the econometric exercise presented in this section, it is not possible to determine whether the relationship between competition and financial constraints arises from demand or supply factors. Therefore, two different interpretations of the latent variable should be allowed. On the demand side, y^*_{istc} can be interpreted as firms' forgone profit related to missed investment opportunities that require external financing, or alternatively as the implicit costs of not realizing the full potential of firms' current resources due to the lack of funds to pay for working capital (Carlin et al., 2010). On the supply side, y^*_{istc} can be seen as an indicator of financial frictions in the credit relationship between financial intermediaries and firm i. Accordingly, high values of y^*_{istc} would signal limited access to credit or high costs of external financing due to banks' assessment of individual firms. The latent variable is modeled as:

[12]The subscripts refer respectively to firm i, industry s, country c at time t.

$$y^*_{istc} = x'_i\beta + c'_i\theta + D'_{ct}\gamma_1 + D'_s\gamma_2 + e_i \tag{1.1}$$

where x'_i is a vector of firm-level characteristics, c'_i is a vector of competition variables, while D_{ct} and D_s are respectively two full sets of country-year and industry dummies. The sign and the significance of the coefficients in the parameter vector θ is the main focus of the analysis. Since the latent variable y^*_{istc} is unobserved, the categorical *Access* and *Cost* will be substituted to y_{istc} to estimate the coefficients of the covariates on the right-hand side of equation 1.1.

The model is estimated by Ordered Probit under the assumption that the error term e_i is normally distributed. Ordered Probit estimates the parameters of model 1.1 and the thresholds $\bar{y}_1, \bar{y}_2, \bar{y}_3$ by maximizing the likelihood of observing the realizations of *Access* and *Costs*. The log-likelihood function to be maximized is:

$$L(\beta, \theta, \gamma_1, \gamma_2, \hat{\bar{y}}_1, \hat{\bar{y}}_2, \hat{\bar{y}}_3) = \sum_{i=1}^{n}\sum_{j=1}^{3} y_{jistc} p_{jistc} \tag{1.2}$$

where the conditional probability p_{jistc} of observing value j of the discrete variable y for firm i can be written as:

$$\begin{aligned}
p_{1istc} &= \Phi(\hat{\bar{y}}_1 - x'_i\hat{\beta} - c'_i\hat{\theta} - D'_{ct}\hat{\gamma}_1 - D'_s\hat{\gamma}_2) \\
p_{2istc} &= \Phi(\hat{\bar{y}}_2 - x'_i\hat{\beta} - c'_i\hat{\theta} - D'_{ct}\hat{\gamma}_1 - D'_s\hat{\gamma}_2) - \Phi(\hat{\bar{y}}_1 - x'_i\hat{\beta} - c'_i\hat{\theta} - D'_{ct}\hat{\gamma}_1 - D'_s\hat{\gamma}_2) \\
p_{3istc} &= \Phi(\hat{\bar{y}}_3 - x'_i\hat{\beta} - c'_i\hat{\theta} - D'_{ct}\hat{\gamma}_1 - D'_s\hat{\gamma}_2) - \Phi(\hat{\bar{y}}_2 - x'_i\hat{\beta} - c'_i\hat{\theta} - D'_{ct}\hat{\gamma}_1 - D'_s\hat{\gamma}_2) \\
p_{4istc} &= 1 - \Phi(\hat{\bar{y}}_3 - x'_i\hat{\beta} - c'_i\hat{\theta} - D'_{ct}\hat{\gamma}_1 - D'_s\hat{\gamma}_2)
\end{aligned}$$

where $\Phi(\cdot)$ is the normal cumulative distribution function. Equation 1.2 is estimated with data from the II and the III waves of BEEPS (2002 and 2005), because the questionnaire adopted in the IV wave (2008-2009) does not allow to distinguish between financial constraints arising from credit rationing or from the high cost of credit. With 27 countries at different stages of the transition process, and 45 industries represented, there is substantial cross-sectional variation in terms of firms' financial constraints and exposure to competition, both within and across countries. Instead, the longitudinal component is insufficient to exploit time variations, because the same firm is observed at most in two periods, and repeated observations are available only for a subsample

of 1,400 firms. Therefore, pooled estimation is the preferred technique to identify the coefficients in 1.1, while fixed-effect panel models will be employed in section 1.6 to rule out the presence of omitted variable bias in cross-sectional analyses. Nevertheless, because the firms in the dataset are associated with a wide range of countries and industries, some precautions need to be adopted to control for heterogeneity in cross-sectional regressions.

First, policies affecting both the firm-level covariates and the dependent variables are controlled for by introducing country-year fixed effects in all specifications of model 1.1. Second, industry fixed-effects are included to allow for different production technologies that might affect both demand for external financing and competition. Third, on the basis of the previous empirical literature on financial constraints, a set of firm-level controls is selected to reduce the risk of bias arising from the omission of relevant firm-level characteristics.

In the literature, younger firms are found to be more financially constrained, as their shorter track records hamper their creditworthiness (Devereux and Schiantarelli, 1990). Therefore, I include the log of age in the set of firm-level controls. In addition to age, the literature suggests that firm size is a robust predictor of firms' access to credit. Beck et al. (2006) find that larger firms encounter fewer obstacles in obtaining credit from banks, because they generate larger cash flows and control more collateralizable assets. In addition, because foreign banks adopt lending practices based on the assessment of hard information instead of relying on 'relationship banking' (Beck et al., 2010), their entry in transition economies may have narrowed credit access to SME and favored bigger firms with comparative advantage in producing hard information (EBRD, 2006). Therefore, I control for size by including two dummy variables for firms employing between 20 and 99 employees (*MediumFirm*), and for firms with 100 or more employees (*LargeFirm*), while the dummy for small enterprises (less than 20 employees) is the omitted category.

Section 1.4.1 shows that subsamples of firms with different legal origins, present significantly different mean values of *Access* and *CostDom*, suggesting that it is necessary to control for this characteristic in pooled estimates. Consequently I include a dummy for those firms that have been private since their establishment (*De-novo private*), for

private firms originally providing intermediate inputs to state-owned clients (*Private subsidiary of ex-SOE*), and for firms established as a joint collaboration between domestic and foreign partners (*Joint venture*). *SOE enterprises* is the category excluded from this set of dummies.

Previous studies find that companies with foreign ownership have easier access to credit than domestic ones, so I include the dummy *Ownerhsip_foreign* for firms belonging to foreign groups (Harrison and McMillan, 2003; Beck et al., 2010). Similarly, the dummies *Ownerhsip_government* and *Ownerhsip_managers* assume value one for those firms that are mainly owned by governments or managers. While the first is meant to control for political distortions in credit relationships, the second is used to test if those firms owned by managers have greater access to finance because of less serious agency problems.

To complete the baseline specification of the model, I include the dummies *ExternalAudit* that takes value one for those firms whose financial statement is reviewed by external auditors, and *CapitalCity* that signals whether firms are located in countries' capital cities. The first dummy is expected to capture the beneficial effect of greater transparency in terms of improved access to financial services, while the second is a proxy for improved access to financial services due to locational advantage, because firms based in larger cities are expected to have access to more banks.

An augmented specification of the model introduces a second set of control variables including: labor productivity $lProd$, capacity utilization CU and the three dummies $SalesGrowth$, $ExportGrowth$, $AssetGrowth$[13]. These dummies assume value 1 respectively when firms increased sales, exports or assets in the last year and 0 otherwise. I also include the dummy variable $Innovation$ that takes value 1 if the firm has introduced new product lines or upgraded existing ones in the last three years. This second set of covariates is meant to control for observable indicators of firms' performance that may affect their creditworthiness and their demand of credit. However, because of reverse causality these controls are more likely to be endogenous with respect to the dependent variables, therefore the baseline specification should be considered the

[13]Capacity utilization is the output produced in a given year as a proportion of the maximum possible output.

preferred one.

Table 1.4 reports the coefficients estimated by ordered Probit when *Access* is on the left-hand side of model 1.1. In the baseline specification (column 1) the estimated coefficients of *CostDom*, *CostFor* and *ProdDom* are all positive and significant at the 1% level, while *ProdFor* is positive but significant only at the 10%. In the augmented specification of the model (column 2), the coefficients of *CostDom*, *ProdDom* and *ProdFor* are significant at the 5%, but *CostFor* is insignificant. Column 3 and 4 report the estimates for specifications that include $IndexDom$ and $IndexFor$ instead of the four individual variables of cost and product competition. These indices are positively and significantly associated with *Access* in both the baseline and the augmented specifications. Lastly, $IndexDom$ and $IndexFor$ are interacted with the dummies $Exporter$, and $NonExporter$[14] to allow for different coefficients for exporters and non-exporters (column 5).

From a qualitative perspective, the results indicate that those firms perceiving greater domestic and foreign competition to develop new products and to lower costs are more likely to report access to finance as a major obstacle for their operations and growth. Across specifications, the point estimates of the coefficients associated with the variables of domestic competition are consistently higher than those of the variables of foreign competition, and the significance of their coefficients is more robust to the introduction of further controls. However, tests of significance on the difference between the coefficients of *CostDom* and *CostFor* and between the coefficients of *ProdDom* and *ProdFor* fail to reject the equality of the estimated parameters.

Ceteris paribus estimated coefficient of $IndexDom$ are smaller for exporters than for non-exporters[15]. On the demand side, the weaker correlation between domestic competitive pressure and financial constraints may be due to the fact that exporters' demand for credit is less driven by the need to defend their market share from domestic competitors. On the supply side instead, financial intermediaries may be less concerned by domestic competition when it comes to extend credit to exporters, be-

[14] $Exporter$ assumes value 1 when the firm exports part of its product directly and value 0 otherwise. $NonExporter = 1 - Exporter$.

[15] The difference between the coefficient of $IndexDom$ for $Exporters$ and $NonExporters$ is significant at the 8%, while the difference in the coefficient of $IndexFor$ is insignificant.

cause their access to foreign markets may provide a signal of their resilience to competition (Greenaway et al., 2007). However, the dummy variable for export status is positively correlated with *Access*. This should be expected, because on the demand side exporters require more credit than non-exporters. Therefore, they may be more constrained by quantitative limitations to the maximum amount of credit that they can borrow (Amiti and Weinstein, 2011). The estimated coefficients of the control variables are consistent with the previous findings in the literature. Larger firms, firms with more transparent procedures, firms with foreign ownership, and more productive firms enjoy greater access to credit.

Since the coefficients in Table 1.4 cannot be interpreted as marginal effects, Figure 1.2 illustrates the relationship between competition and financial constraints by plotting the predicted probabilities of reporting each level of *Access* across the different categories of the competition variables[16]. Among these variables, $CostDom$ has the strongest positive correlation with *Access*. *Ceteris paribus*, when firms perceive low pressure from domestic competitors ($CostDom = 1$) only 15% declares that access to finance is a major obstacle for growth or current operations. Instead, when the pressure is high ($CostDom = 4$) this percentage raises to almost 25%, and this change parallels 10% decrease in the proportion of firms declaring that access to finance is no obstacle. Cost pressure from foreign competitors also increases the probability of reporting high values of *Access*, even if the effect is weaker.

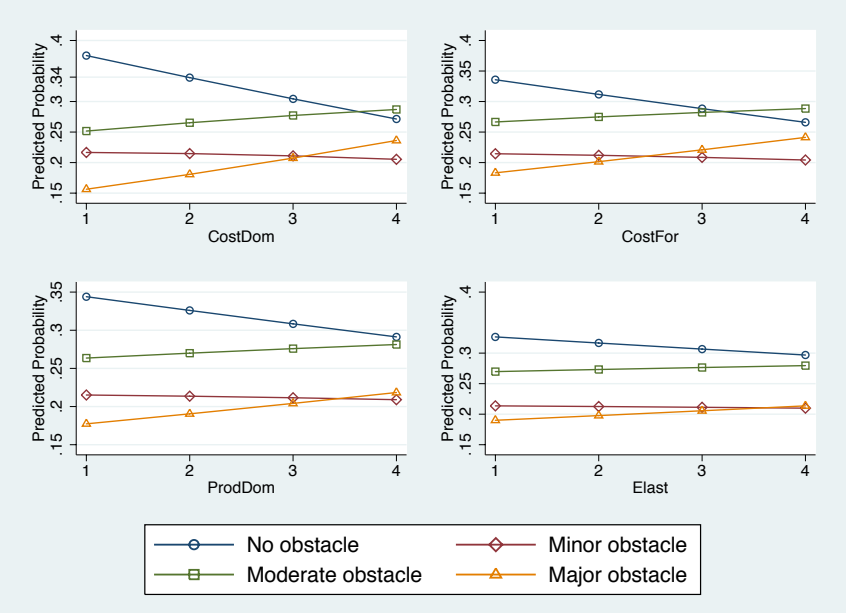
[16]The benchmark firm is a small or medium enterprise with local individual ownership and no direct exports. Probabilities are computed from the estimated coefficients in column (1) of Table 1.4.

Table 1.4: Results from ordered Probit models on *Access*

	(1)	(2)	(3)	(4)	(5)
Competition variables					
CostDom	0.082***	0.062**			
	(0.02)	(0.02)			
CostFor	0.057***	0.043*			
	(0.02)	(0.03)			
ProdDom	0.052***	0.064**			
	(0.02)	(0.02)			
ProdFor	0.028*	0.053**			
	(0.02)	(0.03)			
Elast	0.040***	0.013			
	(0.01)	(0.02)			
ImportComp	0.010	0.016			
	(0.01)	(0.01)			
IndexDom			0.444***	0.382***	
			(0.04)	(0.06)	
IndexFor			0.262***	0.303***	
			(0.03)	(0.06)	
$Exporter \times IndexDom$					0.282***
					(0.08)
$NonExporter \times IndexDom$					0.476***
					(0.08)
$Exporter \times IndexFor$					0.265***
					(0.08)
$NonExporter \times IndexFor$					0.337***
					(0.07)
First set of controls					
ExternalAudit	-0.126***	-0.092**	-0.132***	-0.093**	-0.091**
	(0.02)	(0.04)	(0.02)	(0.04)	(0.04)
log(age)	-0.001	0.037	0.002	0.034	0.035
	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
DeNovo_private	0.042	0.146***	0.021	0.113**	0.112**
	(0.04)	(0.05)	(0.03)	(0.05)	(0.05)
Joint_Venture_foreign	-0.079	0.060	-0.069	0.050	0.049
	(0.06)	(0.08)	(0.06)	(0.08)	(0.08)
MediumFirm	-0.066**	-0.057	-0.084***	-0.078*	-0.080*
	(0.03)	(0.05)	(0.03)	(0.05)	(0.05)
LargeFirm	-0.189***	-0.178***	-0.215***	-0.219***	-0.221***
	(0.04)	(0.06)	(0.03)	(0.06)	(0.06)
Ownership_foreign	-0.148***	-0.172***	-0.148***	-0.160***	-0.164***
	(0.04)	(0.06)	(0.04)	(0.06)	(0.06)
Ownership_government	0.017	0.242	0.020	0.286*	0.306*
	(0.09)	(0.17)	(0.08)	(0.17)	(0.17)
CapitalCity	-0.052**	-0.020	-0.056**	-0.020	-0.019
	(0.02)	(0.04)	(0.02)	(0.04)	(0.04)
Second set of controls					
DirectExporter		0.006		0.012	0.246**
		(0.05)		(0.05)	(0.12)
CU		-0.378***		-0.403***	-0.402***
		(0.09)		(0.09)	(0.09)
lProd		-0.048**		-0.044**	-0.044**
		(0.02)		(0.02)	(0.02)
industry effect (2-digit)	Yes	Yes	Yes	Yes	Yes
country-year effect	Yes	Yes	Yes	Yes	Yes
χ^2	1388.22	646.72	1445.93	704.14	709.74
Obs	11,656	4,624	12,127	4,865	4,865

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors in parentheses. *Subsidiary_fSOE*, *Other_ origin*, *Ownership_manager*, *Skilled* are included but not reported. $SalesGrowth$, $ExportGrowth$, $AssetGrowth$ and $Innovation$ are included in specifications (2), (4) and (5) but coefficients are not reported as they are never significant. The model was also estimated with: (a) no fixed effect, (b) only country effects, (c) only industry effect, (d) only year effects. Results are robust to these alternative specifications. The use of clustered standard errors (by country, industry of country-industry-year level) does not affect the significance of the coefficients on the main variables of interest.

Figure 1.2: Predicted probabilities of reporting different values of *Access*



Notes. Probabilities are predicted by using the coefficients estimated in specification (1) of Table 1.4. Probabilities are calculated for SME, private from the start-up, with individual local ownership and that do not export directly.

The same estimation routine is repeated on *Cost* to verify the extent to which competitive pressure is associated with financial constraints arising from high costs of credit. Results are reported in Table 1.5. In this case, the difference between the estimated coefficients on the variables of domestic and foreign competition is more pronounced than in regressions on *Access*[17]. In the augmented model (column 2) all the variables of foreign competition lose significance, while those of domestic competition are still positive and significant at the 1% level. Regressions with *IndexDom* and *IndexFor* (columns 3 and 4) confirm the intuition that domestic competition is more strongly correlated than foreign competition with financial constraints arising from the high cost of credit. Differently from the results obtained on *Access*, the relationship between competition and *Cost* does not differ according to the export status. Estimated coefficients on the variables of domestic competitive pressure on *Cost* are also generally greater than those on *Access*. This finding suggests that on the supply side, higher risk premium may be the most common response of banks to higher competitive pressure

[17]The coefficient of *CostDom* is greater than the one on *CostFor* at the 2% level of confidence when equality of the coefficients is tested, and the coefficient of *ProdDom* is greater than the one on *ProdFor* at the 3%.

on borrowers, while credit rationing could be a secondary reaction affecting a smaller group of firms.

Figure 1.3 plots the predicted probability of reporting each level of *Cost*, conditional on each category assumed by the competition variables[18]. Greater domestic pressure to reduce costs and innovate products is associated with shifts from low to high levels of *Cost*. Among the firms with *CostDom=1* over 50% reports that the cost of external finance is 'no obstacle' or a 'minor obstacle' for growth and current operations. On the contrary, when *CostDom=4* this proportion falls to 35% and the proportion reporting cost of financing as a 'moderate' or 'serious' obstacle rises to 65%. Therefore, estimates on *Cost* are consistent with the hypothesis that in industries with greater pressure to reduce costs and to introduce new products the risk premium on loans is higher, and that financial intermediaries consider competition in borrowers' markets as a source of uncertainty about firms' survival.

Although, the cross-sectional nature of the analysis does not allow to establish causality, the results presented in this section are consistent with the initial hypothesis that competition affects the seriousness of financial constraints. Interestingly, domestic competition appears more important than foreign competition for financial constraints.

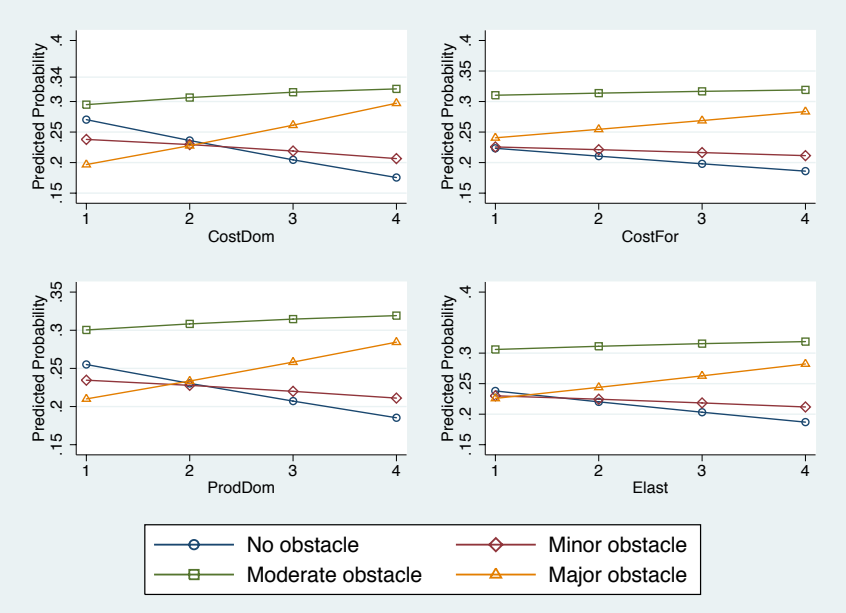
[18] As for the plots on *Access*, in the plots on *Cost* the benchmark firm is a small or medium enterprise with local individual ownership and no direct exports. Probabilities are computed from the estimated coefficients in column (5) of Table 1.5.

Table 1.5: Results from ordered Probit models on *Cost*

	(1)	(2)	(3)	(4)	(5)
Competition variables					
CostDom	0.096***	0.072***			
	(0.02)	(0.02)			
CostFor	0.038**	0.027			
	(0.02)	(0.03)			
ProdDom	0.074***	0.091***			
	(0.02)	(0.02)			
ProdFor	0.023	0.034			
	(0.02)	(0.03)			
Elast	0.054***	0.049***			
	(0.01)	(0.02)			
ImportComp	0.011	0.008			
	(0.01)	(0.01)			
IndexDom			0.556***	0.506***	
			(0.04)	(0.06)	
IndexFor			0.200***	0.191***	
			(0.03)	(0.05)	
$Exporter \times IndexDom$					0.500***
					(0.08)
$NonExporter \times IndexDom$					0.511***
					(0.08)
$Exporter \times IndexFor$					0.135*
					(0.08)
$NonExporter \times IndexFor$					0.241***
					(0.07)
First set of controls					
ExternalAudit	-0.090***	-0.050	-0.091***	-0.043	-0.042
	(0.02)	(0.04)	(0.02)	(0.04)	(0.04)
log(age)	0.019	0.037	0.017	0.030	0.030
	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
DeNovo_private	-0.005	0.122**	-0.021	0.097*	0.096*
	(0.03)	(0.05)	(0.03)	(0.05)	(0.05)
Joint_Venture_foreign	-0.050	0.154*	-0.050	0.124	0.125
	(0.06)	(0.08)	(0.06)	(0.08)	(0.08)
MediumFirm	-0.009	-0.006	-0.023	-0.016	-0.016
	(0.03)	(0.05)	(0.03)	(0.04)	(0.04)
LargeFirm	-0.126***	-0.086	-0.138***	-0.092*	-0.092*
	(0.04)	(0.06)	(0.03)	(0.06)	(0.06)
Ownership_foreign	-0.071*	-0.068	-0.081**	-0.066	-0.069
	(0.04)	(0.06)	(0.04)	(0.06)	(0.06)
Ownership_government	-0.044	-0.116	-0.050	-0.058	-0.051
	(0.08)	(0.17)	(0.08)	(0.16)	(0.16)
CapitalCity	-0.156***	-0.109***	-0.162***	-0.121***	-0.122***
	(0.02)	(0.04)	(0.02)	(0.04)	(0.04)
Second set of controls					
DirectExporter		0.022		0.018	0.107
		(0.05)		(0.05)	(0.12)
CU		-0.549***		-0.576***	-0.575***
		(0.09)		(0.08)	(0.08)
lProd		-0.080***		-0.073***	-0.073***
		(0.02)		(0.02)	(0.02)
industry effect (2-digit)	Yes	Yes	Yes	Yes	Yes
country-year effect	Yes	Yes	Yes	Yes	Yes
χ^2	1692.10	840.44	1735.01	883.43	883.42
Obs.	11,726	4,670	12,206	4,917	4,917

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors in parentheses. *Subsidiary_fSOE*, *Other_ origin*, *Ownership_manager*, *Skilled* are included but not reported. $SalesGrowth$, $ExportGrowth$, $AssetGrowth$ and $Innovation$ are included in specifications (2), (4) and (5) but coefficients are not reported as they are never significant. The model was also estimated with: (a) no fixed effect, (b) only country effects, (c) only industry effect, (d) only year effects. Results are robust to these alternative specifications. The use of clustered standard errors (by country, industry of country-industry-year level) does not affect the significance of the coefficients on the main variables of interest.

Figure 1.3: Predicted probabilities of reporting different values of *Cost*



Notes. Probabilities are predicted by using the coefficients in specification (1) of Table 1.5. Probabilities are calculated for SME, private from the start-up, with individual local ownership and that do not export directly.

1.5.2 Rejected or discouraged?

The aim of this section is to identify more precisely the demand and supply factors that account for the positive and significant correlation between competitive pressure and financial constraints. Since the BEEPS questionnaire was modified over the years and specific questions on the demand and supply of credit were introduced only in 2005, the rest of the analysis is conducted on data from the survey waves of 2005, and 2008/2009. The relevant questions to distinguish credit demand and supply are:

- Q. $k8$: *"Does this establishment have a line of credit or a loan from a financial institutions?"*
- Q. $k16$: *"In the last fiscal year, did your establishment apply for new loans or lines of credit?"*
- Q. $k18a$: *"Did your establishment apply for any new loans or lines of credit that were rejected?"*
- Q. $k17$: *"Which is the main reason for not applying for a loan or a line of credit?"*

In particular, answers to question $k17$ allow to distinguish firms that do not apply for credit because they do not need external financing ($k17 = 1$), from those that do not apply because they are discouraged. I consider as discouraged those firms that motivate their lack of loan applications with one of the following reasons: application procedures are too complex ($k17 = 2$), interest rates are unfavorable ($k17 = 3$), collateral requirements are too high ($k17 = 4$), the size or the maturity of the loan would be insufficient ($k17 = 5$), they are pessimist about the approval of the loan application ($k17 = 6$), informal payment is required ($k17 = 7$), and for any other reason ($k17 = 8$). Discouraged borrowers should be considered financially constrained because if loan applications are costly, and if the probability of obtaining a loan at favorable conditions is low, firms may decide not to apply for loans as a rational response to observed restrictions in the supply of credit (Jappelli, 1990).

Following Drakos and Giannakopoulos (2011), questions $k8$, $k16$, $k18a$ and $k17$ are used to construct the binary variables *Rejected*, *Discouraged* and *Rationed*:

$$Rejected_{istc} = \begin{cases} 1, & \text{if } k8 = no \wedge k16 = yes \wedge k18a = yes \\ 0, & \text{if } k8 = yes \wedge k16 = yes \end{cases}$$

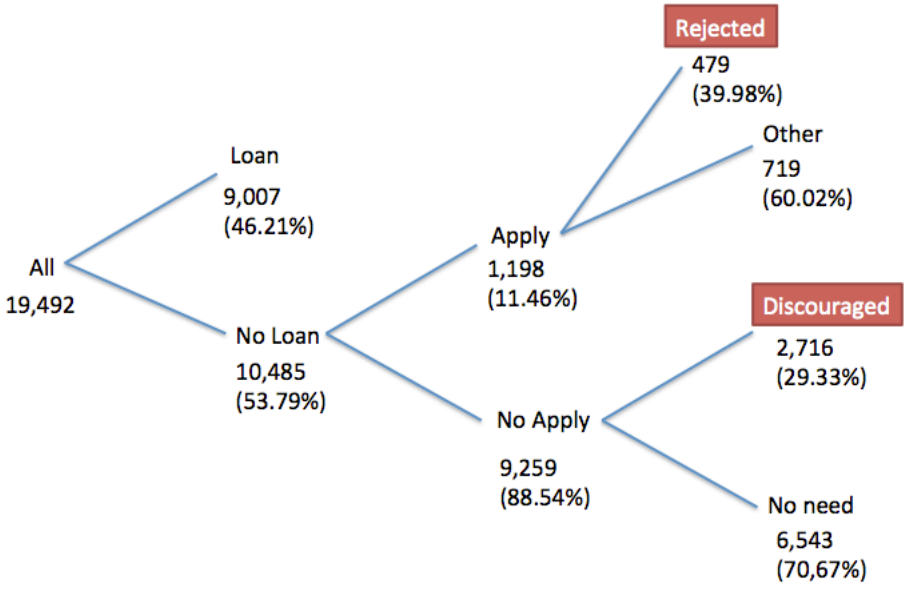
$$Discouraged_{istc} = \begin{cases} 1, & \text{if } k8 = no \wedge k16 = no \wedge k17 \neq 1 \\ 0, & \text{if } k8 = no \wedge k16 = no \wedge k17 = 1 \end{cases}$$

$$Rationed_{istc} = \begin{cases} 1, & \text{if } Discouraged_{istc} = 1 \vee Rejected_{istc} = 1 \\ 0, & \text{otherwise} \end{cases}$$

The first two variables identify those firms that are credit rationed because their loan applications were rejected ($Rejected_{istc} = 1$), and those that are rationed because they expected not to be able to obtain external financing at favorable conditions ($Discouraged_{istc} = 1$). Instead, $Rationed_{istc}$ captures simultaneously both dimensions of credit rationing. Regressions on *Rationed* can be used to investigate whether supply side factors contribute to explain the relationship between competitive pressure and self-reported measures of financial constraints obtained in section 1.5.1. Instead, separate analyses on *Rejected* and *Discouraged* are conducted to test if competitive pressure on borrowers increases banks' propensity to reject loan applications, or if it

rather discourages some firms from applying for credit. Figure 1.4 shows the distributions of firms by credit status.

Figure 1.4: Breakdown of the sample of firms by credit status



Notes. Each node of the figure reports the number of firms providing the answer to the survey question and the percentage of respondents over the population of firms in the previous node. "Rejected" and "Discouraged" are highlighted as these nodes includes all firms that we consider as "Rationed".

By construction, *Rejected* is observed only when firms apply for loans ($k16 = yes$), while *Discouraged* is observed only when they do not apply ($k16 = no$). Consequently, if competitive pressure affects credit demand, selection into the estimation samples for regressions on *Rejected* and *Discouraged* is likely to be endogenous with respect to the key independent variables, and the non-randomness of the sample would bias the estimates of the coefficients of interest. Therefore, consistent estimates are obtained by adopting an Heckman's two stage estimation procedure. First, a Probit model is estimated to compute firms' probabilities to apply for loans. The choice to apply for a loan is modeled as follows:

$$Apply_{istc} = \begin{cases} 1, & \text{if } e_i > -(x_i'\beta + c_i'\theta + D_c'\gamma_1 + D_s'\gamma_2 + D_y'\gamma_3) \\ 0, & \text{if } e_i \leq -(x_i'\beta + c_i'\theta + D_c'\gamma_1 + D_s'\gamma_2 + D_y'\gamma_3) \end{cases}$$

$$Pr(Apply = 1|x_i, c_i, D_c, D_s) = \Phi(-x_i'\hat{\beta} - c_i'\hat{\theta} - D_c'\hat{\gamma}_1 - D_s'\hat{\gamma}_2 - D_y'\gamma_3) \qquad (1.3)$$

where e_i is the normally distributed firm-level error, $\Phi(\cdot)$ is the cumulative normal distribution function, and the polynomial $x_i'\beta + c_i'\theta + D_c'\gamma_1 + D_s'\gamma_2 + D_y'\gamma_3$ corresponds to the right-hand side of model 1.1. Predicted probabilities from 1.3 are then used to construct the Inverse Mills Ratio $\hat{\lambda}_{i1}$, where $\phi(\cdot)$ at the numerator is the normal probability density function:

$$\hat{\lambda}_{i1} = \frac{\phi(-x_i'\hat{\beta} - c_i'\hat{\theta} - D_c'\hat{\gamma}_1 - D_s'\hat{\gamma}_2)}{1 - \Phi(-x_i'\hat{\beta} - c_i'\hat{\theta} - D_c'\hat{\gamma}_1 - D_s'\hat{\gamma}_2)}$$

$\hat{\lambda}_{i1}$ is then included in the linear probability model on *Rejected*, to correct the bias arising from the exclusion of non-applicants from the estimation sample:

$$Rejected_{istc} = x_i'\beta + c_i'\theta + D_c'\gamma_1 + D_s'\gamma_2 + D_y'\gamma_3 + \delta_1\hat{\lambda}_{i1} + e_i \tag{1.4}$$

Instead, *Discouraged* is observed only for firms that do not apply for loans. Therefore, model 1.3 is estimated by substituting on the left-hand side the dependent variable $NonApply = 1 - Apply$. Predicted probabilities from the modified version of 1.3, are then used to construct $\hat{\lambda}_{i2}$. Contrarily to $\hat{\lambda}_{i1}$, this Inverse Mills Ratio corrects the bias deriving from the exclusion of loan applicants from the estimation sample. Therefore, $\hat{\lambda}_{i2}$ is included among the covariates of model 1.5:

$$Discouraged_{istc} = x_i'\beta + c_i'\theta + D_c'\gamma_1 + D_s'\gamma_2 + D_y'\gamma_3 + \delta_2\hat{\lambda}_{i2} + e_i \tag{1.5}$$

I refer to models 1.4 and 1.5 as second-step models to distinguish them from the first-step Probit models used to construct the Inverse Mills Ratios. By testing the significance of the estimated coefficients $\hat{\delta}_1$ and $\hat{\delta}_2$, I indirectly test whether OLS models without the correction terms $\hat{\lambda}_i$ would have generated inconsistent estimates. However, t-tests on these coefficients may also fail to reject the null hypotheses that $\delta_1 = 0$ and $\delta_2 = 0$ if there is near collinearity between the Inverse Mills Ratios and the other variables appearing on the right-hand side of the second-step models 1.4 and 1.5. This problem arises when the specification of the Probit model used to construct the Inverse Mills Ratio includes the same set of covariates appearing in second-step equations. To avoid this problem, I adopt a specification of the Probit equation that excludes the variables of legal origin of the firm (*De-novo Private*, *Private subsidiary ex-SOE*, *Joint Venture Foreign*, *Other Origin*) while maintaining the dummies relative to current

ownership. The exclusion of the variables relative to firms' origin from the first-step regression is based on the assumption that firms' legal origin should not impact on its current demand for credit after controlling for current ownership.

As a second measure to avoid collinearity, in the first- and in the second-step specifications I introduce industry dummies at different levels of aggregation. The selection models include industry dummies at the 3-digit level of ISIC aggregation, while second-step models include industry dummies at the 2-digit level. This approach can be justified by arguing that technological differences across more disaggregated industry classes are more relevant to explain differences of credit demand rather than differences of credit supply. For example, within the 2-digit ISIC industry 'Manufacture of food products and beverages', firms manufacturing dairy products (3-digit ISIC code 151) and firms producing grain mill products (3-digit ISIC code 153), are likely to have different financing needs due to a diverse time lag between the purchase of the intermediate inputs and the sale of the finite product and different investment policies. On the contrary, banks may assess loan applications on the basis of industry-level features that are more stable across these two 3-digit industries (e.g., the proportion of tangible assets).

A simple exercise confirms this intuition. I regress *Apply*, *Rejected* and *Discouraged* on the full set of industry dummies constructed at the 3-digit ISIC level, finding that the adjusted R^2 of the regression on *Apply* (.044) is twice as big as the ones on *Rejected* (.023) and on *Discouraged* (.017). Since more disaggregated industry dummies explain a greater proportion of the variance of the dependent variable used in the first-stage models, this suggests that the exclusion restriction is tenable as long as 2-digit industry dummies are included in second-step regressions. The use of different set of industry dummies in the first and the second stage regressions is effective in reducing collinearity between the $\hat{\lambda}$s and the other covariates on the right-hand side of models 1.4 and 1.5. When all the competition variables $CostDom$, $CostFor$, $ProdDom$ and $ProdFor$ are included in the same model, high collinearity is found between the two variables of domestic competition and between the two variables of foreign competition. Therefore, the indices of domestic and foreign competition $IndexDom$ and $IndexFor$ are substituted to the individual variables of cost and product competition.

Table 1.6 reports the results obtained by implementing the two-step Heckman procedure to estimate the models on *Rationed* (column 1), *Rejected* (column 2) and *Discouraged* (columns 3 and 4)[19]. The last column of the table reports maximum likelihood estimates for the selection model on *Discouraged*. Unfortunately, maximum likelihood could not be used to estimate the models on *Rationed* and *Rejected* because in both cases the maximization process failed to converge[20]. The lower panel of the table shows the estimates of the first-step selection models, where the dependent variables are *NoLoan* (column 1), *Apply* (column 2), and *Non Apply* (columns 3 and 4). The estimated coefficient of the Inverse Mills Ratio is significant only in the model on *Rejected*. This suggests that the exclusion of λ_{i1} from the right-hand side of the equation would have generated inconsistent estimates. On the contrary, coefficients of these correction terms are insignificant in models on *Rationed* and *Discouraged* [21].

First-step estimates confirm the hypothesis that both domestic and foreign competitive pressure are positively associated with greater demand for credit. Indeed, Probit models on *Apply* (*NonApply*) generate positive (negative) and significant coefficients of *IndexDom* and *IndexFor*. The negative coefficient obtained when *IndexDom* is regressed on *NoLoan* supports the idea that in the presence of high domestic competitive pressure firms are less likely to rely exclusively on self-financing. The estimated coefficients of the control variables suggest that larger firms, firms subject to external audit, exporters and more productive firms are more likely to resort to bank credit. Firms with foreign ownership appear instead less reliant on external financing, and this could be the reason why these firms are less likely to report credit rationing and high cost of credit as major obstacles.

[19]When *Rationed* is the dependent variable, I adopt the same specification of the selection models used in regressions on *Rejected* and *Discouraged*, but the dependent variable for the selection process is *NoLoan* that assumes value 1 for firms without a loan and value 0 otherwise. *NoLoan* regulates the selection process because by construction rationed firms are observed only when they do not have a loan.

[20]All estimations are obtained using the command heckman in Stata10. Problems in reaching convergence with ML estimators is also the reason why the Heckman selection model for bivariate variables could not be used.

[21]OLS estimates that are obtained by omitting the correction terms from the models are very similar to those obtained in Heckman models. These are made available upon request.

Second-step regressions estimate positive and significant coefficients of *IndexDom* and *IndexFor* when these variables are regressed on *Rationed* and *Discouraged*. Consistently with previous findings, domestic competition appears more strongly associated with credit rationing than foreign competition. Firms without a loan are 11% more likely to be rationed when exposed to the highest level of domestic competition ($IndexDom = 1$) compared with those that operate in environments without pressure to reduce costs and to innovate products ($IndexDom = 0$). Instead, an equivalent change in the level of foreign competition increases the probability of rationing by less than the 5% [22]. The correlation between competition and credit rationing is completely explained by 'preemptive credit rationing'. Indeed, the coefficients of $IndexDom$ and $IndexFor$ are small and insignificant in the regression on *Rejected*, while they explain respectively a change of 9% and 4% in the regression on *Discouraged*.

These results provide new information on the relationship between competition and financial constraints. On one hand, they suggest that more intense competition is associated with greater demand for external financing, and this result is in line with previous empirical studies finding that competition stimulates investment (Carlin et al., 2001, 2004). On the other hand, they indicate that higher competitive pressure is also associated with greater probability of discouragement. On the basis of this last result, the next section focuses on those factors leading to 'discouragement' of potential loan applicants.

[22] In the second step I estimate linear probability models, therefore the coefficients can be immediately interpreted as marginal effects.

Table 1.6: Results from Heckman selection models

	(1)	(2)	(3)	(4)
Main dependent:	Rationed	Rejected	Discouraged	Discouraged
Estimation technique:	Twostep	Twostep	Twostep	ML
Second step				
IndexDom	0.117***	0.002	0.094***	0.096***
	(0.02)	(0.01)	(0.02)	(0.02)
IndexFor	0.047**	0.007	0.036**	0.039**
	(0.02)	(0.01)	(0.02)	(0.02)
ExternalAudit	-0.043***	0.003	-0.023*	-0.020*
	(0.01)	(0.01)	(0.01)	(0.01)
CapitalCity	-0.038**	0.010	-0.026*	-0.026*
	(0.02)	(0.01)	(0.02)	(0.02)
lProd	-0.016***	-0.006**	-0.017***	-0.016***
	(0.01)	(0.00)	(0.01)	(0.00)
log(age)	0.017*	-0.002	0.012	0.011
	(0.01)	(0.00)	(0.01)	(0.01)
De_Novo_Private	0.062**	-0.010	0.056**	0.057**
	(0.03)	(0.01)	(0.02)	(0.02)
Joint_Venture_Foreign	0.038	-0.001	-0.005	-0.004
	(0.05)	(0.02)	(0.04)	(0.04)
Privatized_SOE	0.065**	-0.013	0.058**	0.059**
	(0.03)	(0.01)	(0.02)	(0.02)
Subsidiary_fSOE	0.018	-0.038	0.055	0.055
	(0.05)	(0.02)	(0.04)	(0.04)
MediumFirm	-0.063***	-0.035***	-0.050***	-0.046***
	(0.02)	(0.01)	(0.01)	(0.01)
LargeFirm	-0.137***	-0.046***	-0.104***	-0.098***
	(0.03)	(0.01)	(0.02)	(0.02)
Ownership_foreign	-0.106***	-0.017	-0.069***	-0.073***
	(0.02)	(0.01)	(0.02)	(0.02)
First step	Dependent: *No-loan*	Dependent: *Apply*	Dependent: *Non-Apply*	Dependent: *Non-Apply*
IndexDom	-0.193***	0.188***	-0.188***	-0.190***
	(0.04)	(0.04)	(0.04)	(0.04)
IndexFor	-0.069*	0.133***	-0.133***	-0.133***
	(0.04)	(0.04)	(0.04)	(0.04)
ExternalAudit	-0.159***	0.206***	-0.207***	-0.208***
	(0.03)	(0.03)	(0.03)	(0.03)
lProd	-0.060***	0.071***	-0.070***	-0.071***
	(0.01)	(0.01)	(0.01)	(0.01)
lage	0.051***	-0.061***	0.062***	0.060***
	(0.02)	(0.02)	(0.02)	(0.02)
MediumFirm	-0.387***	0.307***	-0.307***	-0.307***
	(0.03)	(0.03)	(0.03)	(0.03)
LargeFirm	-0.673***	0.562***	-0.563***	-0.564***
	(0.04)	(0.04)	(0.04)	(0.04)
Subsidiary_fSOE	0.228**	-0.108	0.109	0.110
	(0.09)	(0.09)	(0.09)	(0.09)
Ownership_foreign	0.309***	-0.354***	0.353***	0.354***
	(0.04)	(0.04)	(0.04)	(0.04)
DirectExporter	-0.295***	0.236***	-0.233***	-0.234***
	(0.03)	(0.03)	(0.03)	(0.03)
IndirectExporter	-0.164***	0.121***	-0.121***	-0.121***
	(0.04)	(0.04)	(0.04)	(0.04)
λ	0.007	0.070***	-0.027	
	(0.05)	(0.02)	(0.04)	
p-value Wald test (rho=0)				0.24
industry effect	Yes	Yes	Yes	Yes
country-year effect	Yes	Yes	Yes	Yes
Num. first-step obs.	13,708	13,695	13,692	13,692
Num. second-step obs.	6,803	7,191	6,509	6,509

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors reported in parentheses for the ML model on *Discouraged*.

1.5.3 The collateral channel

Table 1.18 in the Appendix shows the number of firms reporting each of the possible reasons to be discouraged and their proportion over the total. The three main causes of discouragement are high interest rates (46.96%), complexity of application procedures (17.98%), and high collateral requirements (15.44%). While there is no theoretical reason to expect that domestic competitive pressure induces banks to adopt more complex procedures for loan applications, the link between competitive pressure, high interest rates and collateral requirement can be rationalized with the argument that firms in highly competitive industries are riskier borrowers because they face greater probability of failure and greater uncertainty over future return. The positive relationship between cost of credit and competition is supported by the results reported in Table 1.5, whereas the relationship between collateral requirement and competitive pressure remains to be tested.

To do so the variable *Collateral* (i.e., collateral requirement as a proportion of the loan value) is regressed on $IndexDom$ and $IndexFor$ and on the set of firm-level controls previously used in the augmented model on *Access*[23]. However, since the values of *Collateral* are observed only for those firms that obtain credit, it is still necessary to correct for selection bias. The Inverse Mills Ratio is now constructed by using the predicted probabilities from a Probit model on the bivariate variable *Loan* that assumes value 1 when firms have a loan or a line of credit and value 0 otherwise. For the first-stage Probit model, I maintain the same specification previously used in the selection models on *Apply*. In addition, to account for the fact that 22% of the firms with a loan report collateral requirement equal to 0, in the second-stage regression I use a Tobit model including the Inverse Mills Ratio from the Probit model on *Loan* among the covariates[24].

[23] As reported in column 1 of Table 1.4.

[24] Results obtained by omitting the the Inverse Mills Ratio are similar in terms of significance of the coefficients and their magnitude. Although these are not reported, they are available upon request.

Table 1.7: Results from Tobit models on *Collateral*

	(1) Whole Sample	(2) Small Firms	(3) Large Firms	(4) Legal >6	(5) Legal <6	(6) Legal >6 Small firms	(7) Legal >6 Large firms
IndexDom	16.555***	22.008***	12.049**	16.662***	11.871**	30.154***	10.923
	(3.77)	(7.39)	(6.06)	(4.97)	(6.00)	(9.39)	(7.98)
IndexFor	6.346*	5.881	6.948	11.100***	-1.560	13.487*	6.794
	(3.29)	(6.41)	(5.41)	(4.18)	(5.39)	(7.95)	(7.16)
IMR	7.311	-4.853	-9.624	-6.374	2.994	-6.316	-13.627
	(7.87)	(16.10)	(15.12)	(10.86)	(14.82)	(19.55)	(19.45)
ExternalAudit	0.818	-6.076	-4.810	1.800	-2.922	-2.429	2.206
	(2.59)	(5.00)	(4.73)	(3.36)	(4.24)	(6.10)	(6.22)
CapitalCity	0.325	-2.814	5.499	-0.945	4.261	-3.279	-0.243
	(4.01)	(8.17)	(6.21)	(5.42)	(5.88)	(11.01)	(8.59)
lProd	1.427*	-0.112	-2.120	-1.108	-1.117	-1.301	-1.746
	(0.79)	(2.23)	(1.73)	(1.55)	(1.81)	(2.81)	(2.27)
lage	2.877*	5.328	-1.715	1.693	3.727	4.027	0.533
	(1.72)	(3.89)	(2.43)	(2.18)	(2.84)	(5.10)	(3.07)
De_Novo_Private	18.326***	25.967	16.644**	15.504***	19.002	24.703	23.118***
	(5.12)	(20.01)	(6.74)	(5.74)	(12.52)	(21.18)	(7.52)
Joint_Venture_Foreign	7.930	6.684	18.671*	8.891	-3.513	33.553	16.361
	(8.47)	(26.98)	(11.09)	(9.90)	(17.47)	(31.56)	(12.43)
Privatized_SOE	15.375***	29.771	14.011**	10.777*	19.312	32.174	12.986*
	(5.15)	(21.33)	(6.30)	(5.75)	(12.52)	(23.48)	(6.96)
Subsidiary_fSOE	-3.607	8.862	1.998	4.311	-15.214	42.500	20.060
	(9.80)	(27.85)	(14.35)	(11.68)	(19.10)	(27.90)	(19.41)
MediumFirm	16.259***			9.419**	19.193***		
	(3.48)			(4.58)	(6.14)		
LargeFirm	15.863***			6.434	18.429**		
	(4.74)			(6.37)	(8.50)		
Ownership_foreign	-22.835***	-2.147	-27.359***	-18.899***	-26.695***	-7.534	-19.653***
	(4.32)	(11.41)	(5.87)	(5.16)	(8.09)	(13.51)	(6.90)
industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
country-year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	7,609	2,586	2,387	4,491	3,118	1,595	1,365
Num. censored obs.	1,549	642	437	809	740	376	201
Log likelihood	-3.7e+04	-1.2e+04	-1.2e+04	-2.3e+04	-1.5e+04	-7635.50	-6931.78
Pseudo R^2	0.02	0.02	0.03	0.01	0.02	0.02	0.02

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors reported in parentheses.

Table 1.7 reports the results obtained by estimating this model on different sections of the database. First, the model is estimated on the whole sample (column 1). Second, separate regressions are run for small firms only and for big firms only (columns 2 and 3). Third, I run separate regressions for firms operating in countries with relatively stronger and weaker legal rights enforcement (columns 4 and 5)[25]. Lastly, I estimate separate regressions for small firms and big firms in countries with different levels of legal right enforcement (columns 6 and 7).

[25]Legal right enforcement is measured using the *Strength of legal rights index (0-10)* from the World Bank Doing Business Database. Countries with relatively stronger enforcement are those with a value of the index above the sample median of 6. Countries with relatively weaker protection are those for which the index is smaller or equal to 6.

When the model is estimated on the whole sample, firms exposed to the most intense level of domestic competition ($IndexDom = 1$) are found pledging collateral that covers on average 16.5% more of the loan value than firms exposed to the lowest level of domestic competition ($IndexDom = 0$). This result is mainly driven by the collateral requirements of small firms for which the estimated marginal effect of $IndexDom$ is 22% against the coefficient of 12% estimated on the sample with large firms only. By exploiting the cross-sectional dimension of the dataset, I also find that domestic competition is associated with higher collateral requirements in countries with stronger legal right enforcement ($Legalrightsindex > 6$). This result is consistent with the argument made in the *EBRD Transition report 2006*, according to which the use of collateral is common only in those countries where creditors' rights are sufficiently protected to ensure that collateralized assets can be eventually sized by lenders (EBRD, 2006). In these countries, the different effect of competition on small and big firms is even larger. Small firms for which $IndexDom = 1$ are on average required to pledge collateral covering for 30.15% more of the loan value than small firms with no competitive pressure. Instead, for large firms operating in the same group of countries the estimated marginal effect of $IndexDom$ is not statistically different from zero.

According to Chan and Thakor (1987), borrowers who pledge collateral are less subject to moral hazard: by sharing part of the risk, they are prevented from increasing their expected return against lenders' interests. In addition, when lenders cannot identify *ex-ante* the risk embodied in borrowers' projects, collateral can be used as a device through which safer borrowers signal their nature to financial intermediaries (Manove et al., 2001). In both cases, lenders would be more willing to concede larger loans and cheaper credit when collateral clauses are included in credit contracts. Consequently, larger enterprises with more tangible assets should be expected to pledge more collateral, because by doing so they attenuate financial constraints. Results confirm this prediction: the positive coefficients on $MediumFirm$ and $LargeFirm$ in the first column of table 1.7 indicate that medium and large firms pledge respectively 13.78% and 12.31% more collateral than small firms.

Consistently with this interpretation, the positive correlation between $IndexDom$ and $Collateral$ supports the hypothesis that financial constraints are more severe when

competition is intense. On one hand, banks may require more collateral to accept loan applications from firms that operate in more competitive industries. On the other hand, even if banks do not impose minimum levels, these firms may still need to pledge relatively more collateral to obtain affordable credit. This process configures a vicious cycle for small firms. These are more dependent on debt financing for growth but they are also more vulnerable to competitive pressure than larger incumbents[26]. As a consequence, when banks sign debt contracts with small firms whose survival is threatened by competitors, they require higher interest rates or more collateral to insure themselves against borrowers' greater risk of default. However, because small firms control on average fewer tangible assets, the proportion of discouraged firms grows as competition becomes more intense.

The result that the collateral pledged by small firms in competitive industries is relatively higher in countries with stronger legal right enforcement should not be interpreted as evidence that in these countries competitive pressure is more detrimental for small firms' access to finance. It rather suggests that if collateral is an effective risk-sharing device between banks and firms, small companies that can pledge sufficient collateral have greater scope to mitigate credit constraints when exposed to competition. However, firms that are excluded from credit are likely to be relatively more numerous in countries with insufficient legal right enforcement, where the availability of collateralizable assets does not ensure access to credit.

1.5.4 International firms and financial constraints

Within the trade literature on firm heterogeneity, growing attention has been dedicated to financial constraints. The important role that up-front sunk costs play within the seminal model of Melitz (2003), has spurred theoretical and empirical work investigating the impact of financial factors on countries' and firms' extensive and intensive margins of trade. These contributions are motivated by the hypothesis that in the presence of imperfect capital markets not all firms enjoy the same access to credit, and

[26]For example, Cooley and Quadrini (2001) propose a model of firm dynamics with financial frictions that explains why small and young firms present faster and more volatile growth, higher probability of default and job reallocation.

not all potentially profitable exporters obtain sufficient credit to sustain the upfront costs to access foreign markets (Chaney, 2013; Manova, 2008).

A growing body of empirical evidence confirms the relevance of financial factors for international trade. Manova (2008) finds that more financially developed countries have comparative advantage in industries with greater dependence on external financing and fewer tangible assets. Using matched bank-firm data for Japan, Amiti and Weinstein (2011) show that negative shocks in credit supply reduce proportionally more exports than domestic sales. Financial constraints also appear to reduce the number of export destination served by French firms and their probability of survival in foreign markets (Askenazy et al., 2011), while Italian firms that are based in areas with restricted supply of financial services are less likely to export (Minetti and Zhu, 2011). Using the second and the third waves of BEEPS, Gorodnichenko and Schnitzer (2010) find that financial constraints hamper the complementarity of innovation and export activities that foster productivity gains at the firm level. In counter tendency with these results, Stiebale (2011) argues for the irrelevance of financial constraints for export decisions, arguing instead that most financially constrained firms are just not productive enough to compete internationally.

Although the relationship between trade and finance is well established in the literature, the direction of causality between firms' access to external financing and participation to international trade is still a matter of debate. On one side, some authors provide evidence that *ex-ante* unconstrained firms are more likely to access foreign markets, but that export participation does not improve *ex-post* their financial health and access to credit (Bellone et al., 2010). On the opposite side, studies based on UK data suggest that firms' *ex-post* financial status is improved by exporting, but that *ex-ante* financial constraints do not influence their participation in foreign markets (Greenaway et al., 2007). In support to the hypothesis that global engagement reduces financial constraints, Bridges and Guariglia (2008) show that the survival of UK exporters is less sensitive to liquidity constraints than the survival of purely domestic firms.

Feenstra et al. (2011) model the differential effect of information asymmetries on financial constraints faced by exporters and non-exporters, and test theoretical predictions with Chinese firm-level data. In their model financial intermediaries impose

tighter credit constraints on exporters because export operations are inherently riskier than domestic ones due to: longer time lag between production and sale revenue, greater difficulty to enforce cross-border payments, and higher incidence of fixed costs in export activities. Empirically, they find that firms' interest payments, used as a proxy for total loans, are positively associated with revenue, but this relationship is weaker for exporters. This result is interpreted according to the hypothesis that exporters are charged higher interest rates than non-exporters for loans of equivalent size.

This section contributes to the literature on firms' exports and financial constraints by investigating whether exporters in Eastern Europe and Central Asia are less affected by credit rationing arising from greater competitive pressure. This question assumes particular relevance in the light of the results obtained in the previous sections. Indeed, if it is true that competitive pressure on borrowers worsen their prospects to obtain affordable credit, firms' engagement in foreign markets may signal their capacity to survive in the domestic market. Therefore, contrarily to the argument made in Feenstra et al. (2011), financial intermediaries may perceive exporters as less risky borrowers, and be willing to give them credit on more favorable conditions.

In section 1.5.1 the dummy variable *DirectExporters* was included in the augmented specification of the models on *Access* and *Cost*. Those models do not generate clear-cut evidence on the relationship between financial constraints and export status[27]. In the regressions on *Access*, the estimated parameter of the dummy *DirectExporter* was positive and significant only when competition variables were allowed to assume different coefficients for exporters and non-exporters[28]. This may depend on the fact that when restrictions on the parameters are imposed, part of the correlation between export status and *Access* is 'absorbed' by the coefficients of the variables measuring foreign competition[29]. However, the dummy *DirectExporter* was likely to be endogenously determined by financial constraints, and the positive correlation does not constitute

[27] See table 1.4.

[28] See column 5 of Table 1.4.

[29] Indeed, in Section 1.4.1 it was shown that *CostFor* and *ProdFor* are positively associated with export status, suggesting that exporters attach greater importance to foreign competition than non-exporters.

reliable evidence of the fact that exporters are more financially constrained than non-exporters. In addition, regressions on *Cost* did not suggest that exporters are charged relatively higher interest rates than non-exporters[30]. On the contrary, foreign ownership appears consistently associated with less severe financial constraints. Indeed, in the previous sections it has been shown that: foreign firms are less likely to report credit rationing as a major obstacle, that they are less reliant on bank credit, and that they pledge relatively less collateral than domestically owned firms[31].

In this section, the relationship between firms' international activities and credit constraints is investigated more thoroughly, by repeating the estimation of the Heckman selection model on *Rationed* introduced in Section 1.5.2. Two modifications are now introduced on the right-hand side of the model. First, a dummy of lagged export status *exp3* is substituted for the variable of present export status $DirectExporter$. *exp3* assumes value 1 for those firms that exported part of their output directly three years before the survey date, and value 0 otherwise. In previous analyses on *Access* and *Cost* it was not possible to construct this lagged variable because the questionnaire used for the second wave of BEEPS does not contain information on firms' previous export experience. The major advantage of using *exp3* instead of $DirectExporter$ is that the lagged variable is less likely to be simultaneously determined by credit rationing in regressions on *Rationed*. Indeed, *Rationed* refers to credit events (lack of loan application or rejection) occurred in the fiscal year before the survey date, while *exp3* refers to the export status of the firm three years before the survey date.

The second difference from previous specifications is that the variables of domestic and foreign competitive pressure $IndexDom$ and $IndexFor$ are included in the model interacted with $exp3$ and with $NOexp3 = 1 - exp3$. The coefficients of the terms $IndexDom \times exp3$ and $IndexFor \times exp3$ capture the correlation between competition and credit rationing for those firms that exported three years before the survey date. On the contrary, the coefficients on $IndexDom \times NOexp3$ and $IndexFor \times NOexp3$ capture the same correlation for non-exporters. By allowing the coefficients of $IndexDom$ and $IndexFor$ to differ between exporters and non-exporters, this design provides a

[30] See Table 1.5.

[31] See the coefficients of the dummy *Ownership_foreign* in Tables 1.4, 1.6, 1.7.

test of whether export status improves credit access by providing a signal to financial intermediaries about firms' greater capacity to withstand competitive pressure.

The results from the second step of the Heckman model on *Rationed* are reported in Table 1.8, and they confirm that domestic and foreign competition is associated with different probability of credit rationing depending on firms' export status. Purely domestic producers are between 12% and 14% more likely to be credit constrained (i.e., either discouraged or rejected) when $IndexDom$ changes from 0 to 1[32]. Foreign competition is also found to be positively correlated with credit rationing when coefficients are estimated only for the group of non-exporters. On the contrary, all coefficients of $IndexDom$ and $IndexFor$ are insignificant at the 5% level when they refer to the groups of direct exporters[33]. Therefore, it is possible to conclude that *ceteris paribus* exporters in high competitive industries are less likely to be credit constrained than non-exporters, because for the first group of firms the positive correlation between competitive pressure and credit rationing does not hold. However, lagged export status does not affect directly the probability of credit rationing, since the estimated coefficients on *exp3* are insignificant at the 5% level across different specifications.

[32]Proportions refer to the subsample of firms without a loan.

[33]The same results have been obtained running different regressions on the groups of exporters and non exporter at time $t-3$.

Table 1.8: Competition and rationing: exporters vs. non-exporters

	(1)	(2)	(3)	(4)	(5)	(6)
Main Dependent:	Rationed	Rationed	Rationed	Rationed	Rationed	Rationed
Second step						
$IndexDom \times exp3$	0.030	0.072*	0.054			0.054
	(0.03)	(0.04)	(0.04)			(0.05)
$IndexDom \times NOexp3$	0.138***	0.128***	0.119***			0.140***
	(0.02)	(0.02)	(0.02)			(0.02)
$IndexFor \times exp3$				-0.075**	0.035	0.008
				(0.03)	(0.04)	(0.04)
$IndexFor \times NOexp3$				0.060***	0.080***	0.053***
				(0.02)	(0.02)	(0.02)
exp3		-0.040	0.051		-0.007	0.047
		(0.03)	(0.03)		(0.03)	(0.04)
lProd			-0.014**			-0.029***
			(0.01)			(0.01)
log(age)			0.010			-0.010
			(0.01)			(0.01)
MediumFirm			-0.045**			-0.046**
			(0.02)			(0.02)
LargeFirm			-0.071***			-0.081***
			(0.02)			(0.02)
Ownership_foreign			-0.110***			-0.116***
			(0.02)			(0.02)
ExternalAudit			-0.051***			-0.060***
			(0.01)			(0.01)
CapitalCity			-0.041**			-0.028
			(0.02)			(0.02)
First step	*No-loan*	*No-loan*	*No-loan*	*No-loan*	*No-loan*	*No-loan*
$IndexDom \times exp3$	-0.613***	-0.208***	-0.214***			-0.194**
	(0.04)	(0.06)	(0.07)			(0.08)
$IndexDom \times NOexp3$	-0.071**	-0.198***	-0.181***			-0.159***
	(0.03)	(0.03)	(0.04)			(0.04)
$IndexFor \times exp3$				-0.580***	-0.109*	-0.049
				(0.04)	(0.06)	(0.08)
$IndexFor \times NOexp3$				-0.089***	-0.129***	-0.117***
				(0.03)	(0.03)	(0.04)
exp3		-0.429***	-0.299***		-0.325***	-0.319***
		(0.05)	(0.06)		(0.04)	(0.06)
lProd			-0.067***			-0.065***
			(0.01)			(0.01)
log(age)			-0.042**			-0.042**
			(0.02)			(0.02)
MediumFirm			-0.328***		-0.332***	-0.327***
			(0.03)		(0.02)	(0.03)
LargeFirm			-0.487***		-0.444***	-0.486***
			(0.03)		(0.03)	(0.03)
Ownership_foreign			0.233***			0.235***
			(0.04)			(0.05)
ExternalAudit			-0.231***			-0.225***
			(0.03)			(0.03)
CapitalCity			0.164***			0.168***
			(0.04)			(0.04)
Inverse Mills Ratio						
lambda	0.095**	0.094**	0.013	0.127***	-0.128***	0.007
	(0.04)	(0.05)	(0.06)	(0.04)	(0.03)	(0.06)
industry effect	Yes	Yes	Yes	Yes	Yes	Yes
country-year effect	Yes	Yes	Yes	Yes	Yes	Yes
Num. first-step obs.	18,933	18,933	14,241	18,397	18,397	13,830
Num. second-step obs.	8,778	8,778	6,994	8,588	8,588	6,843

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. All models are estimated using the Heckman two-step procedure. Maximum likelihood cannot be used because the likelihood function fails to converge to a maximum when industry dummies are included. Both the first and the second step models include the variables *SubsidiaryfSOE*, *DeNovoPrivate* and *JointVentureForeign*. For the sake of space, coefficients for these variables are not reported in the table but they are available upon request.

1.6 Robustness Checks

The estimates presented in section 1.5.1 may be affected by endogeneity arising from reverse causality, measurement error and omitted variable bias. Of these three sources of endogeneity, the latter represents the major concern as it questions the significance of the relationship between competitive pressure and financial constraints.

Although it is not possible to rule out that financial factors affect the market structure in which firms operate, the literature suggests that the effect of financial constraints on competition is negative (Cooley and Quadrini, 2001; Aghion et al., 2007). Indeed, limited access to credit and high costs of external funds should reduce competitive pressure on incumbent firms by limiting entry and post-entry growth of new competitors. Therefore, reverse causality running from the dependent variables $Access$ and $Credit$ to the independent variables of competitive pressure, would bias downward the estimated coefficients of $CostDom$, $CostFor$, $ProdDom$ and $ProdFor$, and induce to accept the null hypothesis that financial constraints are not affected by competition. Therefore, the presence of this problem would not compromise the main qualitative result that there is a positive correlation between competition and financial constraints.

Measurement error constitutes the major source of concern. Variables constructed from interviewees' subjective evaluations, measure 'objective' phenomena with errors. For example, the executives of two different firms may disagree in evaluating the rejection of a loan as a moderate or as a serious obstacle, even if this has similar consequences for their companies. However, as for the case of reverse causality, measurement error would cause attenuation, biasing the estimated coefficients toward zero.

The worst case scenario is when answers to unrelated survey questions are affected by a systematic bias. This bias might either depend on unobservable individuals' characteristics, or on the structure of the survey. For example, a 'pessimist' interviewee might overestimate constraints and competitive pressure because both are consistent with a negative outlook on the future of the firm. Again, common method bias (CMB) can be introduced by the features of the questionnaire, such as the use of the same scale of measurement to elicit answers across different questions (Podsakoff and Organ, 1986). These problems may originate spurious correlation if unobserved firms' or interviewees'

characteristics affect systematically both dependent and independent variables.

In this section I conduct three robustness checks. First, I exploit the limited panel dimension of the database to control for omitted variable bias by using Panel Fixed-Effect Models. Second, I use the variable *Comp* indicating the number of direct competitors of the firm in the home market as an instrument for the perceived domestic competitive pressure as measured by $IndexDom$. The rationale for this sensitivity test is that *Comp* is a more objective measure of the market structure within which firms operate than $IndexDom$ that is based on managers' perceptions. Hence, by instrumenting $IndexDom$ with *Comp* I exploit only the variance of this variable that is unexplained by omitted time-varying firm-level factors that constitute potential sources of endogeneity. My last robustness check consists in controlling for common method bias by 'purging' the variables of perceived competition and financial constraints of the subjective component.

Fixed-effect Models on *Access* and *Cost* are estimated on the subsample of firms that are observed both in 2002 and 2005, and results are reported in Tables 1.9 and 1.10. For each dependent variable I estimate two specifications of the model. To avoid high pairwise collinearity, variables of product competition and cost competition are introduced separately, or are substituted by the indices $IndexDom$ and $IndexFor$. Each specification is also estimated on the subsample of firms for which the same person was interviewed in both survey waves. This approach controls for the bias arising from the omission of firm-level variables, or from interviewees' time-invariant characteristics that may affect cross-sectional estimates. Fixed-effect models confirm the positive correlation between domestic competition and financial constraints. On the contrary, the coefficients on the variables of foreign competition are insignificant in almost all specifications[34].

[34]The only exception is the positive and significant coefficient of *ProdFor* when this variable is regressed on *Access*.

Table 1.9: Results from Fixed-Effect models on *Access*

	(1) All	(2) Same Interviewee	(3) All	(4) Same Interviewee	(5) All	(6) Same Interviewee
CostDom	0.099**	0.119**				
	(0.05)	(0.06)				
CostFor	0.056	0.018				
	(0.05)	(0.06)				
ProdDom			0.101**	0.100*		
			(0.05)	(0.06)		
ProdFor			0.111**	0.082		
			(0.05)	(0.05)		
IndexDom					0.406**	0.474**
					(0.17)	(0.20)
IndexFor					0.280*	0.169
					(0.17)	(0.19)
Elast	0.058	0.109**	0.056	0.117**	0.056	0.109**
	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)
ImportComp	-0.044	-0.050	-0.053	-0.056	-0.045	-0.050
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
ExternalAudit	-0.034	-0.055	0.003	0.016	-0.035	-0.048
	(0.11)	(0.15)	(0.11)	(0.14)	(0.11)	(0.14)
CU	-0.532**	-0.711**	-0.361	-0.477	-0.473**	-0.638**
	(0.23)	(0.30)	(0.23)	(0.30)	(0.23)	(0.30)
log(age)	0.090	0.264*	0.115	0.271*	0.097	0.271*
	(0.12)	(0.16)	(0.12)	(0.15)	(0.12)	(0.16)
log(lProd)	-0.034	-0.026	-0.019	-0.019	-0.037	-0.030
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
DirectExporter	-0.010	0.015	0.016	0.047	0.029	0.042
	(0.14)	(0.17)	(0.15)	(0.18)	(0.15)	(0.18)
Skilled	0.006	0.003	0.007	0.003	0.007	0.005
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Year 2005	-0.184**	-0.264***	-0.205***	-0.266***	-0.195***	-0.267***
	(0.07)	(0.09)	(0.07)	(0.09)	(0.07)	(0.09)
R^2_within	0.04	0.06	0.04	0.05	0.04	0.06
R^2_between	0.02	0.01	0.01	0.01	0.02	0.01
R^2_overall	0.03	0.02	0.02	0.01	0.03	0.02
Num. groups	1,262	789	1,271	796	1,256	785
Mean num. obs. for group	1.57	1.59	1.57	1.59	1.56	1.58

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors reported in parentheses

Since FE models do not dismiss that the main qualitative result of this chapter is driven by the omission of some firm-level time-invariant factor, I now use instrumental variable regressions to control for endogeneity arising from firm-level time-varying factors[35]. Table 1.11 reports IV estimates obtained by regressing both *Access* and *Cost* on $IndexDom$, where the latter is instrumented by $Comp$, that is a variable assuming value 1 if the firm does not face domestic competitors, value 2 if it faces up to four competitors, and value 3 if faces more than four competitors. Unfortunately, it

[35]I use the user-written Stata command ivreg2 that produces both IV estimates and diagnostic statistics (Baum et al., 2002).

Table 1.10: Results from Fixed-Effect models on *Cost*

	(1) All	(2) Same Interviewee	(3) All	(4) Same Interviewee	(5) All	(6) Same Interviewee
CostDom	0.126***	0.155***				
	(0.04)	(0.05)				
CostFor	0.028	-0.022				
	(0.05)	(0.05)				
ProdDom			0.159***	0.195***		
			(0.05)	(0.06)		
ProdFor			0.052	0.042		
			(0.04)	(0.05)		
IndexDom					0.546***	0.686***
					(0.16)	(0.18)
IndexFor					0.142	0.016
					(0.15)	(0.18)
Elast	0.054	0.078	0.052	0.079	0.045	0.067
	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)	(0.06)
ImportComp	-0.036	-0.026	-0.048	-0.048	-0.041	-0.032
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
ExternalAudit	-0.029	-0.117	-0.023	-0.080	-0.032	-0.115
	(0.11)	(0.14)	(0.11)	(0.13)	(0.11)	(0.14)
CU	-0.340	-0.562**	-0.228	-0.402	-0.295	-0.510*
	(0.23)	(0.27)	(0.23)	(0.28)	(0.23)	(0.28)
log(age)	0.066	0.137	0.104	0.214	0.084	0.170
	(0.11)	(0.14)	(0.12)	(0.14)	(0.12)	(0.14)
log(lProd)	-0.023	0.000	-0.006	0.028	-0.016	0.014
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
DirectExporter	-0.042	-0.101	-0.044	-0.107	-0.019	-0.118
	(0.13)	(0.15)	(0.13)	(0.15)	(0.13)	(0.16)
Skilled	0.010	0.011	0.012	0.012	0.011	0.013
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Year 2005	-0.127*	-0.162*	-0.156**	-0.201**	-0.151*	-0.192**
	(0.08)	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)
R^2_within	0.03	0.04	0.04	0.05	0.04	0.06
R^2_between	0.03	0.02	0.03	0.01	0.03	0.02
R^2_overall	0.04	0.03	0.03	0.02	0.04	0.03
Num. groups	1,268	786	1,277	794	1263	783

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors reported in parentheses.

is not possible to find a similar instrument for $IndexFor$. The F-statistics from first-stage regressions are reported at the bottom of the table. These statistics prove that $Comp$ is a strong instrument for $IndexDom$. The estimated coefficients on $IndexDom$ confirm that domestic competitive pressure is associated with more serious financial constraints. Unfortunately, the magnitude of the IV estimates cannot be compared directly to that of the coefficients obtained in ordered Probit model.

Lastly, I check whether the use of the same scale of measure to elicit answers across different survey questions introduces spurious correlation between the variables of financial constraints and competition. The problem arises when individuals have a subjective tendency to choose answers corresponding to the extreme values of the de-

Table 1.11: IV robustness check

Dependent:	*Access*	*Cost*
Estimator:	IV	IV
IndexDom	0.622**	1.094***
	(0.257)	(0.246)
Firm-level controls	Yes	Yes
Industry FE	Yes	Yes
Country-Year FE	Yes	Yes
R^2	0.113	0.125
Obs.	8,691	8,762
F-stat (first stage)	10.305	13.274

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors in parentheses. Firm-level controls include all controls included in column (1) of table 1.4.

pendent and independent variables. Fixed-effect models, are not sufficient to control for this problem, because this issue may affect with different intensity answers given by the same individual in different interviews. A possible solution, is to use the information obtained from other survey questions to 'filter' our dependent and independent variables in order to eliminate this systematic bias.

Question $q80$ from the 2002 BEEPS questionnaire includes a set of 21 subquestions in which interviewees are asked to evaluate how problematic are different environmental factors to the growth or the current operations of their firms. *Access* and *Cost* are constructed on information from the first two subquestions in $q80$: $q80a$ and $q80b$, and they share the same set of possible answers with the other subquestions in $q80$. As expected, $q80a$ and $q80b$ are strongly and positively correlated (.65), but they also correlate positively and significantly with variables based on the other subquestions of $q80$. This is not immediate evidence of common method bias, as most of these indicators depend on the overall quality of countries' institutional environment, and on the localization of firms within countries. For example, firms operating in more remote areas might jointly report problems in accessing financing, telecommunication, transports and electricity. However, if there is a systematic bias due to the common method used to elicit information, this should explain part of the correlation within this group of variables.

Therefore, *Access*, *Costs*, *CostDom*, *CostFor*, *ProdDom* and *ProdFor* are individually regressed by OLS on a set of variables based on subquestions of $q80$ reporting

the extent to which supply of electricity ($q80d$), access to land ($q80f$), lack of skills and education of available workers ($q80l$), corruption ($q80p$), street crime ($q80q$), and organized crime ($q80r$) constitute obstacles to firms' activities. Because these variables are not expected to be directly associated with financial constraints and competition, their coefficients would capture spurious correlations determined by the questionnaire design. Residuals from these regressions are then used as a proxy for the dependent variable of interest[36]. This proxy is expected to be unaffected by common method bias, because it retains the part of variation of the original variable that is not explained by the tendency to report similar answers to unrelated questions. Table 1.12 reports OLS estimates of model 1.1 where these proxies are substituted to the original dependent variables. Results from this robustness check confirm that the correlation that was found between the variables of competitive pressure and financial constraints is not determined by common method bias.

[36]In table 1.12 these proxies are named $Access^*$, $Costs^*$, $CostDom^*$, $CostFor^*$, $ProdDom^*$ and $ProdFor^*$.

Table 1.12: Results from OLS estimations on *Access and *Cost****

	(1) Access*	(2) Access*	(3) Cost*	(4) Cost*
CostDom*	0.060***		0.097***	
	(0.02)		(0.02)	
CostFor*	0.062***		0.018	
	(0.02)		(0.02)	
ProdDom*		0.066***		0.109***
		(0.02)		(0.02)
ProdFor*		0.056***		0.022
		(0.02)		(0.02)
ExternalAudit	-0.079**	-0.074*	0.001	0.001
	(0.04)	(0.04)	(0.04)	(0.04)
log(age)	0.038	0.031	0.014	0.006
	(0.03)	(0.03)	(0.03)	(0.03)
DeNovo_private	0.087*	0.080	0.039	0.034
	(0.05)	(0.05)	(0.05)	(0.05)
Private_subsidiary_ex_SOE	-0.107	-0.111	-0.102	-0.106
	(0.12)	(0.12)	(0.10)	(0.11)
Other_origin	0.200	0.182	-0.101	-0.089
	(0.18)	(0.18)	(0.15)	(0.15)
MediumFirm	-0.084*	-0.095**	-0.014	-0.017
	(0.05)	(0.05)	(0.04)	(0.04)
LargeFirm	-0.228***	-0.221***	-0.111**	-0.105*
	(0.06)	(0.06)	(0.05)	(0.05)
Ownership_foreign	-0.123**	-0.134**	-0.052	-0.059
	(0.06)	(0.06)	(0.06)	(0.06)
Ownership_manager	0.075	0.071	-0.095	-0.096
	(0.09)	(0.09)	(0.09)	(0.09)
Ownership_government	0.451**	0.400*	-0.022	-0.071
	(0.22)	(0.22)	(0.19)	(0.18)
CapitalCity	-0.093**	-0.099**	-0.158***	-0.165***
	(0.04)	(0.04)	(0.04)	(0.04)
Skilled	0.002	0.002	0.003	0.003
	(0.00)	(0.00)	(0.00)	(0.00)
DirectExporter	0.024	0.012	0.041	0.034
	(0.05)	(0.05)	(0.05)	(0.05)
CU	-0.273***	-0.291***	-0.434***	-0.434***
	(0.09)	(0.09)	(0.08)	(0.08)
log(lProd)	-0.016	-0.017	-0.045**	-0.050**
	(0.02)	(0.02)	(0.02)	(0.02)
SalesGrowth	-0.049	-0.041	-0.094**	-0.094**
	(0.04)	(0.04)	(0.04)	(0.04)
ExportGrowth	0.006	0.008	0.047	0.052
	(0.05)	(0.05)	(0.05)	(0.05)
AssetGrowth	-0.051	-0.061*	0.019	0.018
	(0.04)	(0.04)	(0.04)	(0.04)
Innovation	-0.052	-0.062	0.010	-0.007
	(0.04)	(0.04)	(0.04)	(0.04)
industry effect (2-digit)	Yes	Yes	Yes	Yes
country-year effect	Yes	Yes	Yes	Yes
R^2	0.12	0.12	0.13	0.14
Num. Obs.	4,044	4,054	4,094	4,105

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. White-robust standard errors reported in parentheses.

1.7 Conclusions

In this chapter, I show that financial constraints are relatively more serious in the presence of fiercer competitive pressure. By disentangling the impact of competition on the demand and supply of credit I obtain results that are consistent with the hypothesis that the competitive pressure to reduce costs and to innovate products affects both sides of the credit market; firms in competitive industries tend not to rely exclusively on internal resources, they are more likely to pay a higher cost for credit and to pledge greater collateral. These results are obtained for a set of countries in which financial frictions are exacerbated by relatively underdeveloped legal systems, and by the strong presence of foreign banks with limited knowledge of local companies.

In addition, this chapter sheds light on the ex-post effect of firms' international activity on financial constraints by identifying a channel through which export status may relax *ex-post* financial constraints: that is by signaling firms' resilience to domestic competition. Indeed, I show that exporters' probability of being credit rationed is unaffected by the intensity of domestic or foreign competitive pressure.

From a policy perspective my results suggest that measures aimed at relaxing firms' financial constraints should be particularly targeted to those industries with greater competitive pressure. In those industries, export promotion policies may also have a favorable indirect effect on firms' access to credit. Lastly, from the point of view of transition economies, liberalization policies that deepen domestic and foreign competition should be accompanied or preceded by interventions to reduce the cost of credit and to increase credit supply for small and medium enterprises.

Appendix

Table 1.13: Values assumed by the categorical variables of interest

Variable	Wording of survey questions and answers' codes
Financial Constraints	
Access	QUESTION: Can you tell me how problematic is access to financing (e.g., collateral required) or financing not available from banks for the operations and growth of your business? ANSWERS: 1-No obstacle, 2-Minor obstacle, 3-Moderate obstacle, 4-Major obstacle
Cost	QUESTION: Can you tell me how problematic is cost of financing (e.g., interest rates and charges) for the operations and growth of your business? ANSWERS: 1-No obstacle, 2-Minor obstacle, 3-Moderate obstacle, 4-Major obstacle
Competition	
CostDom	QUESTION: How would you rate the importance of the pressure from domestic competitors on key decisions with respect to reducing the production costs of existing products or services? ANSWERS: 1-Not important, 2-Slightly important, 3-Fairly important, 4-Very important
CostFor	QUESTION: How would you rate the importance of the pressure from foreign competitors on key decisions with respect to reducing the production costs of existing products or services? ANSWERS: 1-Not important, 2-Slightly important, 3-Fairly important, 4-Very important
ProdDom	QUESTION: How would you rate the importance of the pressure from domestic competitors on key decisions with respect to developing new products services and markets? ANSWERS: 1-Not important, 2-Slightly important, 3-Fairly important, 4-Very important
ProdFor	QUESTION: How would you rate the importance of the pressure from foreign competitors on key decisions with respect to developing new products services and markets? ANSWERS: 1-Not important, 2-Slightly important, 3-Fairly important, 4-Very important
Elast	QUESTION: If you raise the prices of your main product/service of 10% above the current level in the domestic market which of the following describe better costumers' reaction? ANSWERS 1-Buy same quantities, 2-Buy slightly lower quantities, 3-Buy much lower quantities, 4-Buy all from competitors
ImportComp	QUESTION: How important is competition from imports in the market for your main product line or main line of services in the domestic market? ANSWERS: 0-Product cannot be imported, 1-Not important, 2-Slightly important, 3-Fairly important, 4-Very important, 5-Extremely important

Table 1.14: Summary statistics

	Mean	Std. Dev.	Min.	Max.	N	BEEPS waves
Financial variables						
Access	2.282	1.145	1	4	14996	II-III
Cost	2.522	1.133	1	4	15125	II-III
Rationed	0.17	0.376	0	1	28324	II-III-IV
Discouraged	0.168	0.374	0	1	21569	II-III-IV
Rejected	0.022	0.148	0	1	21429	II-III-IV
Collateral	105.321	81.097	0	300	11543	II-III-IV
Competition variables						
CostDom	2.758	1.057	1	4	24881	II-III-IV
CostFor	2.061	1.125	1	4	24340	II-III-IV
ProdDom	2.81	1.03	1	4	25167	II-III-IV
ProdFor	2.091	1.136	1	4	24573	II-III-IV
IndexDom	0.595	0.322	0	1	24764	II-III-IV
IndexFor	0.359	0.359	0	1	24094	II-III-IV
ImportComp	2.552	1.469	0	5	151434	II-III
Elast	2.543	1.121	1	4	154764	II-III
Firm-level controls						
log(age)	2.421	0.772	0	5.737	28528	II-III-IV
CapitalCity	0.096	0.295	0	1	29647	II-III-IV
CU	79.041	21.089	0	100	20925	II-III-IV
lProd	8.634	3.151	-3.225	19.331	21609	II-III-IV
SalesGrowth	0.537	0.499	0	1	15730	II-III
ExportGrowth	0.227	0.419	0	1	8762	II-III
AssetGrowth	0.378	0.485	0	1	15556	II-III
Innovation	0.583	0.493	0	1	15730	II-III
Skilled	0.503	0.3	0	1	29647	II-III-IV
Ownership_government	0.059	0.235	0	1	28790	II-III-IV
Ownership_foreign	0.087	0.283	0	1	28790	II-III-IV
DirectExporter	0.251	0.434	0	1	28790	II-III-IV
IndirectExporter	0.081	0.273	0	1	28790	II-III-IV
De_Novo_Private	0.629	0.483	0	1	28790	II-III-IV
Joint_Venture_Foreign	0.023	0.151	0	1	28790	II-III-IV
ExternalAudit	0.462	0.499	0	1	28116	II-III-IV
Subsidiary_fSOE	0.017	0.129	0	1	28790	II-III-IV
size	1.761	0.793	1	3	28081	II-III-IV

Table 1.15: Breakdown of the sample by country and year

Country	2002	2005	Total
Albania	170	204	374
Armenia	171	351	522
Azerbaijan	170	350	520
Belarus	250	325	575
Bosnia	182	200	382
Bulgaria	250	300	550
Croatia	187	236	423
Czech Republic	268	343	611
Estonia	170	219	389
FYROM	170	200	370
Georgia	174	200	374
Hungary	250	610	860
Kazakhstan	250	585	835
Kyrgyz	173	202	375
Latvia	176	205	381
Lithuania	200	205	405
Moldova	174	350	524
Poland	500	975	1,475
Romania	255	600	855
Russia	506	601	1,107
Serbia	250	300	550
Slovakia	170	220	390
Slovenia	188	223	411
Tajikistan	176	200	376
Turkey	514	557	1,071
Ukraine	463	594	1,057
Uzbekistan	260	300	560
Total	6,667	9,655	16,322

Table 1.16: Cross-correlation table I

	1	2	3	4	5	6	7
1-CostDom	1.000						
2-ProdDom	0.713	1.000					
3-CostFor	0.335	0.238	1.000				
4-ProdFor	0.239	0.259	0.816	1.000			
5-Elast	0.198	0.209	0.102	0.098	1.000		
6-Market	0.187	0.199	0.011	0.015	0.157	1.000	
7-ImportComp	0.183	0.197	0.364	0.377	0.145	0.108	1.000

Notes. All correlations are significant at the .05 level of confidence. Data from BEEPS II and III.

Table 1.17: Cross-correlation table II

Variables	1	2	3	4	5	6	7	8
1-Ownership_government	1.000							
2-Ownership_manager	-0.033*	1.000						
3-Ownership_foreign	-0.076*	-0.034*	1.000					
4-StateOwnership	0.029*	0.056*	0.008	1.000				
5-ForeignOwnership	-0.056*	-0.007	0.038*	-0.513*	1.000			
6-DeNovo_private	-0.097*	-0.020*	-0.181*	0.050*	0.073*	1.000		
7-Subsidiary_fSOE	0.050*	0.004	0.034*	-0.006	-0.056*	-0.256*	1.000	
8-Joint_Venture_foreign	-0.015	-0.005	0.250*	0.051*	-0.017	-0.383*	-0.028*	1.000

Notes. * indicates significance at the .05 level of confidence. Data from BEEPS II and III.

Table 1.18: Reasons for being *Discouraged*

	Freq.	Percent.
Application procedures are too complex	361	17.98
Interest rates are not favorable	943	46.96
Collateral requirements are too high	310	15.44
Size of loan or maturity are insufficient	99	4.93
It is necessary to make informal payment	41	2.04
Did not think it would be approved	95	4.73
Other	159	7.92

Table 1.19: Firm Exports and Credit Status

	Whole Sample	**Rationed**		**Discouraged**		**Rejected**	
		0	**1**	**0**	**1**	**0**	**1**
Non-Exporter	21,069	16,733	3,720	13,168	2,515	15,256	427
	(75.89)	(75.33)	(88.01)	(76.05)	(88.49)	(77.62)	(84.89)
Exporter	6,695	5,481	507	4,148	327	4,399	76
	(24.11)	(24.67)	(11.99)	(23.95)	(11.51)	(22.38)	(15.11)

Notes. The table reports frequencies and column percentages in brackets.

Chapter 2

Corporate Financial Structure and Export Quality

with Flora Bellone and Sarah Guillou

2.1 Introduction

Departing from the Modigliani and Miller (1958) theorem a number of empirical papers question the irrelevance of the corporate financial structure for real activities by showing that leverage, as a measure of debt financing, affects investment patterns and productivity growth within firms (e.g., Aivazian et al., 2005; Nucci et al., 2005; Nunes et al., 2007; Coricelli et al., 2012). These findings from the financial literature are paralleled by the evidence emerging from studies on heterogeneous export performance across firms. Models of export behavior in which credit constraints prevent illiquid firms from sizing profitable export opportunities (Manova, 2008; Chaney, 2013) have motivated several analyses on the role of financial attributes in determining export entry and success on foreign markets (Greenaway et al., 2007; Bellone et al., 2010; Askenazy et al., 2011; Minetti and Zhu, 2011). Although the direction of causality between firms' export status and financial attributes is a matter of debate, the conclusions of these papers agree that exporters and non-exporters are different in terms of liquidity and financial structure.

The supporters of the hypothesis that financial factors should be included among

the determinants of heterogenous export performance have generally interpreted high leverage as a sign of financial constraints, arguing that debt overhang may inhibit firms' capacity to finance externally the fixed entry costs of exports. Moreover, recent advancements in the trade literature suggest that in addition to the capacity of paying for fixed entry costs, the ability to produce higher quality products is an important determinant of selection into exporting and a major driver of success in foreign markets. For example, Iacovone and Javorcik (2008) and Kugler and Verhoogen (2012) find convincing evidence that Mexican plants invest to upgrade output quality before starting to export, and a series of papers using data on firm-level export flows find that exporters of more expensive varieties[1] reach more distant destinations and realize higher revenue (Bastos and Silva, 2010; Crozet et al., 2011; Manova and Zhang, 2012). Hence, a possible channel through which financial factors may affect export performance is through their impact on firms' capabilities and incentives to upgrade output quality.

This chapter explores the finance-quality channel by investigating whether exporters' leverage is a determinant of quality heterogeneity across exported varieties. Our hypothesis stems from the predictions of models in the financial literature showing that the recourse to debt financing may eventually affect the costs and incentives to invest in quality enhancing activities (Long and Malitz, 1985; Maksimovic and Titman, 1991). We base our empirical analysis on firm-level export and balance sheet data provided respectively by the French Customs and by the French National Statistical Office (INSEE). These data are used to obtain an estimator of quality for over 120,000 individual export flows, six HS6 consumer products, and over six thousand French exporters. The novel result of this study is that leverage affects negatively firms' ability to compete on foreign market through quality. However, this result holds only for 'illiquid' exporters:, defined as those firms whose working capital is insufficient to cover completely operating costs. This evidence signals that leverage has a differential impact on firms' real activities depending on whether debt financing is an optimizing choice (Jensen and Meckling, 1976), or a necessary substitute for insufficient internal

[1]Throughout this chapter we refer to a 'variety' as a single product, defined at the 8 digit level of the Combined Nomenclature (CN8), shipped by a single firm to a single export destination.

resources (Myers and Majluf, 1984).

The major methodological contribution of this paper is the use of a discrete choice model of consumer demand (Berry, 1994; Khandelwal, 2010) to obtain a measure of quality at the level of individual export flows. In the trade literature, price differences across similar products have been used to proxy differences in quality[2]. However, this strategy is not viable to study the impact of leverage on quality. Because corporate financial structure may both affect firm investment to increase productivity and quality, its net effect on prices would be ambiguous. For example, if exporters that are simultaneously more leveraged and less productive sell more expensive varieties than competitors, by measuring relative quality with relative prices we may wrongly attribute to leverage a positive effect on output quality. The measure of export quality that we employ avoids this problem because it is based on the choice of consumers between alternative varieties once we control for differences in price.

This measure is then regressed on leverage and other firm-level covariates by using three different estimators that exploit different sources of variation in leverage and export quality. First, we present estimates obtained from pooled OLS models that include a full set of product-destination fixed effects. In these models, identification relies on variations across firms that export different varieties of the same product to the same foreign market. Given the time-persistence of leverage and quality (i.e., some determinants of perceived quality such as branding are rather stable over time) this estimator would appear as the most appropriate. However, firm-level omitted variables that may affect exporters' financial structure and output quality are a major concern when exploiting cross-sectional variations for identification. To deal with this issue we check the robustness of the results by adopting Fixed Effect models (FE) and Fixed Effect Instrumental Variable (FEIV) models that control for firm-level time invariant factors and simultaneity between leverage and quality. The significant negative relationship between leverage and quality is robust to the use of different estimation techniques.

To the best of our knowledge the only other paper that investigates explicitly fi-

[2]In turn, exported products' prices are proxied by the unit-values of individual export flows obtained by dividing the values of exported products by their quantities.

nancial factors in relation to export quality is Fan et al. (2012). These authors present a model in which credit rationing has an ambiguous effect on export prices, and they find that exporters based in Chinese provinces with higher loans to GDP ratios export more expensive varieties, and that firms operating in 2-digit ISIC industries with higher financial dependence export cheaper products. Methodologically, we distinguish our contribution from the work of these authors by using a firm-level measure of leverage instead of industry- or regional-level regressors that are more likely to capture structural differences across provinces and industries than firm heterogeneity. In addition, although Fan et al. (2012) obtain a quality estimator similar to the one that we use, our approach to the structural estimation of the discrete choice model of demand differs from their one as we deal with endogeneity through IV, and we allow for the demand parameters to vary across different HS6 product categories.

The rest of the paper is structured as follows. Section 2.2 reviews the recent trade literature on output quality as a dimension of firms' competitiveness in international markets. Section 2.3 introduces the conceptual framework underpinning our hypotheses. Section 2.4 describes the data. Section 2.5 propose a preliminary analysis on the impact of leverage on firm investment, and some correlations between exporters' characteristics and exported varieties' unit-values. Section 2.6 introduces the methodology we adopt to obtain an estimator of quality. Section 2.7 presents the empirical model of export quality and leverage and the main results. In Section 2.8 we conduct robustness checks. Section 2.9 concludes.

2.2 Does quality matter for export performance?

The role of product quality as a determinant of firms' competitiveness in international markets is a promising strand of the recent trade literature as it bears both theoretical and policy implications. From a policy perspective, this literature helps defining the scope for governments to promote indirectly exports through microeconomic initiatives that encourage domestic firms to upgrade their products. From a theoretical perspective instead, quality has been invoked to rationalize the many instances in which exporters of more expensive varieties are found outperforming competitors with

cheaper goods. This evidence is indeed at odds with the process of 'efficiency sorting' predicted by the seminal models of the 'New-new Trade Theory' (Bernard et al., 2003; Melitz, 2003; Helpman et al., 2004).

According to 'efficiency sorting', while the least productive firms limit their sales to the domestic market, the most productive ones manage to offset higher transport costs and to gain market shares abroad by selling cheaper varieties. Hence, free-on-board export prices across firms are expected to correlate negatively with the distance and the 'toughness' of the markets they serve (Melitz and Ottaviano, 2008). Since many empirical studies find evidence contrasting these predictions, research has been directed towards quality as a further dimension of firm and product heterogeneity, and 'quality sorting' has been advanced as a competing paradigm. Indeed, if the production of high quality goods involves higher marginal costs, or if exporters of better products have greater market power, then the negative correlation between export prices and exported volumes does not necessarily hold.

While the development of the firm-level trade literature has been fueled by the use of micro data revealing the superior attributes of exporters (e.g., ISGEP, 2008), investigations on export quality take the moves from the growing availability of customs data. These typically register all commercial transaction occurring between domestic firms and the rest of the world, enabling researchers to better characterize firms' export (import) portfolios in terms of products, destinations (origin), revenue and quantities. In particular, these databases provide the necessary information to calculate unit-values as the ratio between values and quantities exported by individual firms within each product category and destination. Unit-values are the closest empirical counterparts of prices that can be used to draw inference about the role of quality in international trade.

Studies on quality face the double challenge of formalizing this abstract concept within trade models and to quantify its prominence in empirical applications. The severity of these challenges is due to the fact that quality relates to aspects that are difficult to parametrize in general formulations, and that are mostly unobserved by the econometrist. These issues have been addressed by adopting different approaches, each one offering a particular solution to the trade-off between capturing stylized facts

valid across many product categories and getting more fine-grained aspects of the role of quality in trade. Some studies focus on attributes that are specific of some products (e.g. Crozet et al., 2011), while others obtain more general estimators that infer quality from the capacity of countries (or firms) to sell large volumes of relatively expensive varieties (Khandelwal, 2010; Roberts et al., 2012; Gervais, 2013), or from information on aggregate prices and countries' trade balances (Hallak and Schott, 2008). In addition, while quality is generally associated with the relative desirability of substitutable varieties, preferences for quality are not identical across markets, and consumers across export destinations may be differently willing to pay a price premium for quality. For example, Crinò and Epifani (2010) explain why the best Italian exporters sell relative small shares of their output to low-income countries with a model in which preferences for quality increase monotonically in the income of the export destination.

Baldwin and Harrigan (2011) observe that the unit-values of US exports correlate positively with the distance and negatively with the market size of destination countries. By introducing 'taste for quality' in the core structure of Melitz (2003), they replicate these facts; if quality, besides quantity, accrues to foreign consumers' utility, the relative price of the exported varieties is an insufficient statistics to measure competitiveness across countries (or firms), because demand depends on quality-adjusted prices rather than on absolute prices. Quality is also introduced in the model of Bernard et al. (2007) as an exogenous attribute of exported goods. In this model, multi-product firms find it easier to export higher quality varieties to more distant and tougher markets, because output quality compensates for the cost disadvantage of exporters *vis-a-vis* domestic producers[3].

Manova and Zhang (2012), Bastos and Silva (2010) and Crozet et al. (2011) provide empirical support to the 'quality sorting' hypothesis. The first two papers exploit variations in unit-values across firms exporting similar products to test the relationship between export prices and the distance of destination markets, or to investigate how export prices relate to firms' export revenues. The third work uses instead wine guides' rating of different varieties of Champagne as a direct measure of quality. Analyses based

[3]The cost-disadvantage of foreign *vis-a-vis* domestic producers arises because the price of the imported varieties embodies transport and insurance costs.

on this measure confirm the results obtained with unit-values, as it is found that highly rated producers of Champagne export at higher prices, in greater volumes and towards a larger number of markets. Hence, previous empirical findings motivate our interest for firm-level financial factors as determinants of firms' capacity to compete on foreign markets through quality. In the next section, we outline the theoretical foundations for the two specific hypothesis that we test in this paper.

2.3 Financial structure and output quality

The Modigliani-Miller theorem states that corporate financial structure is irrelevant for the value of the firm (Modigliani and Miller, 1958). This proposition has been questioned by a large theoretical literature that demonstrates how information asymmetries and imperfect capital markets may affect access to different sources of external financing, cost of capital and ultimately firms' value. It follows, that the observed financial structure of companies may not optimize their current and future profitability.

Myers and Majluf (1984) look into information asymmetries between insiders (i.e., manager and current shareholders) and outsiders (i.e., potential buyers of shares) to explain the observed pecking order pattern of financing; firms finance their expenses by first using internal resources, when these are insufficient they use debt, and as a last resort they issue new equities. They show that if the real value of shares is private information of the manager, it is in the interest of insiders to issue new shares only if the market valuation of the firm is above its real value. By anticipating this behavior, the demand of outside investors falls short of firms' financing needs unless they expect shares to be issued in the absence of less expensive sources of financing. This problem may oblige managers to finance investment through debt, even if this source of financing does not lead to an optimal investment policy.

Indeed, Long and Malitz (1985) show that debt financing may cause firms to invest less than optimally if the return of their investment is uncertain, and if it varies in different 'states of the world'. Investment increases revenue in all 'states of the world'. However, in 'good states of the world' the firm realizes sufficient revenue to repay its debt and the shareholders are residual claimants, while in 'bad states of the world'

shareholders cede all the revenue as a partial repayment of firm's debt to bondholders. Intuitively, if the manager acts in the interest of shareholders, underinvestment is determined by the different extent to which investment increases the expected return for shareholders and bondholders in 'bad states of the world': bondholders benefit from investment as they might expect to recover a greater part of their loan, while shareholders do not benefit at all. This asymmetry creates an incentive problem and causes more leveraged firms to invest less than optimally. In addition, the distortion is accentuated if lenders anticipate borrowers' underinvestment and charge higher costs for credit because they expect to recover a smaller part of the loan in 'bad states of the world'.

The paper of Long and Malitz provides an additional insight that leads to our hypothesis of a negative effect of leverage on quality. Indeed, their model predicts that firm-specific intangible investment such as advertisement and R&D is more prone to agency problems because lenders find it more difficult to monitor managers' use of resources, and the greater specificity of the assets (or services) bought by the firm translates into higher 'agency costs' of debt. Therefore, they argue that firms that resort more intensively to debt financing have a relative disadvantage in undertaking intangible investment. They find empirical support for this prediction analyzing US firms' patterns of investment and financing. Hence, this paper suggests that underinvestment due to debt financing affects more seriously activities directly related with quality upgrading or with consumers' perception of product quality.

An alternative explanation for the negative relationship between leverage and quality is provided by Maksimovic and Titman (1991). They present a model in which firm investment in product quality is undertaken to build up a 'reputation capital' that allows to charge higher prices in the future. High leverage increases the probability of future bankruptcy, and it shortens firms' optimization horizon. In turn, leverage causes lower present investment in quality. In addition, highly leveraged firms that face an immediate threat of bankruptcy may reduce quality (if this reduces costs) to sustain cash flow and repay their debts. In the words of the authors, this strategy of the firm is equivalent to "obtaining an involuntary loan from consumers, since the reduction in future revenue resulting from the loss or reputation corresponds to the

repayment" (Maksimovic and Titman, 1991, pag. 117). By analyzing inventory shortfalls as a measure of poor service quality in the supermarket industry, Matsa (2011) brings empirical support for this hypothesis, as he finds that highly leveraged firms degrade their product quality (i.e., more frequent shortfalls in inventories) to preserve cash flow for debt servicing.

The literature that have been surveyed up to this point stresses the costs and distortions introduced by debt financing and the reasons why illiquid firms may be forced into adopting a highly leveraged financial structure that constraints their investment behavior. However, the 'Trade-off Theory' of corporate financial structure provides reasons why debt financing could also enhance firms' value. Debt financing may eventually increase investment if the tax shield function of debt (i.e., the possibility of discounting interest rate payments from taxable profits) increases the net present value of investment opportunities. Jensen and Meckling (1976) also show how in the presence of conflicts between managers and owners, debt is a 'disciplinary device' through which owners control managers, because interest rate payments reduce firms' free cash-flow at the disposal of managers for unprofitable discretionary spending. This insights suggest that for some firms high leverage is an optimal choice, and we should not expect their competitiveness to be affected negatively by their levels of debt. Drawing from these theories, we expect that the relationship between leverage and quality would be mediated by two opposite channels leading to the hypotheses that we test with French data:

Hyp 1: exporters with high levels of debt have a cost-disadvantage or fewer incentives in undertaking quality enhancing activities, and we expect them to export lower quality varieties

Hyp 2: for firms that opt for high leverage as a value-optimizing choice, the beneficial effects of debt offset the distortions induced by this source of financing. For these firms a highly leveraged financial structure does not necessarily affect product quality.

2.4 Data

The empirical analysis is conducted on data obtained from two sources: the *Fichier complet de Système Unifié de Statistique d'Entreprises* (FICUS) provided by the French National Statistical Office (INSEE), and the French Customs Dataset. FICUS reports balance sheet items and demographic information, covering the population of French firms. We have access to annual files relative to the period 1997-2007. After appending these files, the resulting firm-year panel dataset includes over two million observations for the manufacturing sector. Leverage of firm f at time t (Lev_{ft}) is constructed using FICUS variables as the book value of total debt over total assets. FICUS includes also information on firms' age, ownership, employment, assets, liquidity and their need for external financing. We use these information to construct firm-level controls. Outliers are eliminated by replacing to missing observations below the 1st or above the 99th percentiles of each variable's distribution. We also eliminate observations with anomalous values in some of the balance sheet variables[4].

The Customs database reports exports values (euros), quantities (kilograms), destinations and product classes (CN8) of the export flows of French firms. This dataset excludes the flows of small exporters because firms that export less than €1,000 outside the EU, or less then €100,000 within the EU, are not required to fill in a complete declarations of their transactions. The different thresholds for reporting would be a problem if we were to investigate firms' characteristics in relation to their export destinations. However, this is not a concern for our identification strategy as we investigate differences across exporters serving the same market, or variations in quality over time for the same exported variety defined at the firm-product-destination level. Because some product categories change CN8 product code over time, we use tables provided by Eurostat to concord the classification to the 2007 version.

Customs data are used to construct unit-values of exported varieties as flow values divided by quantities $UV_{fpd} = \frac{val_{fpd}}{qty_{fpd}}$, where f, p, d are indices for firm, CN8 product

[4]We drop firms that in any years report negative levels of revenue or debt. We also drop firms for which total assets (composed by tangible, intangible and tangible assets) are lower than tangible or intangible assets, or of the sum of these two asset types.

and export destination. Unit-values are common proxy for prices in the literature despite numerous flaws that have been exposed since the paper of Kravis and Lipsey (1971), and more recently highlighted by Silver (2007). Caveats for using unit-values to compare the prices of different varieties are particularly serious when products are weakly homogenous, nevertheless the 8-digit level of product disaggregation lessens this flaw. In addition, unit-values are very noisy proxies for export prices because measurement error in quantities determine extreme variations. To mitigate this issue we drop observations outside the 0.5% extreme percentiles of the unit-value distribution within each CN8 product category, and export flows with extreme unit-value variations from one year to the following (above and below the 1% percentiles). Unit-values and market shares of exported varieties are sufficient information to estimate quality according to the methodology that is explained in Sections 2.6.

A nice feature of the FICUS and the Customs datasets is that they both identify firms through the same fiscal identification codes (SIREN). Therefore, we can associate individual trade flows in Customs to the firm-level variables that we observe in FICUS, in order to investigate the quality of exported varieties in relation to exporters' attributes.

2.5 Preliminary analysis

2.5.1 Leverage and investment

Before inquiring into the relationship between corporate financial structure and export quality, we test whether high leverage hampers firm investment as predicted by the financial literature surveyed in section 2.3. We conduct this preliminary exercise on all manufacturing firms (i.e., both exporters and non-exporters) in FICUS. In this dataset we can separately observe firms' book value of tangible ($Tang$) and intangible ($Intang$) assets[5]. In order to assess the differential impact of leverage on the growth of these two classes of assets, we estimate two separate investment equations on $\Delta Tang_{t/t-1}$

[5] $Tang$ includes land, buildings, plant, equipment and machinery, other fixed assets, assets under construction. $Intang$ includes the value of firms' assets that are not classified as financial or tangible assets.

and on $\Delta Intang_{t/t-1}$, that are respectively the log differences in the value of tangible and intangible assets between consecutive periods.

Table 2.1 reports the means and the standard deviations of the variables in the investment model. The average growth rate of tangible and intangible assets are respectively 6.4% and 2.8%. The lower growth rate for intangible assets reflects the greater inertia of this category of assets. This may be explained by the fact that *Intang* includes elements that are slower to adjust such as the value of firms' client base, licenses, brand and patents[6]. The average log value of total assets is 5.166 that corresponds to €984,000. However this value is driven above the median of the sample (i.e., €144,000) by the presence of a small group of very large firms.

Table 2.1: Summary statistics investment variables

Variable	**Mean**	**Std. Dev.**	**Obs.**
Lev	0.203	0.225	1,950,977
$\Delta Intang$	0.028	0.192	1,026,211
$\Delta Tang$	0.064	0.215	1,562,687
$\Delta Sales$	0.02	0.291	1,634,642
Asset	5.166	1.715	1,918,175

Notes. *Asset* is log of firms' total assets in '000 euros. The mean of this variable is not representative of the sample as it is drive by the presence of a small group of very large firms.

The simple dynamic asset growth models that we estimate incorporates firms' lagged leverage ratios Lev_{it-1} on the right-hand side:

$$y_{it} = \beta_0 y_{it-1} + \sum_{s=0}^{1} \beta_s \Delta Sales_{it-s} + \beta_3 Lev_{it-1} + \beta_4 Asset_{it-1} + e_{it} \tag{2.1}$$

where y stands either for $\Delta Tang_{t/t-1}$ or for $\Delta Intang_{t/t-1}$. We include in the investment equation both current and lagged changes in sales to capture firm investment opportunities. These variables are used in the absence of informations on the market values of quoted firms that would be necessary to compute Tobin's Q ratios.

We estimate a static specifications of equation 2.1 (i.e., by imposing $\beta_0 = 0$), by random effects (RE) and Fixed Effect (FE) models. RE models allows for individual

[6]Over 65% of the observations in our sample have values of $\Delta Intang_{t/t-1}$ falling within the interval between 0 and -0.05.

heterogeneity by including an individual specific time-invariant component in the error term. However this component is assumed to be random and uncorrelated with the explanatory variables included in the model. If this assumption is true, then RE estimates are consistent and more efficient than FE ones[7]. FE on the contrary does not rely on the assumption of independence of the individual-specific time-invariant component of the error with respect to the explanatory variables, because it estimates the model after applying within-transformation to the data[8]. Although FE models cannot identify the coefficients on time-invariant variables, they are consistent even in case of correlation between the fixed individual-specific component of the error and the explanatory variables included in the model. An Hausman test is conducted on the estimates of the two models and it strongly rejects the consistency of the RE coefficients (p-value 0.00).

We eventually drop the constraint on the coefficient β_0 and estimate the dynamic specification of 2.1 by using the Arellano-Bond GMM estimator (AB) (Arellano and Bond, 1991). This estimator deals simultaneously with the bias arising from the omission of individual fixed-effects and with the endogeneity of the lagged dependent and other covariates on the right-hand side of the model. The first issue is addressed by first differencing the data within each panel unit to eliminate individual fixed effects from the error. The second issue is solved by instrumenting the first-differenced endogeneous variables with their lagged levels. Coefficients are identified by exploiting the full set of orthogonality conditions arising from the independence of first-differenced errors from lagged levels of the instrumented variables. The System GMM estimator introduced by Blundell and Bond (1998) reaches greater efficiency than AB by exploiting additional moment conditions, however it relies on the braver assumption that changes in instrumenting variables are uncorrelated with the fixed effects (Roodman, 2009). However, because lagged changes in leverage and sales can be correlated with unobservable firms' characteristics, we prefer not to make this assumption and we stick to the AB estimator.

[7]Efficiency of this estimator derives from the fact that the variance-covariance matrix is estimated by imposing structure in the composition of the error term.

[8]By subtracting to each realization of a given variable its mean computed within the panel unit, within-transformation removes the individual-specific time-invariant component from the error.

Table 2.2 reports the results obtained when we regress equation 2.1 using the three different estimators. In the two static specifications of the model (RE and FE) higher levels of leverage are found associated with slower growth of both intangible and tangible assets. The Hausman test suggests that RE estimates on Lev_{it-1} are inconsistent, and by comparing RE and FE estimates we infer that the RE coefficients are upward biased. A possible explanation for this bias is that firms that are more active in expanding tangible and intangible assets might have on average higher demand for credit and higher levels of leverage than those that invest less. A similar rational might explain why the coefficient on this variable is more negative when estimated by AB in the model on $\Delta Intang_{it}$. In AB regressions we treat Lev_{it-1} as an endogenous variable, so that to prevent the upward bias due to reverse causality going from investment in intangibles to levels of debt. The same is not true when we look at the coefficient on Lev_{it-1} from the AB model on $\Delta Tang_{it}$, as this is positive and significant at the 1% level in contrast with the negative coefficients produced by RE and FE models on the same variable.

On one hand, we may be tempted to interpret this finding as a confirmation that debt has a more negative impact on investment in intangibles than on tangible asset growth (Long and Malitz, 1985). On the other hand, the Hansen J test of overidentification rejects the joint validity of the instrument set in the model on $\Delta Tang_{it}$, casting some doubts on the consistency of the estimates from this model[9]. Therefore, we prefer to avoid drawing any conclusion on the differential effect of firms' leverage on tangible and intangible asset growth. However, estimates of the coefficient on Lev_{it-1} when regressed on $\Delta Intang_{it}$ are consistently negative across model specifications and estimation techniques. This supports the initial hypothesis that firms' with higher dependence on debt financing tend to have slower expansion of intangible assets. If investment in intangible assets is closely related with product quality, we then expect to find a negative impact of leverage on this dimension of firms' competitiveness.

In the next part of this preliminary analysis we shift the attention on exporters only,

[9]Nevertheless, some authors argue that given the tendency of overidentification tests to reject the null hypothesis in large samples, a significant statistic of the Hansen J test should not be automatically interpreted as a violation of the orhtogonality assumption on which identification by GMM relies upon (e.g., Chen and Guariglia, 2013).

Table 2.2: Leverage and asset growth

	$\Delta Intang_{it}$			$\Delta Tang_{it}$		
	RE	FE	AB	RE	FE	AB
$\Delta Sales_t$	0.058***	0.040***	0.100***	0.131***	0.094***	0.232***
	(0.001)	(0.001)	(0.034)	(0.001)	(0.001)	(0.032)
$\Delta Sales_{t-1}$	0.031***	0.018***	-0.031**	0.091***	0.061***	0.043***
	(0.001)	(0.001)	(0.013)	(0.001)	(0.001)	(0.011)
Lev_{t-1}	-0.038***	-0.056***	-0.090***	-0.057***	-0.169***	0.044***
	(0.001)	(0.002)	(0.014)	(0.001)	(0.002)	(0.015)
$Asset_{t-1}$	0.014***	-0.015***	0.022	-0.002***	-0.061***	-0.183***
	(0.000)	(0.001)	(0.019)	(0.000)	(0.001)	(0.033)
$\Delta Intang_{t-1}$			0.252***			
			(0.075)			
$\Delta Tang_{t-1}$						0.365***
						(0.047)
$Constant$	-0.066***	0.151***		0.050***	0.370***	
	(0.001)	(0.007)		(0.001)	(0.005)	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Hansen-J (p-value)			0.156			0.001
m(1) (p-value)			0.000			0.000
m(2) (p-value)			0.000			0.000
m(3) (p-value)			0.885			0.587
m(4) (p-value)			0.676			0.343
R^2		0.010			0.059	
Obs.	843,556	843,556	632,069	1,271,755	1,271,755	993,388

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. At the bottom of the table we report diagnostic statistics for the AB models. The Hansen-J (p-value) is the p-value from the overidentification test that is used to verify the null hypothesis of joint validity of the instrument set. $m(i)$ is a test of autocorrelation of the i order on the residuals, where the null hypothesis is no autocorrelation. While first-order autocorrelation is introduced by construction when we first difference observations, higher order autocorrelation suggests excluding closer lags of the endogenous variables from the instrument set. Hence, we use the 3rd and the 4th lags of $\Delta Intang_{t-1}$, $\Delta Tang_{t-1}$, $\Delta Sales_t$, $\Delta Sales_{t-1}$, $Asset_{t-1}$ and Lev_{t-1} as instruments. AB regressions are implemented in Stata with the user-written command xtabond2 (Roodman, 2003).

by comparing exported varieties' unit-values across firms with different characteristics. We previously discussed the shortfalls of proxing the relative quality of competing variety by comparing their unit-values, however this exercise would allow to relate our investigation to the literature surveyed in section 2.2.

2.5.2 Exporters' characteristics and export prices

In this section we exploit the entire Customs dataset to obtain some stylized but suggesting evidence on the relationship between exporters' characteristics and export prices. We propose a simple empirical exercise that highlights some differences between firms exporting varieties with different prices within the same HS6 product class. First, each export flow is associated with a price quartile according to the position of its demeaned unit-value in the unit-value distribution of the corresponding HS6 product

category[10]. The firm-level variables listed in table 2.3 are then regressed on the set of dummies identifying the different price quartiles of exported varieties:

$$y_{ft} = c + Q2_{fpdt} + Q3_{fpdt} + Q4_{fpdt} + e_{ft} \tag{2.2}$$

where y_{ft} is a firm-level variable measuring either performance, financial status or demographic characteristics, c is the constant and Qi_{ft} is a dummy that assumes value 1 if the variety exported by firm f to destination d at time t belongs to the i quartile of the demeaned unit-value distribution of the HS6 product p, and it assumes value 0 otherwise. Because the dependent variable is common to all export flows generated by the same firm, the error is likely to be correlated across the observations associated with the same exporter. Hence, we correct the standard errors by using cluster-robust standard errors with the clustering unit set at the level of each individual firm-year couples. Because this exercise has a purely descriptive purpose, we do not take measures to avoid the endogeneity of export prices (hence of the quartile dummies), and we avoid inferring any causal relationship from the estimates that we obtain.

Table 2.3: Definition of the variables

Name	Definition	FICUS name
Age	firm age since creation date	based on datcr
Employee	average num. full time employees	effsalm
Assets	sum of tangible, financial and intangible assets	tactint
Cash Flow	gross operating income over total assets	ebe/tactint
Profit	profit before taxes over total assets	pbcai/tactint
Wage	average wage per employee	saltrai / effsalm
Labor Productivity	value added per employee	vaht / effsalm
Inv. Rate Tangible	physical investment over total assets	invcorp/tactint
Inv. Rate Intangible	intangible investment over total assets	(invavap - invcorp) /tactint
Collateral	tangibles over total assets	immocor / tactint
Intangible	intangibles over total assets	immoin /tactint
Leverage	debt over total assets	empdett / tactint
Liquidity	liquidity minus liquidity needs over total assets	(FDR - BFDR)/tactint

Notes. A description of the original variables in FICUS (in French) can be found at the website : http://www.webcommerce.insee.fr/FichesComm/PSMSUSE/PSM_presentation.htm.

Results are shown in Table 2.4. Column 1 reports estimates for the constant that should be interpreted as the mean value of the dependent variable when this is computed

[10]Demeaned unit-values are obtained by subtracting to the unit-value of each variety the mean unit-value computed over all varieties exported to the same destination in the same year within the same HS6 product class.

over the group of firms exporting the cheapest varieties (first quartile of the price distribution). The remaining columns show how the mean values of the dependent variables differ from the ones computed on the first group, for firms exporting within the second (column 2), the third (column 3), and the fourth (column 4) quartiles of the price distribution.

Table 2.4: Exporters' characteristics by quartiles of export price

	c	$Q2_{fpdt}$	$Q3_{fpdt}$	$Q4_{fpdt}$	Obs.
Dependent:	(1)	(2)	(3)	(4)	(5)
Age	25.98***	2.600***	3.005***	3.364***	2,341,228
Employee	319.4***	81.34***	103.9***	173.1***	2,511,199
Assets	83184.5***	31714.6***	40966.7***	71770.9***	2,513,179
Cash Flow	0.108***	0.000343	0.00101***	0.00147***	2,263,998
Profit	0.0941***	0.00124***	0.00216***	0.00389***	2,267,352
Wage	27.78***	0.348***	0.991***	2.248***	2,485,756
Labor prod.	58.37***	1.657***	3.223***	6.212***	2,485,823
Invest. rate intangible	0.00607***	-0.000577***	-0.000224***	0.0000912**	2,275,653
Invest. rate tangible	0.0379***	-0.00210***	-0.00287***	-0.00296***	2,283,284
Leverage	0.166***	-0.00232***	-0.00266***	-0.00379***	2,290,526
Collateral	0.411***	-0.0136***	-0.0199***	-0.0286***	2,592,876
Intangible Assets	0.0571***	-0.000611***	0.000914***	0.00334***	2,290,468
Liquidity	0.0714***	-0.00310***	-0.00381***	-0.00433***	2,187,555

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. HS6 product class and year fixed effects are included in each regression.

Firms exporting more expensive varieties are found to be older and larger in terms of employment and total assets. They have also higher profitability and cash flows. They pay higher wages and display greater labor productivity, and these differences are stronger for firms exporting within the upper quartile. Their rate of tangible investment is slightly and significantly lower, while they invest more in intangibles. Consistently with our hypothesis regarding a negative impact of leverage on quality we find that firms exporting more expensive varieties have also lower levels of debt, higher cash flow but lower liquidity. This evidence might signal that these firms generate more internal resources but have also greater financing needs.

Overall, results dismiss the hypothesis that higher prices are associated with weaker exporters in terms of size, efficiency and financial attributes, and they suggest that quality matters more the cost-competitiveness for French exports. In addition, the preliminary evidence on unit-values and firms' leverage calls for a more formal test on the relationship between exporters' financial structure and export quality.

2.6 The discrete choice model of demand

This section introduces Berry's discrete choice model of demand (Berry, 1994), and it describes the empirical strategy to obtain a measure of export quality by estimating this model with French Customs data. The central idea of the model consists in inverting the demand function so that to infer from aggregate market information the mean utility level that each variety of a differentiated product accrues to consumers. The model imposes some structure on demand by assuming that each individual i consumes only one unit of the variety j that delivers the greatest utility:

$$u_{ij} > u_{ik} \quad \forall \quad k \in K \tag{2.3}$$

where K is a product class encompassing all varieties sharing some degree of substitutability. The set K is composed by one or more 'nests', that are groups of varieties (indexed by g) characterized by greater substitutability among each others[11]. To allow for the nested structure of K, consumers' utility is modeled according to the following specification (McFadden, 1974):

$$\begin{aligned} u_{ij} &= \delta_j + \zeta_{ig} + (1-\sigma)\epsilon_{ij} \quad , \quad 0 \leq \sigma < 1 \\ \delta_j &= X_j'\beta + \alpha p_j + \zeta_j \quad , \quad \alpha \leq 0 \end{aligned} \tag{2.4}$$

where δ_j is the expected utility from the consumption of j. This depends on a vector of product attributes X_j and parameters β, on price p_j and on product quality ζ_j. The terms ζ_{ig} and ϵ_{ij} are consumers' deviations from the mean utility δ_j that are determined respectively by heterogeneous preferences across consumers for different nests of varieties, and across varieties belonging to the same nest. The within-group substitutability parameter σ determines the extent to which different consumers agree on the utility they derive from choosing j. Eventually, the negative parameter α captures the disutility of price that is common across consumers.

By assuming that idiosyncratic deviations in preferences ϵ_{ij} follow a Type I extreme-

[11] For example, K may include all varieties of man shirts on the market. Although consumers can always substitute one variety for another in K, they are more likely to substitute shirts of the same material (belonging to the same nest g within K).

value distribution, utility function 2.4 originates the following nested logit model[12]:

$$s_j = \frac{e^{\delta_j/(1-\sigma)}}{[\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{\sigma} \times \sum_{g\in K}[\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}} \tag{2.5}$$

where s_j is the market share of variety j. This can be seen as the aggregate realization of individual consumers' choices, when the probability that consumer i chooses variety j over any other alternative in K is increasing in the relative utility delivered by j compared to the competing varieties. Berry shows that the log difference between s_j and the market share s_o of an outside variety can be conveniently written in linear form[13]:

$$ln(s_j) - ln(s_o) = X_j'\beta + \alpha p_j + \sigma ln(s_{j/g}) + \zeta_j \tag{2.6}$$

where $ln(s_j) - ln(s_o)$ is the normalized share of variety j measured over the total market of product class K. On the contrary, the 'nest share' $s_{j/g}$ is the share of variety j measured over the market for nest g to which that variety belongs[14]. From the last equation we can obtain an estimator of product quality Q_j as:

$$\begin{aligned} Q_j &= [ln(s_j) - ln(s_o)] - [\alpha p_j + \sigma ln(s_{j/g})] \\ Q_j &\equiv X_j'\beta + \zeta_j \end{aligned} \tag{2.7}$$

Equation 2.7 shows that an estimator of quality can be obtained as the normalized market shares of individual varieties that are not explained by their prices or by their nest-shares. This residual component is the part of demand for variety j that is determined by product characteristics other than price (X_j), by consumers' taste (β) and by a 'brand' component (ζ_j). Admittedly, Q_j should be given a broad definition of quality encompassing different products' aspects such as: closeness to consumers' taste, quality of the materials, design and consumers' appreciation for the brand. Nevertheless this proxy fits our research question as we aim to determine whether firms' leverage inhibits activities such as market research, advertisement, product development. These are the activities pertaining to exporters' non-price competitiveness.

[12]The assumption that the idiosyncratic error in individual preferences follows a Type I extreme-value distribution is a common assumption of multinomial logit models.

[13]Ideally, the outside variety is a variety whose price and quality is uncorrelated with the price and quality of the varieties whose market shares are normalized (Nevo, 2000).

[14]In the Appendix, we provide a step-by-step derivation of equation 2.6.

2.6.1 Identification strategy

We bring the model to the data by defining each export flow fpd that we observe in the Customs dataset as an individual exported variety, and K as the set of all varieties that belong to the same 6-digit product class. The nests within K are constructed as groups of products belonging to the same 8-digit product class. At time t the market share of each individual variety within a destination market is defined as $s_{fpdt} = \frac{q_{fpdt}}{MKT_{dt}}$, where the numerator is the exported quantity (in Kg) of variety fpd, and MKT_{dt} is the aggregate quantity demanded by consumers in country d for all varieties belonging to the same 6-digit class. The nest share is defined instead as $ns_{fpdt} = \frac{q_{fpdt}}{MKT_{pdt}}$, where the denominator is the physical volume in market d of all varieties within the same 8-digit class.

The empirical challenge in constructing market shares is determined by the unavailability of data reporting total demand at the country-product level. To overcome this problem we proxy for unobserved demand in each country with the aggregate quantity imported within each 6-digit class. We use the BACI dataset to compute the outside varieties' share S_{odt}[15] . This is the share on non-French imports over the total imports of country d in a given 6-digit product class. This share is used to approximate market size: $MKT_{dt} = \frac{\sum_{dt} q_{fpdt}}{1-S_{odt}}$, where the numerator is the total exports from France to country d within a 6-digit product class obtained by aggregating individual export flows[16]. Similarly we approximate the size of the market at the 8-digit level as $MKT_{pdt} = \frac{\sum_{pdt} q_{fpdt}}{1-S_{odt}}$, where the numerator is the aggregate quantity exported by France to country d within the same 8-digit product class. We estimate the model by individual 6-digit product classes to allow for the parameters α and σ to differ across Ks. The specification we adopt is similar to the one proposed by Khandelwal (2010):

[15]The BACI dataset reconciles trade declarations from importers and exporters as they appear in the COMTRADE database (Gaulier and Zignago, 2010).

[16]For example, if France exports to Italy 2,000 Kg of man shirts and its market share over Italy's imports of man shirts is 0.2, then the share of non-French imports in that product class is the outside variety's share $S_o = 1 - 0.2 = 0.8$. The total market for shirts in Italy is computed as $MKT = \frac{2{,}000kg}{1-0.8} = 10,000Kg$.

$$\begin{aligned} ln(s_{fpdt}) - ln(s_{odt}) &= \alpha UV_{fpdt} + \sigma log(ns)_{fpdt} + \delta_t + \delta_c + \hat{Q}_{fpdt} \\ \hat{Q}_{fpdt} &\equiv \delta_{fpd} + \delta_{fpdt} \end{aligned} \tag{2.8}$$

where UV_{fpdt} is the unit-value of the export flow fpd proxying for its price, while the error $\hat{Q}_{fpdt}$ is the empirical equivalent of the quality estimator Q_j in equation 2.7. This error can be decomposed into a firm-product-destination fixed effect δ_{fpd} that absorbs the time-invariant features of the variety that affect its market share in d (i.e., quality of the materials, closeness to consumers' taste, brand name), and by a time-varying component δ_{fpdt} that captures shocks in demand reflecting the positive impact of firms' activities to promote their product on foreign markets (i.e., advertisement, improvements in design and materials). Negative variations in δ_{fpdt} reflect instead the incapacity of firm f to keep the pace with quality upgrades that are implemented by French exporters of competing varieties within the same market d. The remaining terms δ_t and δ_d control respectively for macroeconomic shocks common to all French exporters and for destination-specific time-invariant factors.

If higher quality products are priced at higher mark-ups, or if their production involves higher marginal costs, then $\hat{Q}_{fpdt}$ is likely to be positively correlated with unit-values UV_{fpdt} and with the log of the nest-share $log(ns)_{fpdt}$. Therefore, OLS estimates of α are generally upward biased (Nevo, 2000). To deal with endogeneity in unit-values and nest-shares we estimate 2.8 by adopting a panel Fixed-Effect Instrumental Variable Estimator (FEIV). By setting the panel unit at the level of the individual variety fpd, within-group transformation eliminates the correlation between the regressors and the fixed-effect component of quality δ_{fpd}, hence preventing omitted variable bias. Identification of α and σ now relies only on time-variations in market shares and prices within the same variety defined by the triplet firm-product-destination fpd.

To deal with the endogeneity of UV_{fpdt} and $log(ns)_{fpdt}$ we use three instruments. The first instrument is the average price computed across all French varieties of the same 8-digit product p exported to country d at time t: $z_{1pdt} = N_{pdt}^{-1} \times (\sum_{pdt} UV_{fpdt})$, where N_{pdt} is the number of French varieties exported to that market. Arguably, variations in average price z_{1pdt} over time may be caused by shocks in aggregate demand that simultaneously affect the demand for individual varieties. However, we argue that

the exogeneity of the instrument is preserved, because the dependent variable of model 2.8 is the market share of variety fpd rather than its total demand. *Ceteris paribus* a positive shock in demand will affect in the same proportion the demand for a single variety and the aggregate demand for all French varieties, hence leaving individual market shares unchanged. On the contrary, it is reasonable to assume that individual exporters will adjust the mark-ups on their varieties on the basis of variations in the aggregate price. On the basis of this assumption we expect the instrument z_{1pdt} to correlates with the instrumented variable UV_{fpdt}.

The second instrument for prices is the physical productivity of the firm, obtained as output quantity per employee[17]. Since the physical productivity of labor does not depend on prices we expect this instrument to be exogenous with respect to quality variations but to be correlated with unit-values through marginal costs. Lastly, we instrument for market shares of individual firms by using the number of different 8-digit products exported by the same firm to d. This last instrument was used by Khandelwal (2010) under the assumption that the intensive (i.e., quantities exported) and the extensive (i.e., number of different products exported) margins of trade are correlated, but that the number of different varieties exported is uncorrelated with the quality of each individual variety.

2.6.2 Selection of the product categories

Conceptual and methodological issues prevent us from estimating the discrete choice model of consumer demand over the whole set of 6-digit product categories observed in the Customs dataset. First, this model is more appropriate to describe consumers' behavior than producers' choice upon different suppliers of intermediate and capital goods; importers of intermediates, equipment and machineries may indeed be less flexible in choosing among alternative varieties, because contracts and technological factors

[17]Because information on quantities are available only for exported output, we compute the total quantity exported by the firm within a product class q_{exp}, then we estimate the total quantity produced by the same firm as: $q_{tot} = \frac{v_{tot}}{v_{exp}} \times q_{exp}$, where v_{tot} and v_{exp} are respectively firms' value of total sales and total exports. We lag the instrument to prevent measurement errors in quantities from driving the correlation between unit-values and the instrument.

may constraint their ability to switch suppliers. In addition, individual idiosyncratic shocks in preferences provide the basis for the probabilistic modeling of consumers' choice. In contrast, it is more problematic to explain why the same imported intermediate or capital good may contribute differently to the output of different importing firms. For these reasons, we choose to restrict our analysis to the exports of consumer products. In order to identify the HS6 product categories that correspond to these goods, we refer to the UN 'Classification by Broad Economic Categories' (BEC). Concordance tables are used to map HS6 products into BEC categories, and only those products that are defined according to this classification as 'mainly for household consumption' are retained in the dataset[18].

Market shares are computed by aggregating both wholesalers' and manufacturers' exported quantities to estimate the aggregate import demand of foreign countries. However, when we estimate the demand model we use only the observations for manufacturers' exports. Two reasons motivate this choice. First, a recent paper by Bernard et al. (2011) highlights differences in the export behavior of manufacturing firms and wholesalers. These authors find that wholesalers' exports respond differently to macroeconomic shocks (i.e., exchange rate fluctuations), and that these firms face different costs of exporting. For these reasons, differences in the market shares of manufacturers and wholesalers may be driven by factors other than quality or prices. Second, the hypotheses on the effect of firms' financial structure on export quality are based on the assumption that production and sales are carried out by the same firm.

Upon restricting our focus on manufacture firms exporting consumer goods, we select six HS6 product categories for which we obtain satisfactory diagnostic tests after FEIV estimations, and for which demand parameters are significantly different from 0 and precisely estimated[19]. Table 2.5 summarizes the process of selecting these products.

[18]More precisely, we keep the following BEC classes: 122 (food and beverages for household consumption), 61 (durable consumer goods), 62 (semi-durable consumer goods), 63 (non-durable consumer goods). Class 51 (passenger motor cars) is excluded due to the very limited number of firms that participate to this segment of French exports.

[19]These products categories are 'Wooden Furniture' (HS6: 940360), 'Sparkling Wine' (HS6: 220421), 'Perfumes' (HS6: 330300), 'Lamps' (940510), 'Chocolate and confectionery' (HS6: 180690), and 'Still Wine' (HS6: 220410).

In the first column we rank each HS6 product category by the number of observations in the dataset. The FEIV specification of the demand model is indeed estimated for the 30 products with the greatest number of observations. The 21st product (HS6: 180690) in this ranking is the one with the smallest number of observations for which we obtain significant estimates of the demand parameters. In addition, column (5) reports the product categories for which the FEIV estimates of the demand parameters are different from 0 at the 0.05 level of significance. Lastly, because our proxy of export quality depends on the consistency of the estimated parameters, in column (4) we mark those products for which the Hansen-J test fails to reject the joint validity of the instrument set at the 0.05 level.

Table 2.5: Selection of the 6-digit products

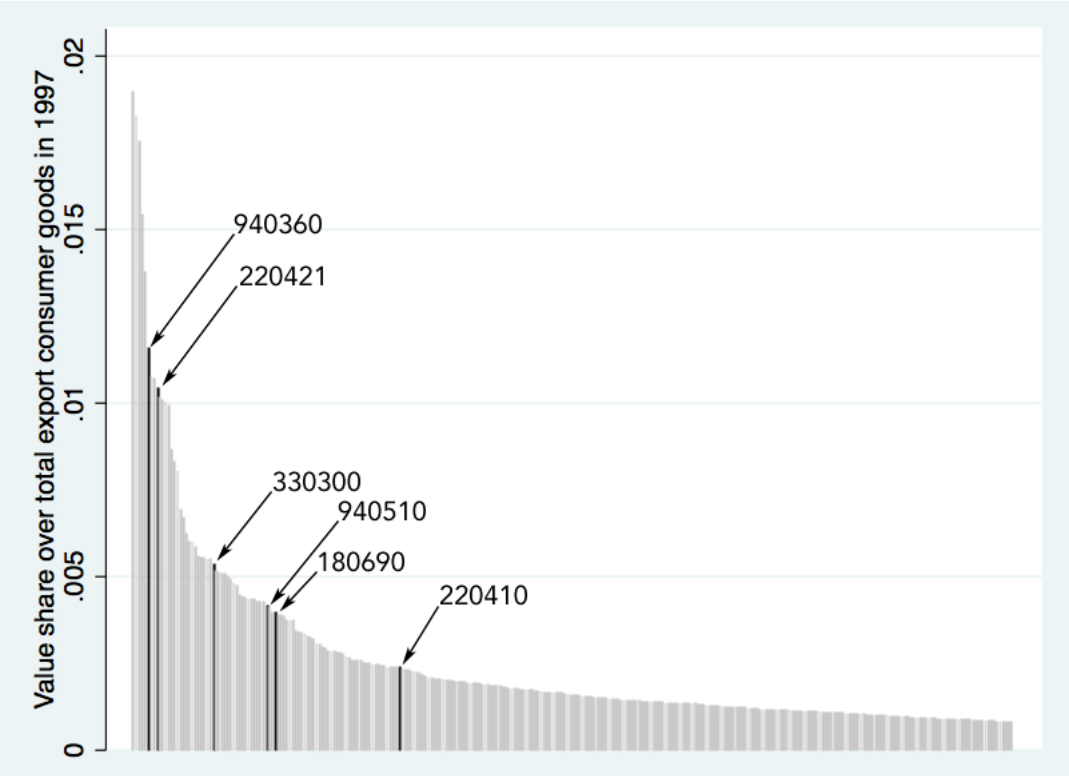
(1) Rank flows	(2) HS6	(3) Obs.	(4) Insignificant Hansen-J	(5) Significant estimates	(6) Consumer good	(7) Num. nests
1	330300	57,851	✓	✓	✓	2
2	330499	54,958	✗	✓	✓	1
3	940360	39,635	✓	✓	✓	3
4	490199	35,702	✓	✗	✓	1
5	490290	33,046	✗	✓	✓	3
6	300490	33,046	✗	✓	✓	1
7	220421	32,899	✓	✓	✓	32
8	392690	32,289	✓	✗	✓	4
9	621149	31,155	✗	✓	✓	1
10	621050	28,746	✗	✗	✓	1
11	420292	27,008	✓	✗	✓	5
12	610990	26,315	✗	✓	✓	3
13	210690	25,825	✓	✗	✓	7
14	621143	25,378	✓	✗	✓	5
15	620462	22,450	✗	✗	✓	6
16	610910	22,208	✗	✗	✓	1
17	620463	21,520	✓	✗	✓	5
18	220410	20,966	✓	✓	✓	3
19	940510	20,409	✓	✓	✓	6
20	620469	19,417	✗	✗	✓	6
21	180690	18,984	✓	✓	✓	8

The table refers only to the 21 6-digit consumer products with the greater number of observations in the Custom dataset once we drop the exports associated with wholesalers. In columns (4), (5) and (6) the (✓) indicates that the product category satisfies the condition in the headings of the table. Column (7) reports the number of different 8-digit product sub-classes (nests) belonging to same 6-digit class.

The significance of the estimated coefficients appears mostly related to the number of observations in each product class, however it should be recognized that by restricting the analysis to the products for which we obtain negative and significant estimates of the price coefficient, we risk over-representing product classes with higher price

elasticity of demand. However, the main objective of this study is to compare the output quality of firms exporting the same HS6 product, rather than to determine how the relationship between financial structure and quality differs across product categories. Therefore, even thus our methodology is difficult to apply to the analysis of a wide range of different exported products, it nevertheless serves the main focus on firms' heterogeneity.

Figure 2.1: Product ranking by the value share of consumer good exports in 1997



Notes. The figure is constructed from BACI data. Each bar corresponds to a unique HS6 consumer good exported from France in 1997. We represent here only the first 300 product category for importance on total French exports of consumer goods. The y-axis represents the share of each individual product category over the total exports of consumer goods. Although, France exported more than 1,000 different HS6 product classes, here we represent only the first 300 products for economic relevance.

The six product categories that we selected are also economically important over the French exports of consumer goods. Figure 2.1 ranks on the x-axis the 300 most important HS6 product categories (over 1,042 different ones) for their value share over the total French exports of consumer goods in 1997. The products we investigate rank high; the most important is 'Wooden Furniture' (HS6: 940360) ranking (7th), while the least important is 'Still Wine' (HS6: 220410) ranking (92nd). In addition, these products fit well our investigation on quality, as their demand is likely to be determined

by exporters' capacity to carry out 'quality enhancing' activities such as: researching consumers' taste in foreign markets, improving packaging and product design, adopting better materials, switching to quality enhancing production techniques and investing in advertisement to promote their brand.

2.6.3 Estimation results

FE and FEIV estimates of the demand parameters are respectively reported in the upper and in the lower panel of Table 2.6. As expected, across all product categories the estimates of the coefficient α from FEIV models are consistently smaller than those obtained from FE models. This evidence suggests that by instrumenting unit-values and nest shares we correct the upward bias due to their correlation with the unobserved time-variant component of quality. In addition, FEIV estimates of the substitution parameter σ fall in the plausible range $[0-1)$. Overidentification tests for the selected product categories confirm the validity of the instrument set.

Estimates on σ indicate the extent to which an increase in the market share of a given variety within the nest (i.e., the 8-digit product class of the variety) translates into an increase in the market share over the broader 6-digit product class. When $\sigma = 1$ there is a one-to-one mapping of changes in market shares within the nest and the product class; this implies that if a variety increases its nest share of 1%, there is another variety within the same nest that loses an equivalent share of the market; high substitution parameters suggest also that consumers are more willing to switch varieties belonging to the same 8-digit class rather than substituting across nests. On one hand, the magnitude of σ does not bear particular economic meaning because it depends on the hierarchic structure of the classification used to define different product categories. For example, if a 6-digit class collects very different 8-digit products, then $\sigma \to 1$ by construction. On the other hand, exporters of products with lower estimated σ may face a wider pool of competing varieties, because varieties are more substitutable across nests. 'Perfumes and toilet waters', 'Lamps' and 'Chocolate and confectionery' are the three product categories with the lowest estimated parameter σ. Hence, smaller σs for these products may either be explained by the greater willingness of consumers to substitute across nests within each of these product classes (e.g., between perfumes

and toilet waters), or by the fact that these 6-digit classes include less heterogeneous 8-digit products.

Table 2.6: Estimated demand parameters

	(1) Chocolate and confectionery	(2) Wine (still)	(3) Wine (sparkling)	(4) Perfume and toilet waters	(5) Wooden furniture	(6) Lamps
Estimates from FE models						
α_{FE}	-0.017***	-0.001	-0.006***	-0.001***	-0.002***	-0.001***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
σ_{FE}	0.788***	1.072***	0.946***	0.987***	0.931***	0.884***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.70	0.89	0.89	0.93	0.90	0.80
Obs.	17,390	18,737	29,502	54,598	37,474	14,339
Estimates from FEIV models						
α_{FEIV}	-0.088***	-0.008**	-0.039***	-0.016***	-0.024***	-0.004**
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)
σ_{FEIV}	0.852***	0.913***	0.977***	0.548***	0.967***	0.747***
	(0.08)	(0.22)	(0.06)	(0.10)	(0.04)	(0.07)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Own-price elasticities						
Median	-4.88	-1.16	-1.16	-1.02	-6.81	-0.36
High	-8.36	-1.51	-4.27	-1.65	-12.60	-0.76
Low	-3.03	-0.55	-0.62	-0.60	-3.53	-0.19
Hansen J (p-value)	0.24	0.24	0.46	0.40	0.67	0.23
R^2	0.68	0.88	0.90	0.73	0.89	0.82
Obs.	8,971	10,809	13,079	28,187	14,833	4,984

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. The reported estimates are obtained by FEIV estimation of the discrete choice model, implemented by using the user-written command xtreg2 in Stata (Schaffer, 2005). For all product categories we instrument for unit-values and nested-shares using the same set of instruments as described in the body of the text. Cluster robust standard errors are reported in parentheses (cluster unit: product-destination).

Table 2.6 reports also the Median, the High (75th percentile) and the Low (25th percentile) elasticities of market shares to prices. Indeed each exported variety has its own specific elasticity to price that depends on the estimated parameters α and σ, on its market shares s_j and $s_{j|g}$, and on its price uv_j[20]. In the nested logit framework the elasticity of demand is more negative for varieties with higher prices, because idiosyncratic errors in consumers' preferences follow a Gumbel distribution[21]. The median response of the market share to 10% increase in prices ranges from -60% for exporters of 'Wooden Furniture' to -0.6% for those exporting 'Sparkling Wine'.

[20]Details on the computation of own-price elasticities are provided in the Appendix.

[21]Because of the skewness to the right of this distribution, the highest realizations of individual preferences for a given variety (i.e., ϵ_{ij} in equation 2.4) are relatively less frequent than the lowest ones. Hence an increase in price has a greater negative impact on the probability of choosing a variety when its price is relatively high.

FEIV estimates of the demand parameters are used to construct the predicted market shares of individual varieties. By subtracting these predicted values from the observed market shares we obtain the quality estimator $\hat{Q}_{fpdt}$, where f indicates the exporting firm, p is the 8-digit product category of the exported variety, d is the destination country, and t is the year. Before studying firm characteristics in relation to export quality, we investigate how $\hat{Q}_{fpdt}$ affects the relationship between the revenue and the prices of individual export flows. Indeed, previous studies have argued that the positive correlation between export revenue and prices is caused by the correlation of prices with the unobserved quality of exported varieties (e.g, Bastos and Silva, 2010; Manova and Zhang, 2012). If the estimator $\hat{Q}_{fpdt}$ truly captures export quality, its inclusion in regressions of prices on revenue is expected to correct for the omitted variable bias that drives the positive correlation between prices and revenue.

Table 2.7: Export values, prices and quality

	(1)	(2)	(3)
Dependent:	$log(value)_{fpdt}$	$log(value)_{fpdt}$	$log(value)_{fpdt}$
$log(uv)_{fpdt}$	0.065***		-0.457***
	(0.010)		(0.013)
$\hat{Q}_{fpdt}$		2.062***	2.211***
		(0.016)	(0.013)
$Constant$	9.534***	9.559***	10.730***
	(0.027)	(0.001)	(0.033)
Product-country-year FE	Yes	Yes	Yes
R^2	0.214	0.574	0.597
Obs.	123,467	121,062	121,062

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. Cluster robust standard errors are reported in parentheses (cluster unit: product-destination-year).

The first column of Table 2.7 reports the coefficient on the log of unit-values $log(uv)_{fpdt}$ when these are regressed on the log of export revenue $log(value)_{fpdt}$. This coefficient is identified by exploiting cross-sectional variations in prices and revenue across varieties of the same 8-digit product exported by different firms to the same destination[22]. The positive coefficient on $log(uv)_{fpdt}$ is in line with previous studies. We also find a positive coefficient on $\hat{Q}_{fpdt}$ when this is substituted to unit-values in the regression on $log(value)_{fpdt}$. Consistently with our expectations, when both $log(uv)_{fpdt}$ and $\hat{Q}_{fpdt}$ are regressed on $log(value)_{fpdt}$ we find that the coefficient on prices turns negative,

[22]We include a full set of product-country-year dummies to control for heterogeneoty across products, markets and time.

while the coefficient on the estimator of quality is positive and significant at the 0.01 level. This simple test provides encouraging evidence on the appropriateness of our estimator as it appears correcting for the omitted variable bias affecting the coefficient on prices in column (1).

2.7 Leverage end export quality

In this section we discuss how we identify the effect of exporters' leverage on quality by dealing with possible sources of endogeneity. Our simple specification of the model of leverage and export quality is:

$$\hat{Q}_{fpdt} = c_{pdt} + \beta Lev_{ft} + Z'_{ft}\gamma + \eta_f + \eta_{ft} + \epsilon_{fpdt} \tag{2.9}$$

where c_{pdt} accounts for shocks in demand that affect all firms exporting the same HS6 product to the same destination. This term is important for identification because the estimator of quality is the residual market share of an exported variety once we control for its price, therefore it embodies destination-product specific demand shocks. The term η_f and η_{ft} represent unobservable fixed and time-varying factors at the firm-level. Z'_{ft} is a vector of observable firm-level controls. This vector includes: the log number of workers $log(empl)_{ft}$, labor productivity $log(lprod)_{ft}$ computed as value added per employee, the log of firms' stock of intangible assets $log(Intang)_{ft}$, the log of firm's age $log(age)_{ft}$ and two dummies that assume value one if the exporter belongs to a business group $Group_{ft}$ or if it is foreign-owned $Foreign_{ft}$. These covariates are included to increase the efficiency of the estimates and to control for observable factors that might affect both firms' financing decisions and the quality of their exported varieties. For example, older firms may have easier access to credit and be perceived as producers of better quality products because of their longer track records and their well established brand name. Firms that are part of a business group may have lower leverage due to greater access to groups' internal financing (Boutin et al., 2011), and at the same time they may benefit from quality enhancing activities carried out by other affiliates[23].

Pooled OLS with cluster robust standard errors is the first estimator we apply to equation 2.9. By including a full set of product-destination-year dummies, we force

[23]in the Appendix, Table 2.14 shows pairwise correlation between all variables included in the model.

identification to rely on variations in quality and leverage across firms exporting the same product to the same destination. These variations are the most appropriate source of identification to answer our research question. Indeed, we want to investigate whether differences in financial structure across firms determine differences in exported quality. In addition, Lev_{ft} and $\hat{Q}_{fpdt}$ are time-persistent variables hence we expect that the estimators that exploit time variations may underestimate the impact of leverage on quality. However, OLS would generate consistent estimates of β only if leverage is uncorrelated with η_f and η_{ft}. Because this assumption is very restrictive we will also regress the model by within-group FE and FEIV estimators.

Within-group FE transforms the variables in 2.9 to eliminate η_f from the right-hand side of the model[24]. By doing so, we prevent the correlation between leverage and some firm-level time-invariant factors subsumed in the error to bias the coefficient on Lev_{ft}. However FE models are still insufficient to address the endogeneity of Lev_{ft} arising from its correlation with firm-level shocks affecting both its financial structure and the quality of its exports. In addition, endogeneity might arise from reverse causality if firms modify their financial structure as the result of an increase in revenue from foreign markets, or if they reduce their level of debt prior to investing in quality upgrading activities (e.g., this may happen if the cost of credit is relatively higher for this kind of investment). We address this issue by using FEIV models to instrument current variations in leverage with past variations in exporters' financial structure. The validity of this approach relies on the assumption that lagged variations in firms' leverage are predetermined with respect to current variations in the quality of the exported varieties. Given that we use first and second demeaned lags of the endogenous regressors as instruments for current realizations, and given that we have annual data, this assumption does not appear unreasonable.

2.7.1 Results

Table 2.8 reports summary statistics on firms' attributes and export patterns for each of the six product categories selected for our analysis. Leverage differs significantly

[24] All variables are demeaned at the level of each panel group, where groups are defined at the level of individual varieties (fpd).

Table 2.8: Summary statistics for the estimation sample

HS6	Obs.	Firms	Employees	Leverage	Liquidity	lprod	Intangibles	UV	Flows	Dest.
180690	7893	456	203.24	0.20	0.05	3.83	0.12	13.35	5.33	3.67
220410	14042	553	87.33	0.28	-0.01	4.27	0.06	10.15	11.68	8.10
220421	16921	674	169.79	0.23	0.02	4.02	0.07	7.83	5.70	3.43
330300	48376	1114	234.74	0.18	0.02	4.04	0.18	33.41	13.54	10.89
940360	31562	3256	156.07	0.17	0.05	3.66	0.12	20.04	3.53	2.98
940510	7174	706	242.69	0.14	0.06	3.78	0.16	78.08	3.01	2.67

Notes. HS6 product categories are: Chocolate and confectionery (180690), Still wine (220410), Sparkling wine (220421), Perfume and toilet waters (330300), Wooden furniture (940360), Lamps (940510). *Obs.* is the total number of export flows observed, *Firms* is the number of unique exporters in the sample, *Employee* is the average number of employees by exporter, *Leverage* is the average book vale to total asset ratio, *Liquidity* is the difference between firms' working capital and financing need to cover operating expenses normalized over total assets , *lprod* is the log of labor productivity defined as value added per employee, *Intangibles* is the ratio of intangible assets over total assets, *UV* is the average unit-value of exported varieties, *Flows* is the average number of export flows by firm (product-destination), *Dest* is the average number of unique destinations served by exporter.

across firms exporting different products. Exporters of perfumes (HS6: 330300), lamps (HS6: 940510) and wooden furniture (HS6: 940360) are characterized by lower debt-to-asset ratios, larger size and higher proportion of intangibles over total assets. These product classes have also higher average unit-values indicating that they include the most expensive varieties in our sample. On the contrary, exporters of wines (HS6: 220410 and 220421) are characterized by higher leverage, smaller size and lower ratios of intangibles over total assets. These descriptive statistics appear consistent with the theoretical predictions of Long and Malitz (1985) whereby firms with a greater proportion of 'opaque' assets are relatively disadvantaged in financing intangible investment through debt. The table reports also exporters' average liquidity obtained as the difference between working capital and financing needs for operating expenses (normalized over total assets). This variable indicates firms' operative dependence on external financing. Exporters of wine and perfumes appear more reliant on external financing to cover their operative expenses. However differences in liquidity across product categories are smaller than differences in leverage, suggesting that heterogeneity in financial structure across exporters of different products might be mostly determined by different patterns of investment financing rather than by different operative dependence on credit.

In figure 2.2 we show kernel densities of $\hat{Q}$ estimated by individual 6-digit product categories. For each product class we plot empirical densities estimated on the split samples of exporters with low leverage ($Lev_{ft} < 0.31$) and exporters with high leverage

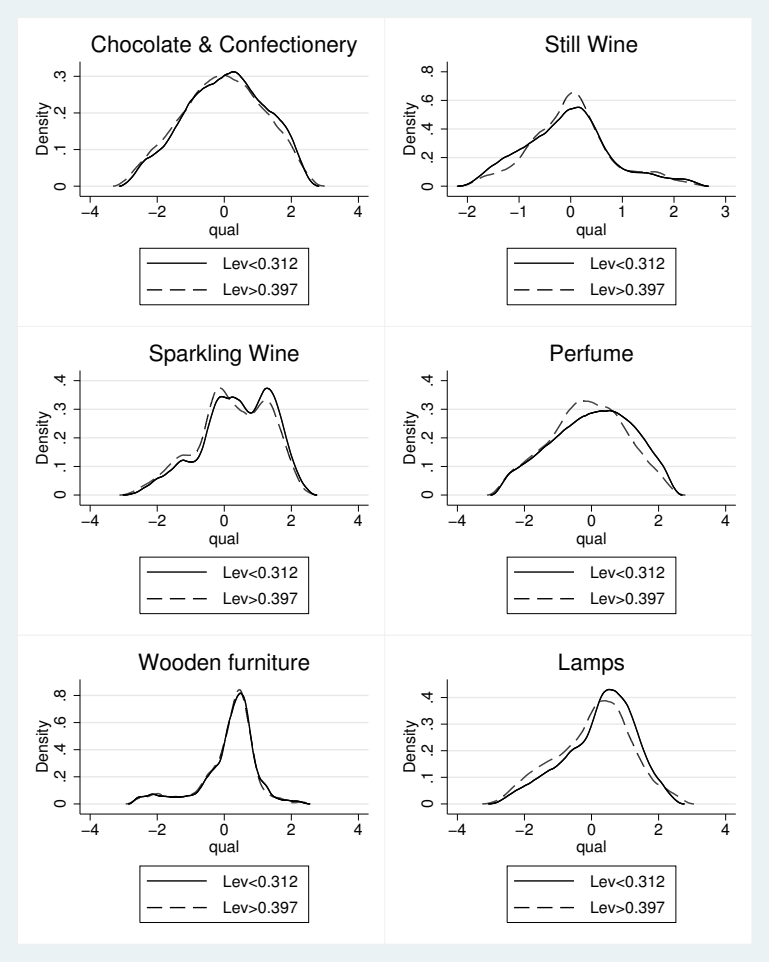
($Lev_{ft} > 0.36$)[25]. Differences in the distribution of $\hat{Q}$ between 'high leverage' and 'low leverage' exporters are apparent for three out of the six product categories in our sample[26]. The distribution of $\hat{Q}$ for low-leverage firms appears shifted toward higher values when we consider the exports of 'Perfumes', 'Sparkling Wine' and 'Lamps'. For other products empirical differences in the distribution of $\hat{Q}$ are less apparent. This evidence calls for more formal tests on the relationship between exporters leverage and exported varieties' quality.

The results from the estimation of equation 2.9 are reported in Table 2.9. We first regress the model on the whole sample obtained by pooling together observations for all HS6 product category. Then, estimation is repeated separately on the samples of export flows generated by firms with $Liquidity > 0$ and with $Liquidity < 0$. A similar split sample strategy is also implemented in Nucci et al. (2005) to capture the differential effect of leverage on TFP for firms that are able to finance productivity enhancing opportunities with own funds and those that require external financing. These authors find indeed that the effect of leverage on TFP is more negative for firms with low liquidity, confirming that higher levels of debt constraint firms' ability to implement productivity enhancing activities.

[25]We split the sample using the threshold above which leverage has been found to affect negatively TFP growth (Coricelli et al., 2012).

[26]The Kolmogorov-Smirnov test fails to reject the equality of the distributions of $\hat{Q}$ only for Chocolate and Confectionery (HS6:180690).

Figure 2.2: Distributions of $\hat{Q}$ by groups of exporters with different leverage



Notes. All densities are estimated using the Epanechnikov kernel function. Bandwidth are selected automatically by Stata (kdensity command). The sample is split according to the threshold level of leverage above which debt is found hampering productivity growth within firms Coricelli et al. (2012).

In addition, this separation criterium allows to partially discriminate those firm that choose a highly leveraged financial structure by balancing costs and benefit of debt financing (i.e., Trade-off Theory), from those that accumulate debt in the absence of sufficient liquidity to finance with internal resources operating expenses and investment (i.e., Pecking Order Theory). Indeed, if a firm is left with sufficient internal resources to cover the costs of current operations after investing ($Liquidity_{ft} > 0$), either it does not need any external financing, or it substitutes available internal resources with debt. Hence the use of debt financing for these firms can be explained by the beneficial effects of debt (e.g., tax shield function of debt). On the contrary when working capital is

insufficient to cover operating expenses ($Liquidity < 0$), debt financing is more likely to be a forced solution rather than a value optimizing choice.

Results obtained on the whole sample confirm **Hyp1** that leverage impacts negatively the quality of firms' exports. The coefficients on Lev_{ft} range from -0.066 (FE) to -0.188 (FEIV). The upward bias of the FE estimator might be due to the fact that for some firms quality upgrading investment is financed by debt. Hence in these cases leverage and quality move in the same direction. However, we are interested to see if firms with higher levels of leverage are less capable of upgrading the quality of their exported products. For this reason pooled OLS and FEIV estimates are more relevant for our research question. The pooled OLS estimator gives implicitly more weight to differences in levels of leverage across exporters, while FEIV addresses reverse causality that biases upward FE estimates by instrumenting changes in leverage at time t with lagged changes (i.e., by using the first and the second lags of Lev_{ft} as instruments). The estimated coefficient of Lev_{ft} that is obtained by implementing FEIV on the whole sample is significant only at the 10% level. Weak significance casts some doubts on the fact that the impact of leverage on quality is negative for all firms.

Estimates from the split samples of liquid and illiquid firms provide a much clearer picture. Leverage is found affecting negatively and significantly the export quality of illiquid firms only. This evidence is in line with hypothesis **Hyp2**. When we look at firms with insufficient internal resources to finance operations, the coefficients on Lev_{ft} are consistently more negative than those obtained on the whole sample and they are all significant at the 1% level across different estimators. On the contrary, leverage does not appear to reduce quality for firms with sufficient internal liquidity. Hence, we conclude that debt financing constraints firms' ability (or incentive) to compete through quality on foreign markets only when exporters' financial structure is not a value optimizing choice but rather the consequence of insufficient internal liquidity.

Table 2.9: Firms' leverage and export quality

	Pooled Sample			Liquidity>0			Liquidity<0		
	OLS	FE	FEIV	OLS	FE	FEIV	OLS	FE	FEIV
Lev_{ft}	-0.131***	-0.066**	-0.188*	-0.029	-0.044	0.309*	-0.242***	-0.129***	-0.828***
	(0.021)	(0.028)	(0.108)	(0.032)	(0.040)	(0.163)	(0.031)	(0.047)	(0.273)
$log(Intang)_{ft}$	0.011***	0.004	0.058***	0.020***	0.013**	0.077***	-0.011***	-0.014*	0.011
	(0.002)	(0.005)	(0.019)	(0.003)	(0.006)	(0.027)	(0.003)	(0.008)	(0.032)
$log(lprod)_{ft}$	0.173***	0.050***	0.045***	0.174***	0.050***	0.026*	0.155***	0.026**	0.040***
	(0.015)	(0.008)	(0.010)	(0.016)	(0.010)	(0.014)	(0.015)	(0.011)	(0.015)
$log(empl)_{ft}$	0.064***	0.111***	0.086***	0.061***	0.104***	0.057**	0.073***	0.097***	0.130***
	(0.008)	(0.012)	(0.020)	(0.009)	(0.016)	(0.027)	(0.008)	(0.022)	(0.034)
$Group_{ft}$	-0.037***	0.024***	0.019	-0.056***	0.022*	0.024	-0.013	0.037***	0.003
	(0.009)	(0.009)	(0.015)	(0.010)	(0.013)	(0.020)	(0.011)	(0.012)	(0.026)
$Foreign_{ft}$	0.057***	-0.019	-0.030	0.030	-0.043*	-0.078**	0.109***	0.042**	0.104***
	(0.017)	(0.015)	(0.022)	(0.019)	(0.023)	(0.039)	(0.024)	(0.020)	(0.040)
$log(age)_{ft}$	-0.000	-0.160*	-0.198**	0.000	-0.172**	-0.230***	-0.000	-0.156	-0.206
	(0.000)	(0.086)	(0.095)	(0.000)	(0.087)	(0.081)	(0.000)	(0.105)	(0.152)
$Constant$	-0.954***			-0.938***			-0.837***		
	(0.091)			(0.102)			(0.085)		
pd FE	y	n	n	y	n	n	y	n	n
hs6-t FE	y	y	y	y	y	y	y	y	y
fpd FE	n	y	y	n	y	y	n	y	y
Hansen (p)	-	-	0.818	-	-	0.024	-	-	0.706
R^2	0.597	0.005	0.003	0.577	0.004	0.002	0.647	0.003	-0.012
Groups		15,654	6,956		10,146	4,581		7,354	3,255
Obs.	85,335	72,227	32,292	52,001	41,274	19,154	33,334	25,821	10,945

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. Cluster-robust standard errors in parentheses (cluster unit: product-destination). FEIV models are estimated by GMM using the first and the second lags of the endogenous variables (Lev_{ft}, $log(Intang)_{ft}$, $log(lprod)_{ft}$) as instruments. FEIV models are estimated using the user-written command xtivreg2 in Stata (Schaffer, 2005). R^2 for FE and FEIV models are reported but they are not correct as they do not account for the part of variance that is explained by individuals' FEs, therefore they should be not interpret as reliable measure of goodness of fit of the model. $pdFE$ are CN8 product-destination fixed effects, $hs6 - tFE$ are HS6 product-year fixed effects, $fpdFE$ are firm-CN8 product-destination FE. Except for the latter group of FE controlled for by within-group transformation of the variables, the other two FE are introduced in the model by a full set of dummies.

The estimated coefficients on the control variables deserve some discussion. Larger and more productive exporters are found associated with the export of better quality varieties across all specifications. This result is in line with the evidence documenting positive correlation between output price and firm size (Kugler and Verhoogen, 2012). Therefore, our analysis based on a theoretically grounded estimator of quality, confirms the hypothesis of complementarity between firms' scale, productivity and quality. In addition, consistently with the idea that investment in intangible assets contributes to the real or perceived quality of exporters' good, we find that $log(Intang)_{ft}$ is positively correlated with export quality, although this relationship does not hold for illiquid firms. A possible explanation for this result is that the composition of intangible assets for this group of firms includes elements that are less relevant for quality upgrading. However, this is only a tentative hypothesis for which a proper test of validity is beyond

the scope of this paper.

In FE and FEIV models, the coefficients on the dummy variables $Group_{ft}$ and $Foreign_{ft}$ are identified only by variations in the time series of these variables associated with firms that are acquired by a domestic or by a foreign group during the period under analysis. The sign of the estimated coefficients on $Group_{ft}$ differs across estimators and samples, and we prefer not to advance any interpretation on the effect of entrance in a business group for output quality. On the contrary, foreign acquisition seems having a positive impact on export quality only for firms with negative liquidity while the effect is ambiguous when estimated on the whole sample and on the group of liquid exporters. Lastly, contrary with prior expectations on the effect of firms' age on the 'brand component' of quality, we find that $log(age)_{ft}$ is negatively correlated with quality when its coefficient is estimated on the whole sample.

In FEIV regressions we apply within-group transformation to eliminate the fixed-effect component from the error term. Given the strongly unbalanced structure of our dataset, this transformation preserves a greater number of observations and produces more precise estimates than first-differencing. However, when we use within-group transformation, lagged values of the endogenous covariates may not be valid instruments. This happens if the correlation between the error and the endogenous covariates at time t is strong, and if the time-t realization of the endogenous covariate plays an important role in the computation of the within-group means of this variable. On the contrary, the transformation of the data by first-differencing does not generate this problem. First-differencing eliminates the fixed-effect from the error and it preserves the validity of second and greater lags of the endogenous covariates as instruments for their current values (Wooldridge, 2001). Table 2.15 in the Appendix shows FEIV estimates of the model obtained by first-differencing (FD) the data instead of applying within-group transformation. From a qualitative perspective, the results are in line with FEIV estimates in Table 2.9, even thus the estimated effect of leverage is more negative in regressions with first-differenced data. However, by comparing the number of observations and the estimated standard errors obtained from regressions with first-differencing to those obtained from the model with within-group transformation, it is clear that first-differencing of the data causes a greater loss of information than

within-group transformation. Because the two approaches deliver the same qualitative result, we prefer within-group transformation as it preserves more information and it generates more precise estimates.

2.8 Robustness checks

In this section we conduct a series of robustness exercises to test whether the negative correlation between firms' leverage and export quality holds also when we change the composition of the estimation sample, when we use alternative proxies for quality and financial structure, or when we evaluate the impact of leverage on different quantiles of the distribution of $\hat{Q}_{ft}$.

We start by extending the estimation sample to the whole list of twenty-one 6-digit products reported in Table 2.5. Because overidentification tests reject the appropriateness of the instrument set used in FEIV regressions for many of these products, we obtain the proxy for quality $\hat{Q}_{FE}$ as the residual computed from the demand parameters estimated by FE. Even thus $\hat{Q}_{FE}$ still captures non-price competitiveness of exporters, we are aware that this proxy will underestimate export quality, and especially so for high-quality varieties[27]. Table 2.10 reports the output from this first exercise. This robustness check confirms our main qualitative result that leverage is negatively associated with exported varieties' quality. However, contradicting our previous findings, FEIV estimates on this sample suggest that the negative effect of leverage on quality is stronger for liquid firms than it is for illiquid ones.

This inconsistency calls for a second check to understand whether this different result arises from the extension of the sample to a wider range of products, or if instead it is due to the use of the biased proxy for quality $\hat{Q}_{FE}$. In order to check which of these possible reasons is the most plausible, we run the same set of regressions on $\hat{Q}_{FE}$ on the restricted sample of six products only. Results are reported in Table 2.11. As we find that the inconsistency (i.e., greater negative impact of leverage on liquid firms) is still present when models are estimated on the restricted sample, then we exclude that our previous results was an artifact of sample composition. It rather appears that this

[27]In the Appendix we include a discussion on this bias and its causes.

inconsistency is related to the use of $\hat{Q}_{FE}$ as a proxy for quality on the left-hand side of the models used for robustness checks. Therefore, we argue that this first exercise does not undermine the validity of our previous findings.

Table 2.10: Robustness check: estimates on the extended sample of 21 products by using $\hat{Q}_{FE}$ as a proxy for quality

	Pooled Sample			Liquidity>0			Liquidity<0		
	OLS	FE	FEIV	OLS	FE	FEIV	OLS	FE	FEIV
Lev_{ft}	-0.026***	-0.020**	-0.097***	-0.022***	-0.015	-0.138***	-0.046***	-0.022	-0.050
	(0.005)	(0.008)	(0.036)	(0.006)	(0.012)	(0.053)	(0.008)	(0.015)	(0.076)
$log(Intang)_{ft}$	-0.002***	0.002	0.008*	-0.003***	0.002	0.003	-0.003***	-0.000	0.007
	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.005)	(0.001)	(0.003)	(0.011)
$log(lprod)_{ft}$	0.012***	0.007***	0.005*	0.011***	0.010***	0.009**	0.013***	0.004	0.008**
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
$log(empl)_{ft}$	0.013***	0.022***	0.026***	0.013***	0.025***	0.030***	0.014***	0.020***	0.023**
	(0.001)	(0.003)	(0.005)	(0.002)	(0.004)	(0.006)	(0.002)	(0.007)	(0.012)
$Group_{ft}$	-0.005**	0.004	0.017***	-0.005*	-0.007	0.009	-0.007**	0.022***	0.037***
	(0.002)	(0.004)	(0.006)	(0.003)	(0.005)	(0.008)	(0.003)	(0.006)	(0.011)
$Foreign_{ft}$	0.025***	0.004	0.008	0.031***	-0.000	-0.002	0.010**	0.018*	0.022
	(0.003)	(0.006)	(0.009)	(0.004)	(0.008)	(0.012)	(0.005)	(0.010)	(0.015)
$log(age)_{ft}$	-0.000***	0.053	-0.042	-0.000***	0.065	-0.023	-0.000	-0.023	-0.110
	(0.000)	(0.091)	(0.090)	(0.000)	(0.097)	(0.026)	(0.000)	(0.046)	(0.135)
$Constant$	-0.117***			-0.126***			-0.134***		
	(0.018)			(0.019)			(0.018)		
pd FE	y	n	n	y	n	n	y	n	n
hs6-t FE	y	y	y	y	y	y	y	y	y
fpd FE	n	y	y	n	y	y	n	y	y
Hansen (p)			0.144			0.265			0.820
R^2	0.776	0.000	0.000	0.781	0.000	0.000	0.792	0.000	0.001
Groups		79,777	30,550		55,196	21,356		29,427	11,588
Obs.	415,645	335,657	132,433	274,290	209,100	83,356	141,355	100,680	39,473

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. Cluster-robust standard errors in parentheses (cluster unit: product-destination). FEIV models are estimated by GMM using the first and the second lags of the endogenous variables (Lev_{ft}, $log(Intang)_{ft}$, $log(lprod)_{ft}$) as instruments.FEIV models are estimated using the user-written command xtivreg2 in Stata (Schaffer, 2005). R^2 for FE and FEIV models are reported but they are not correct as they do not account for the part of the variance that is explained by individuals' FEs, therefore they should be not interpret as reliable measure of goodness of fit of the model. $pdFE$ are CN8 product-destination fixed effects, $hs6-tFE$ are HS6 product-year fixed effects, $fpdFE$ are firm-CN8 product-destination FE. Except for the latter group of FE controlled for by within-group transformation of the variables, the other two FE are introduced in the model by a full set of dummies.

The second robustness check consists in repeating the estimation of equation 2.9 by substituting $\hat{Q}_{ft}$ on the left-hand side of the equation with unit-values. As we have previously mentioned, the effect of leverage on unit-values is ambiguous if more leveraged exporters are less capable of implementing productivity enhancing measures as suggested by empirical studies on leverage and TFP (e.g., Aivazian et al., 2005; Nucci et al., 2005; Nunes et al., 2007; Coricelli et al., 2012). However, if the negative effect of debt on quality prevails on the efficiency-hampering one, we should expect more leveraged firms to export relatively cheaper varieties within each product-destination

couple. In addition, this robustness check allows to compare our estimates with previous evidence on firms' financial factors and export prices. Manova et al. (2011) and Fan et al. (2012) argue that credit rationed Chinese firms export relatively cheaper varieties within narrowly defined product categories. On the contrary, Secchi et al. (2011) find that Italian exporters in financial distress tend to set relatively higher export prices in foreign markets. By comparing the results of regressions on export prices with those previously obtained on the estimator of quality we can better disentangle the effect of financial factors on unit-values and quality.

Table 2.11: Robustness check: estimates on the restricted sample of 6 products by using $\hat{Q}_{FE}$ as a proxy for quality

	Pooled Sample			Liquidity>0			Liquidity<0		
	OLS	FE	FEIV	OLS	FE	FEIV	OLS	FE	FEIV
Lev_{ft}	-0.035***	-0.040**	-0.178**	-0.043***	-0.062**	-0.246**	-0.059***	-0.019	-0.061
	(0.012)	(0.020)	(0.084)	(0.014)	(0.028)	(0.119)	(0.019)	(0.033)	(0.223)
$log(Intang)_{ft}$	-0.009***	0.001	0.012	-0.012***	0.002	0.002	-0.007***	-0.003	0.021
	(0.001)	(0.004)	(0.011)	(0.002)	(0.004)	(0.013)	(0.002)	(0.007)	(0.026)
$log(lprod)_{ft}$	0.026***	0.005	0.004	0.020***	0.006	0.007	0.034***	0.011	0.018**
	(0.003)	(0.005)	(0.006)	(0.004)	(0.006)	(0.008)	(0.005)	(0.007)	(0.008)
$log(empl)_{ft}$	0.034***	0.040***	0.051***	0.040***	0.038***	0.043***	0.026***	0.049***	0.069***
	(0.003)	(0.009)	(0.013)	(0.003)	(0.011)	(0.017)	(0.004)	(0.014)	(0.023)
$Group_{ft}$	0.007	0.012	0.042***	0.002	-0.010	0.015	0.013*	0.053***	0.087***
	(0.005)	(0.008)	(0.013)	(0.007)	(0.011)	(0.018)	(0.007)	(0.013)	(0.026)
$Foreign_{ft}$	0.059***	0.008	0.019	0.077***	-0.010	-0.020	0.021**	0.037**	0.056*
	(0.008)	(0.012)	(0.021)	(0.011)	(0.017)	(0.034)	(0.010)	(0.018)	(0.034)
$log(age)_{ft}$	-0.001***	0.097	-0.048	-0.002***	0.116	-0.010	-0.000	0.016	-0.100
	(0.000)	(0.096)	(0.092)	(0.000)	(0.105)	(0.098)	(0.000)	(0.106)	(0.129)
$Constant$	-0.267***			-0.211***			-0.258***		
	(0.026)			(0.027)			(0.033)		
pd FE	y	n	n	y	n	n	y	n	n
HS6-Year FE	y	y	y	y	y	y	y	y	y
fpd FE	n	y	y	n	y	y	n	y	y
Hansen (p)			0.492			0.398			0.642
R^2	0.781	0.001	0.001	0.790	0.001	0.000	0.797	0.001	0.002
Groups		22,294	9,641		13,639	5,964		10,655	4,658
Obs.	122,918	101,568	44,314	72,320	55,416	24,964	50,598	38,616	16,226

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. Cluster-robust standard errors in parentheses (cluster unit: product-destination). FEIV models are estimated by GMM using the first and the second lags of the endogenous variables (Lev_{ft}, $log(Intang)_{ft}$, $log(lprod)_{ft}$) as instruments. FEIV models are estimated using the user-written command xtivreg2 in Stata (Schaffer, 2005). R^2 for FE and FEIV models are reported but they are not correct as they do not account for the part of the variance that is explained by individuals' FEs, therefore they should be not interpret as reliable measure of goodness of fit of the model. $pdFE$ are CN8 product-destination fixed effects, $hs6-tFE$ are HS6 product-year fixed effects, $fpdFE$ are firm-CN8 product-destination FE. Except for the latter group of FE controlled for by within-group transformation of the variables, the other two FE are introduced in the model by a full set of dummies.

Table 2.12 reports the estimates of regressions on the unit-values of exported varieties. Results from this exercise are in line with those that we obtained in regressions on $\hat{Q}_{ft}$ as we find a negative relationship between leverage and export prices in FE and

FEIV estimates from the pooled sample. As for the previous exercise, we still find that the negative correlation between prices and leverage is much stronger within the sample of firms that cannot self-finance current expenses. Looking at the other firm-level covariates, we find that the coefficients of $log(empl)_{ft}$ and $log(lprod)_{ft}$ on prices have opposite sign to those obtained on $\hat{Q}_{ft}$. Hence, we conclude that larger and more productive firms are more competitive both on the price and on the quality profile. In other words, they charge relatively lower prices but they can still sell higher quality products than competitors setting similar prices.

Table 2.12: Robustness check: firms' leverage and export prices

	Pooled Sample			Liquidity>0			Liquidity<0		
	OLS	FE	FEIV	OLS	FE	FEIV	OLS	FE	FEIV
Lev_{ft}	0.018	-0.070***	-0.247***	0.188***	-0.063*	-0.152	-0.167***	-0.053	-0.499**
	(0.031)	(0.022)	(0.087)	(0.037)	(0.038)	(0.119)	(0.041)	(0.034)	(0.243)
$log(Intang)_{ft}$	0.055***	0.019***	0.049***	0.062***	0.027***	0.089***	0.043***	0.008	-0.026
	(0.002)	(0.003)	(0.011)	(0.003)	(0.004)	(0.014)	(0.003)	(0.006)	(0.024)
$log(lprod)_{ft}$	-0.010	0.011**	0.005	-0.003	0.030***	0.014	-0.024***	-0.026***	-0.016*
	(0.008)	(0.005)	(0.007)	(0.010)	(0.007)	(0.010)	(0.009)	(0.008)	(0.009)
$log(empl)_{ft}$	-0.025**	0.004	-0.032**	-0.025**	0.052***	0.001	-0.023**	-0.065***	-0.087***
	(0.011)	(0.008)	(0.013)	(0.012)	(0.011)	(0.020)	(0.009)	(0.014)	(0.025)
$Group_{ft}$	-0.051***	0.001	-0.007	-0.087***	0.007	0.010	-0.002	-0.010	0.002
	(0.018)	(0.008)	(0.012)	(0.021)	(0.010)	(0.016)	(0.021)	(0.013)	(0.023)
$Foreign_{ft}$	0.024	-0.004	-0.022	-0.069***	-0.014	-0.066**	0.194***	-0.018	0.024
	(0.023)	(0.012)	(0.018)	(0.026)	(0.016)	(0.028)	(0.027)	(0.018)	(0.034)
$log(age)_{ft}$	0.004***	-0.026	-0.068	0.006***	-0.060	-0.053	0.002***	0.032	-0.050
	(0.000)	(0.040)	(0.052)	(0.000)	(0.048)	(0.081)	(0.000)	(0.049)	(0.053)
$Constant$	2.362***			2.321***			2.425***		
	(0.076)			(0.085)			(0.078)		
pd FE	y	n	n	y	n	n	y	n	n
HS6-Year FE	y	y	y	y	y	y	y	y	y
fpd FE	n	y	y	n	y	y	n	y	y
Hansen (p)			0.640			0.189			0.872
R^2	0.468	0.001	0.001	0.464	0.004	0.005	0.498	0.002	-0.008
Groups		16,482	7,254		10,733	4,805		7,777	3,406
Obs.	90,717	77,021	34,111	55,427	44,187	20,286	35,290	27,495	11,547

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. Cluster-robust standard errors in parentheses (cluster unit: product-destination). FEIV models are estimated by GMM using the first and the second lags of the endogenous variables (Lev_{ft}, $log(Intang)_{ft}$, $log(lprod)_{ft}$) as instruments. FEIV models are estimated using the user-written command xtivreg2 in Stata (Schaffer, 2005). R^2 for FE and FEIV models are reported but they are not correct as they do not account for the part of the variance that is explained by individuals' FEs, therefore they should be not interpret as reliable measure of goodness of fit of the model. $pdFE$ are CN8 product-destination fixed effects, $hs6-tFE$ are HS6 product-year fixed effects, $fpdFE$ are firm-CN8 product-destination FE. Except for the latter group of FE controlled for by within-group transformation of the variables, the other two FE are introduced in the model by a full set of dummies.

The third sensitivity test is conducted by substituting Lev_{ft} in regressions on $\hat{Q}_{ft}$ with a different indicator of corporate financial structure called $Equity_{ft}$. This variable is constructed as the ratio of the book value of firms' initial capital and issued equities over total assets. $Equity_{ft}$ captures the extent to which firms use equity financing for

investment and current expenses. On one side, according to the Pecking Order Theory of corporate financial structure, we expect that in the presence of information asymmetries between insiders (i.e., managers and current shareholders) and outsiders (i.e., perspective shareholders), equities are the most expensive form of external financing (Myers and Majluf, 1984). On the other side, this source of financing does not expose firms to bankruptcy risk and it does not distort firms' incentives to invest in quality enhancing activities. Therefore, we do not have a strong prior about the effect of more equity financing on output quality when firms substitute internal financing with equity financing. On the contrary, for firms that are liquidity constrained we expect equity financing to impact positively on output quality, when equities substitute debt. In other words, for liquidity constrained firms the issue of new shares may constitute a source of financing that is relatively more expensive than debt, but that does not distort the incentives and the relative costs of quality upgrades.

In table 2.13 we can see that the point estimates of the coefficients of $Equity_{ft}$ are positive but insignificant when models are estimated on the pooled sample. However, estimates on $Equity_{ft}$ change sign across the samples of 'liquid' and 'illiquid' exporters. In particular we find that equity financing is positively correlated with export quality in the group of illiquid exporters. We interpret the positive correlation between equity financing and quality as a sign that among illiquid exporters, those that have greater scope for substituting equity financing for debt financing have greater advantage in competing through quality on foreign markets. On the contrary, $Equity_{ft}$ appears having a negative and significant impact on export quality among 'liquid' exporters when the model is estimated by FEIV. However, the Hansen-J test of overidentifying restrictions rejects the joint validity of the instruments (Hansen p-value=0.015) at the 0.05 level of significance. For this reason, we prefer not to interpret this coefficient as an evidence for a quality-hampering effect of equity financing. Despite this, the positive and significant effect of equity financing for 'illiquid' exporters is in line with our main story according to which firms that resort to debt financing in absence of alternatives (i.e., either internal or equity financing) are relatively disadvantaged in exporting high-quality products.

Table 2.13: Robustness check: firms' equity financing and export quality

	Pooled Sample			Liquidity>0			Liquidity<0		
	OLS	FE	FEIV	OLS	FE	FEIV	OLS	FE	FEIV
$Equity_{ft}$	0.020	0.027	0.028	-0.031	-0.018	-0.379***	0.016	0.056*	0.684***
	(0.017)	(0.018)	(0.068)	(0.024)	(0.024)	(0.102)	(0.018)	(0.031)	(0.164)
$log(Intang)_{ft}$	0.011***	0.004	0.040**	0.021***	0.012*	0.066***	-0.010***	-0.012	-0.025
	(0.002)	(0.005)	(0.018)	(0.003)	(0.007)	(0.022)	(0.003)	(0.009)	(0.030)
$log(lprod)_{ft}$	0.184***	0.052***	0.052***	0.185***	0.053***	0.014	0.159***	0.034***	0.055***
	(0.016)	(0.008)	(0.010)	(0.017)	(0.010)	(0.014)	(0.015)	(0.012)	(0.015)
$log(empl)_{ft}$	0.069***	0.118***	0.095***	0.068***	0.112***	0.041	0.073***	0.107***	0.173***
	(0.008)	(0.012)	(0.020)	(0.010)	(0.016)	(0.025)	(0.008)	(0.021)	(0.035)
$Group_{ft}$	-0.037***	0.024**	0.021	-0.061***	0.019	0.025	0.002	0.042***	0.026
	(0.009)	(0.009)	(0.016)	(0.011)	(0.014)	(0.020)	(0.011)	(0.012)	(0.027)
$Foreign_{ft}$	0.059***	-0.013	-0.023	0.032	-0.049**	-0.081**	0.115***	0.059***	0.139***
	(0.018)	(0.016)	(0.022)	(0.020)	(0.024)	(0.040)	(0.025)	(0.021)	(0.041)
$log(age)_{ft}$	-0.000	-0.166*	-0.167*	0.000*	-0.167*	-0.200**	-0.001*	-0.194*	-0.212
	(0.000)	(0.088)	(0.096)	(0.000)	(0.086)	(0.087)			
$Constant$	-1.041***			-0.957***			-0.966***		
	(0.090)			(0.094)			(0.088)		
pd FE	y	n	n	y	n	n	y	n	n
HS6-Year FE	y	y	y	y	y	y	y	y	y
fpd FE	n	y	y	n	y	y	n	y	y
Hansen (p)			0.705			0.015			0.997
R^2	0.613	0.005	0.005	0.593	0.005	0.002	0.662	0.004	-0.019
Groups		15,717	6,958		9,900	4,444		7,486	3,220
Obs.	85,715	72,530	31,975	51,712	40,921	18,842	34,003	26,468	10,883

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. Cluster-robust standard errors in parentheses (cluster unit: product-destination). FEIV models are estimated by GMM using the first and the second lags of the endogenous variables (Lev_{ft}, $log(Intang)_{ft}$, $log(lprod)_{ft}$) as instruments. FEIV models are estimated using the user-written command xtivreg2 in Stata (Schaffer, 2005). R^2 for FE and FEIV models are reported but they are not correct as they do not account for the part of the variance that is explained by individuals' FEs, therefore they should be not interpret as reliable measure of goodness of fit of the model. $pdFE$ are CN8 product-destination fixed effects, $hs6-tFE$ are HS6 product-year fixed effects, $fpdFE$ are firm-CN8 product-destination FE. Except for the latter group of FE controlled for by within-group transformation of the variables, the other two FE are introduced in the model by a full set of dummies.

We conclude this section by investigating the impact of leverage on different quantiles of the distribution of $\hat{Q}_{ft}$. Indeed, our results suggest that firms with higher leverage export varieties with lower expected value of $\hat{Q}_{ft}$. However, this finding is both consistent with a shift to the left of the whole distribution of export quality for less leveraged firms or with a localized impact on some quantiles. To better characterize the impact of leverage on quality we run quantile regressions (Koenker and Bassett, 1978) of Lev_{ft} on $\hat{Q}_{ft}$ using only the 2004 cross-section[28] . In order to control for product-destination fixed effects without including a large number of dummies, we transform the variables in equation 2.9 by subtracting their means computed at the CN8 product-destination level to each observation[29].

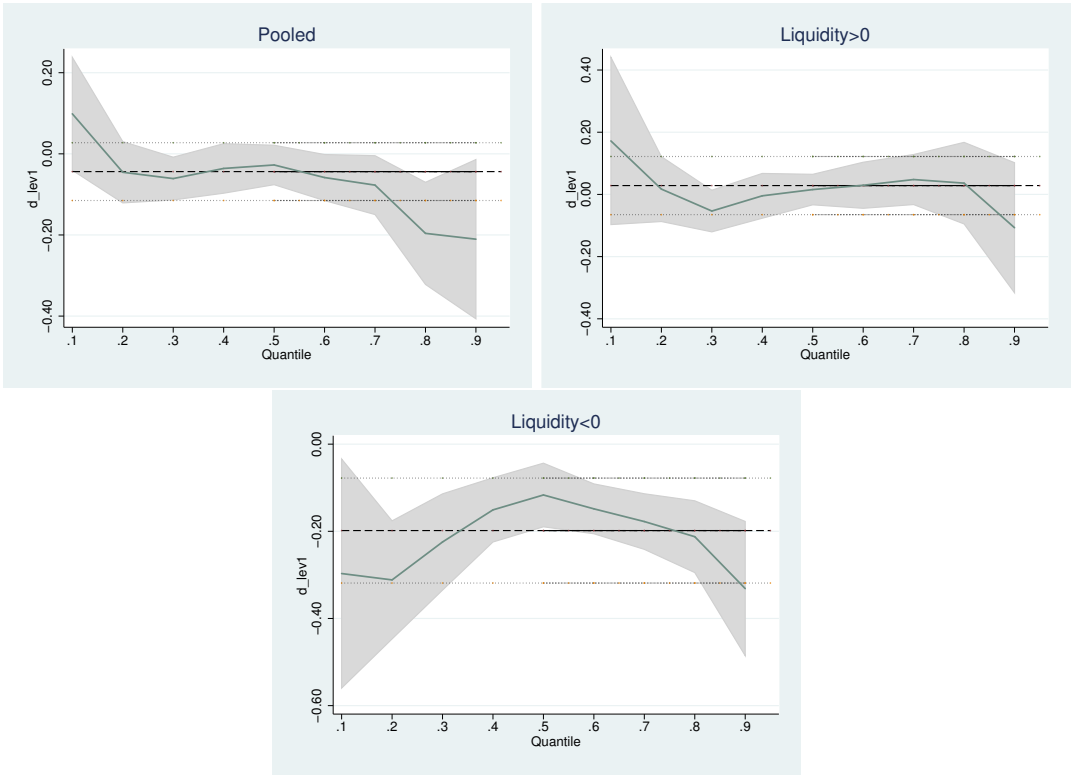
[28]Results are virtually identical when we estimate quantile regressions using the cross-sections for 1997, 2000 and 2007.

[29]We also tried estimating the Unconditional Quantile Regressor for Panel Data developed by

We provide estimates of the coefficients and standard errors in Table 2.16 in the Appendix. Figure 2.3 plots the estimated coefficients on Lev_{ft} over the deciles of $\hat{Q}_{ft}$ together with 95% confidence bands. On the pooled sample, Lev_{ft} is found having a negative and statistically significative effect only on the upper part of the distribution of $\hat{Q}_{ft}$ (i.e., on all deciles above the Median). This evidence suggests that debt financing may reduce firms' ability to reach the highest qualitative standards but it does affect their lower bound for quality. A slightly different picture emerges when we consider separately 'liquid' and 'illiquid' firms. For the first group, the coefficient on Lev_{ft} is negative and significant only when it is estimated on the 9th decile of $\hat{Q}_{ft}$. On the contrary, leverage is found shifting to the left the whole distribution of quality estimates for 'illiquid' firms, as we find negative and significant coefficients on all deciles. However, coefficients are more negative when the impact of leverage is estimated on the bottom and the upper deciles of $\hat{Q}_{ft}$. From this exercise we conclude that 'illiquid' firms with higher levels of debt find relatively more difficult to reach the highest levels of quality, and that they export goods with lower minimum levels of quality that 'illiquid' exporters with less debt. Overall these robustness checks confirm our main story about the differential impact of leverage on export quality for firms that have different scope for substituting debt for internal liquidity.

Powell (2010) by running in Stata the code associated with this paper. This estimator offers the possibility to control for individual firms' fixed effects in quartile regressions without affecting the interpretation of the results, as it happens for the panel quantile regression estimator proposed by Canay (2011). However, the size of the sample and some limitations in computing power prevented us from implementing successfully this estimator. For this reason, we decided to implement a cross-sectional quantile regression on the transformed variables.

Figure 2.3: Plots of the effect of Lev_{ft} on all deciles of the distribution of $\hat{Q}_{ft}$



Notes. The three panels plot the coefficients of Lev_{ft} when regressed on the deciles of the distribution of $\hat{Q}_{ft}$. The 'Pooled' panel refers to quantile regression estimates obtained on the whole sample, while $Liquidity > 0$ and $Liquidity >< 0$ refer respectively to estimates on the samples of firms with sufficient and insufficient liquidity to cover operating expenses. The solid line within the shaded area is the plot of the coefficients, while the shaded gray area is the 95% band of confidence of the estimated coefficients. The thicker horizontal line represents the OLS coefficient, and the two thinner horizontal lines delimit the 95% confidence interval for the OLS estimates. These figures are produced by using the user-written Stata command grqreg (Azevedo, 2004).

2.9 Conclusions

Our study contributes to further the understanding of the relationship between financial factors and firm export behavior by casting light on the 'quality channel'. Indeed, we find that the corporate financial structure determines firms' ability to compete on foreign markets through quality, consistently with models predicting that debt financing and financial distress reduce firms' incentive and ability to invest in quality enhancing activities such as advertisement and R&D (Long and Malitz, 1985; Maksimovic and Titman, 1991).

An interesting finding that emerges from our analysis is that the negative impact of leverage on export quality is conditional upon firms' dependence on external financing

for operating expenses. We interpret this result by referring to alternative theories of corporate financial structure. For some firms, an intense use of debt responds to a value-optimizing choice. In our sample we identify these firms as the the ones that have higher liquidity, because they are able to substitute debt with internal resources. For others, debt may be the only solution to compensate for insufficient internal resources and for the lack of access to equity financing. These firms are most likely the ones that cannot self-finance completely current expenses. As we find that the effect of leverage on quality is especially strong and significant for the latter group of firms, we argue that debt financing constraints quality upgrading only in the presence of liquidity constraints.

We believe that our study has some important implications, as it suggest that policies affecting the use to debt financing (e.g., changes in corporate taxation rates) may also affect indirectly firms' incentives to upgrade their product quality and thus their ability to compete on foreign markets. Again, our findings suggest that market-based financial systems, by providing greater opportunities and cheaper costs of equity financing, could be relatively more effective in promoting quality as a specific dimension of firms' international competitiveness.

Appendix

Derivation of equation 2.6

Given the assumptions of the discrete choice model of demand, the probability P_j that any individual consumer chooses variety j over all the others possible substitutes in K can be written as:

$$P_j = P_{j/g} \times P_g \tag{2.10}$$

where P_g is the probability that the choice of the consumer falls on one of the products in group g, and g is an index for each of the varieties' 'nests' that compose the wider set K. By expressing the probability P_g according to a multinomial logit model we can write:

$$P_g = \frac{\left[\sum_{k \in g} e^{\delta_k/(1-\sigma)}\right]^{(1-\sigma)}}{\sum_g \left[\sum_{k \in g} e^{\delta_k/(1-\sigma)}\right]^{(1-\sigma)}} \tag{2.11}$$

$P_{j/g}$ is instead the probability of choosing j conditional on the choice of group g:

$$P_{j/g} = \frac{e^{\delta_j/(1-\sigma)}}{\sum_{k\in g} e^{\delta_k/(1-\sigma)}} \tag{2.12}$$

by multiplying the right-hand sides of 2.11 and 2.12 we obtain:

$$P_j = \frac{e^{\delta_j/(1-\sigma)}}{[\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{\sigma} \times \sum_g [\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}} \tag{2.13}$$

the expression for P_j can be simplified if we normalize the probability of choosing each j by the probability of choosing an outside variety delivering expected utility $\delta_o = 0$[30]. The probability of choosing the outside variety (hence not choosing any of the inside varieties) is:

$$P_o = \frac{1}{\sum_g [\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}} \tag{2.14}$$

taking the log difference of P_j and P_o we obtain:

$$ln(P_j) - ln(P_o) = \frac{\delta_j}{1-\sigma} - \sigma ln(\sum_{k\in g} e^{\delta_k/(1-\sigma)}) \tag{2.15}$$

by using 2.11, 2.14 and 2.10 we find that $ln(\sum_{k\in g} e^{\delta_k/(1-\sigma)}) = [ln(P_g) - ln(P_o)]/(1-\sigma)$. After substituting the right-hand side of this expression in 2.15, and after some simplification we obtain:

$$ln(P_j) - ln(P_o) = X_j'\beta - \alpha p_j + \sigma(P_{j/g}) + \zeta_j \tag{2.16}$$

because the observed market shares s_j, s_o and $s_{j/g}$ can be thought as empirical counterparts of P_j, P_o and $P_{j/g}$, then 2.10 is the empirical equivalent of 2.16.

Derivation of the elasticity of demand

By defining $D_g = \sum_{j\in g} e^{\delta_j/1-6}$ equation (2.5) can be written as:

$$s_j = \frac{e^{\delta_j/(1-\sigma)}}{D_g^{\sigma}[\sum_g D_g^{(1-\sigma)}]} \tag{2.17}$$

[30]The outside variety is a variety for which we do not identify the mean utility. Instead we normalize it to 0 and express the mean utility of all other varieties in relation to the outside variety (Nevo, 2000). In practice, the market share of the outside variety is computes as $s_o = 1 - \sum_{j\in K} s_j$, where $\sum_{j\in K} s_j$ is the aggregate share of the inside varieties.

then

$$\frac{\partial s_j}{\partial p_j} = \frac{e^{\delta_j/(1-6)}\frac{\partial \delta_j}{\partial p_j} D_g^{\sigma}[\sum_g D_g^{(1-\sigma)}] - e^{\delta_j/(1-\sigma)}[\frac{\partial (D_g^{\sigma})}{\partial p_j}[\sum_g D_g^{1-\sigma}] + D_g^{\sigma}\frac{\partial (D_g^{1-\sigma})}{\partial p_j}}{(D_g^{\sigma}[\sum_g D_g^{(1-\sigma)}])^2} \tag{2.18}$$

because $\frac{\partial \delta_j}{\partial p_j} = \frac{\alpha}{1-\sigma}$, we can use the definition of s_j in (2.17) and the definition of $P_{j/g} \equiv s_{j/g}$ in (2.8) to write (2.18) as:

$$\frac{\partial s_j}{\partial p_j} = \frac{\alpha}{1-\sigma} s_j(1 - \sigma s_{j|g} - (1-\sigma)s_j) \tag{2.19}$$

then multiplying (2.19) by $\frac{p_j}{s_j}$ we obtain the formula for the market share elasticity of demand:

$$\frac{\partial s_j}{\partial p_j} \times \frac{p_j}{s_j} = \frac{\alpha}{1-\sigma} p_j(1 - \sigma s_{j|g} - (1-\sigma)s_j) \tag{2.20}$$

Additional tables

Table 2.14 reports pairwise correlation between all variables included in the models of export quality and financial structure.

Table 2.14: Correlations between the main variables used in regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) $\hat{Q}_{fpdt}$	1								
(2) $log(UV)_{fpdt}$	0.0246***	1							
(3) Lev_{ft}	-0.0362***	-0.0998***	1						
(4) $log(Intang)_{ft}$	0.0659***	0.266***	-0.0749***	1					
(5) $log(empl)_{ft}$	0.0770***	0.197***	-0.150***	0.756***	1				
(6) $log(age)_{ft}$	0.00671*	0.0376***	0.0206***	0.148***	0.238***	1			
(7) $Group$	-0.0122***	0.101***	0.00730*	0.242***	0.307***	0.144***	1		
(8) $Foreign_{ft}$	0.0373***	0.150***	-0.0533***	0.336***	0.317***	-0.0172***	-0.390***	1	
(9) $log(lprod)_{ft}$	0.0581***	0.171***	-0.102***	0.278***	0.0810***	0.0297***	0.128***	0.133***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2.15 reports FEIV estimates after first-differencing the data to eliminate firm-product-destination fixed effects from the error. Results are qualitatively similar to those obtained from FEIV models applying within-group transformation to the data.

Table 2.15: FEIV estimates with first-differencing of the data

	Pooled	Liquidity>0	Liquidity<0
ΔLev_{ft}	-2.844***	-0.188	-1.098*
	(0.750)	(2.565)	(0.578)
$\Delta log(Intang)_{ft}$	-0.442*	0.580	-0.124
	(0.236)	(1.056)	(0.195)
$\Delta log(empl)_{ft}$	0.070**	0.018	0.191**
	(0.035)	(0.045)	(0.086)
$\Delta Group_{ft}$	-0.022	0.111	-0.029
	(0.028)	(0.168)	(0.031)
$\Delta Foreign_{ft}$	0.182***	0.065	0.218***
	(0.055)	(0.161)	(0.078)
$\Delta log(lprod)_{ft}$	0.034*	-0.027	0.024
	(0.020)	(0.096)	(0.021)
hs6-t FE	y	y	y
Hansen (p)	0.716	0.064	0.153
R^2	-0.378	-0.245	-0.038
Groups	5,430	3,887	2,931
Obs.	18,778	12,202	6,576

Notes. * $p < .1$, ** $p < .05$, *** $p < .01$. Cluster-robust standard errors in parentheses (cluster unit: product-destination). FEIV models are estimated by GMM using the second and third lags of the endogenous variables as instruments. The model is in first-differences, for this reason the coefficient on $log(age)_{ft}$ is not identified.

Table 2.16: Coefficients on Lev_{ft} in quantile regressions on $\hat{Q}_{ft}$

Quantiles:	Pooled Sample	$Liquidity > 0$	$Liquidity < 0$
q10	0.099	0.172	-0.297**
	(0.085)	(0.109)	(0.128)
q20	-0.045	0.017	-0.312***
	(0.047)	(0.054)	(0.065)
q30	-0.061**	-0.053	-0.225***
	(0.025)	(0.035)	(0.050)
q40	-0.036	-0.005	-0.151***
	(0.024)	(0.032)	(0.035)
q50	-0.027	0.016	-0.117***
	(0.019)	(0.028)	(0.037)
q60	-0.058***	0.029	-0.148***
	(0.022)	(0.033)	(0.034)
q70	-0.077**	0.048	-0.178***
	(0.032)	(0.044)	(0.038)
q80	-0.196***	0.036	-0.212***
	(0.058)	(0.080)	(0.054)
q90	-0.210**	-0.107	-0.331***
	(0.088)	(0.112)	(0.097)
Obs.	8,048	5,095	2,953
Bootstrap(rep.)	200	200	200

Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Quantile regressions are run on the 2004 cross-section of the panel dataset. The table reports estimated coefficients of Lev_{ft}. Standard errors are obtained by bootstrap (200 replications). We use the command sqreg in Stata that estimates simultaneously the coefficients of the covariates on different quantiles of the dependent variable's distribution. Control variables are included but their coefficients are not reported.

Table 2.16 reports estimates of the coefficient of Lev_{ft} in quantile regressions on $\hat{Q}_{ft}$

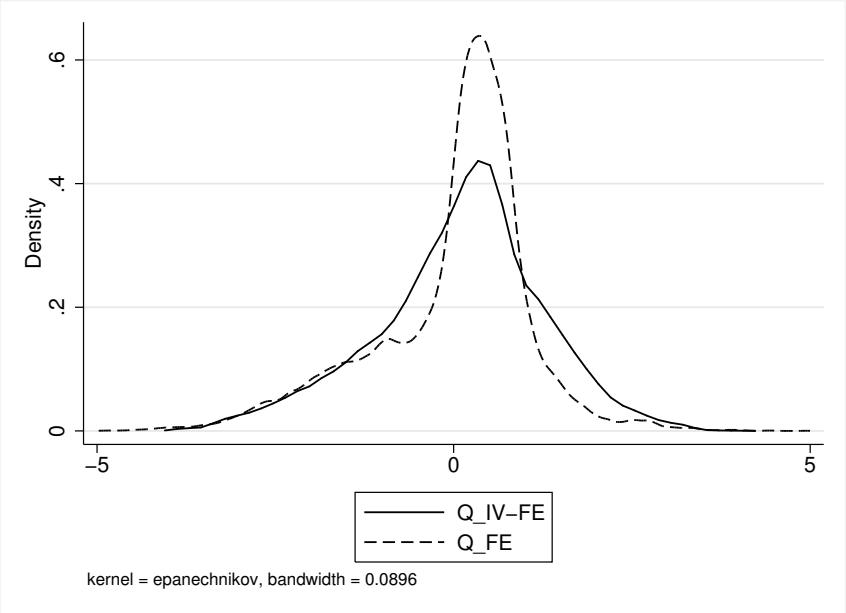
for all deciles of the dependent variable's distribution. We run the regression on the whole sample and on the samples of firms that have sufficient liquidity to cover current expenses ($Liquidity > 0$) and of those with insufficient liquidity ($Liquidity < 0$). Point estimates are generally positive and not significantly different from zero along the distribution of the quality measure for liquid firms. The contrary is true when we estimate quantile regressions for illiquid firms. Hence, higher levels of debt affect negatively all moments of the distribution of export quality for illiquid firms.

Comparing quality estimates obtained by FEIV and by FE

Figure 2.4 compares the empirical densities of $\hat{Q}_{FEIV}$ and $\hat{Q}_{FE}$. These are respectively the proxies for export quality obtained by estimating the model of demand by FEIV and by FE for the six 6-digit product categories included in the analysis. We find the distribution of $\hat{Q}_{FE}$ to be more leptokurtic than the one of $\hat{Q}_{FEIV}$. This is mostly due to the underrepresentation in this distribution of higher values of $\hat{Q}_{FE}$ when compered to the distribution of $\hat{Q}_{FEIV}$. Under the assumptions that the FEIV estimates are consistent, $\hat{Q}_{FE}$ is underestimating the quality of exported varieties, but this happens only in the upper part of the distribution.

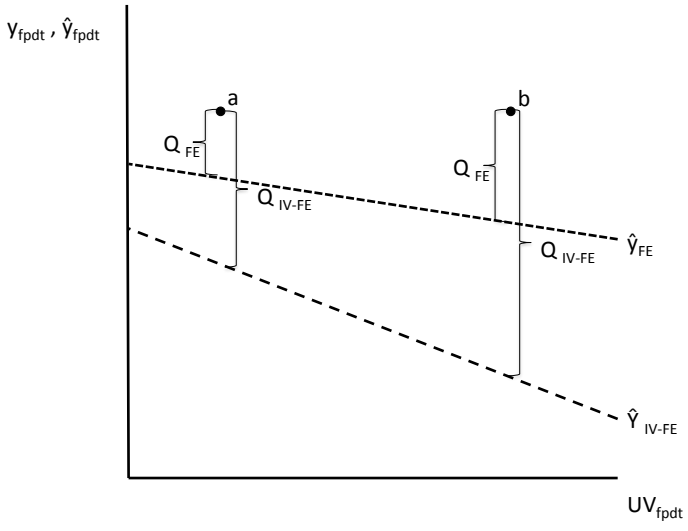
In diagram 2.5 we provide the intuition of why $\hat{Q}_{FE}$ underestimates the quality of high-quality varieties when compared to $\hat{Q}_{FEIV}$. On the y-axis we represented observed market-shares y_{fpdt} and predicted market shares $\hat{y}_{fpdt}$, that are computed from the estimated coefficients α_{FE} and α_{FEIV} on unit-values. The schedule of $\hat{y}_{FEIV}$ is more negative than the one relative to the predictions by FE, because we expect α_{FE} to be positively biased due to the correlation between prices and the unobserved time-varying component of quality. The points (a) and (b) in the diagram represent two varieties with the same observed market shares but with different prices. Given the assumptions of the model, we expect variety (a) to have lower quality, as it has the same market share of (b) even thus its price (UV on the x-axis) is lower. Because the proxy for quality measures the distance between observed and predicted market shares, when the intercept of the schedule $\hat{y}_{FEIV}$ is lower than the one of $\hat{y}_{FE}$, then $\hat{Q}_{FE}$ underestimate quality, and especially so for varieties with higher-quality and higher prices. This intuition is consistent with what we observe in Figure 2.4.

Figure 2.4: Densities of the quality estimator obtained by FEIV and by FE



Notes. The figures compare the distributions of the estimators of quality obtained by estimating the disrete choice model by FEIV and by FE for the six 6-digit product categories included in the headings of Table 2.6. Densities are estimated using the Epanechnikov kernel function. Bandwidth are selected automatically by Stata (kdensity command).

Figure 2.5: Why does $\hat{Q}_{FE}$ underestimate quality?



Notes. (a) and (b) are two hypothetical varieties exported to the same market. The different slopes of the two schedules reflect the fact that the price coefficient α_{FE} is less negative than α_{FEIV} because of the positive bias due to the positive correlation between prices and unobserved quality. Q_{FEIV} and Q_{FE} are differences between predicted and observed market shares and they represent the quality measures respectively obtained by FEIV and FE.

However, in that figure we see also that $\hat{Q}_{FE}$ may over-estimate quality for some low-quality varieties. This can be easily reproduced in the diagram by shifting the intercept of the $\hat{y}_{FEIV}$ schedule above of the one of the $\hat{y}_{FE}$ schedule. Unfortunately, we cannot check the relative position of the intercepts because both the FE and the FEIV estimators do not allow to identify the constant of the model.

Chapter 3

Promoting firm growth and exports through tax policy

with Tania Treibich

3.1 Introduction

Export promotion is an important objective for economies affected by prolonged slowdowns of domestic demand. In France, the urgency to foster domestic firms' internationalization has arisen to the forefront of the policy debate after the recent release of the Gallois report (Gallois, 2012). This report mentions a competitiveness gap between France and some other European countries such as Germany or Sweden, as revealed by a decrease in the French share of EU exports and by a negative trade deficit at the national level. Therefore, the evaluation of measures that may affect directly or indirectly firm exports is relevant for France and for other economies in post-crisis Europe, as they face the common challenge of fueling the recovery by achieving greater international competitiveness. Because small and medium enterprises (SME) tend to be underrepresented in international trade, despite their important role in the domestic economy, dedicated policies should contribute to increase their participation in foreign markets. Our paper investigates the effects of a fiscal reform in France that progres-

sively reduced the rate of Corporate Taxation (CT) for SME. We show that the tax reduction had a positive impact on these firms by promoting their growth and their participation to international markets.

Our contribution to the economic literature is twofold. On one hand, we evaluate the effectiveness of reductions in CT as a tool to promote the growth and exports of small and medium-sized firms. On the other hand, we contribute methodologically to the trade literature by addressing endogeneity issues arising when attempting to estimate the impact of asset growth on firm exports. Abundant empirical evidence has established that exporters are larger and more productive than non-exporters (e.g., Bernard et al., 1995; ISGEP, 2008), and that much of this difference can be attributed to self-selection of the best performers into foreign markets (e.g Bernard and Jensen, 1999). If the ex-post impact of export entry on firm growth and productivity (i.e., the so called 'learning-by-exporting' effect) has been extensively investigated (e.g., Clerides et al., 1998; Wagner, 2002; Girma et al., 2004), much less attention has been paid to the impact of ex-ante firm growth on their probability to become exporters. Because firm growth is affected by unobservable factors such as managerial choices and profit opportunities, it is difficult to identify its causal effect on export entry. In addition, firms' investment and employment policies are likely to reflect their strategy with regard to future expansion in foreign markets; as a consequence, reverse causality impedes the correct identification of the impact of ex-ante firm growth on exports (Lileeva and Trefler, 2010).

In this paper we attempt to solve these issues by exploiting the reform of the SME CT rate as an exogenous shock affecting firm investment in fixed asset, and through this channel SME export status. In France between 2001 and 2003, the CT rate for SME was reduced from 33.33% to 15% for the part of profit not exceeding €38,120, with the stated objective of strengthening SME growth and capital structure (Raspiller, 2007). The eligibility for the reduced taxation was subject to two criteria. The first was related to size, by requiring firms' revenue not to exceed €7,630,000; the second criterium restricted the group of the beneficiaries to independent firms only, with the purpose of preventing opportunistic fractioning of large enterprises into

smaller subsidiaries[1]. These criteria provide an opportunity to construct two different, but not mutually exclusive, control groups against which to measure the impact of CT reduction on eligible firms. A third control group is constituted by those firms that were not affected by the reform because they were not liable for corporate taxation.

By adopting a simple Difference-in-Differences (DiD) strategy we compare the evolution of firm size in the group of treated firms (eligible for CT reduction) against each group of untreated firms. Once we control for firm heterogeneity by adopting a panel Fixed-Effects estimator, we find that the reform produced a significant and positive impact on firms' tangible asset growth. This result validates the use of a dummy for CT reduction to instrument for firm tangible asset growth in IV models on export participation. Next, estimates obtained from IV models suggest that 10% increase in investment determines an average increase of 3.6% in firms' probability to export. Hence, our main conclusion is that policies that foster asset growth are effective in promoting SME export participation.

These results are confirmed when instead of comparing treated and untreated firms we exploit the heterogeneous impact of the reform within the group of eligible firms with average pre-reform profit below €38,120. Heterogeneity within this group is determined by the fact that firms with different asset composition and financial structure benefit to different extents from CT reductions. For example, firms resorting more intensively to debt financing are less affected by cuts in taxation, because they can discount interest rate payments from taxable profit. Again, firms whose assets have higher rates of fiscal depreciation can discount a greater proportion of capital expenditure from profit. Following the approach of Egger et al. (2009), we capture this heterogeneity by computing effective marginal tax rates (EMTR) and effective average tax rates (EATR) for individual firms.

Most of the theoretical literature on firm heterogeneity and trade has conceived firm size (and growth) as a mere reflection of their unobserved efficiency. For example, in the seminal model of Melitz (2003) size is solely determined by the innate productivity

[1]More precisely, for eligible firms the "issued capital must be fully paid up, and at least 75% of it must be held continuously by individuals or by companies that themselves satisfy these conditions" (Raspiller, 2007).

of the firm and by its access to foreign markets. However, some authors point out that firm capability to produce larger volumes of output constitutes itself an advantage for perspective exporters as they can spread more thinly the fixed costs of exporting over larger volumes of sales (e.g., Wagner, 1995). An alternative explanation for a positive impact of tangible asset growth on export propensity emerges from the model of Blum et al. (2013). This model does not feature constant marginal cost of production as it is common in trade models with heterogeneous firms. On the contrary, by allowing marginal costs to increase in output quantity for a given level of fixed capital, they show that firms with more capital have a cost-advantage in producing larger volumes of output to serve foreign markets. We interpret our findings in the light of this theoretical insight.

The rest of the paper is organized as follows. In section 3.2 we review the literature on corporate taxation and firm investment behavior. In this section we also discuss the nature of the empirical issues arising when we investigate the relationship between firm export status, size and productivity. Section 3.3 describes the data and the construction of the effective rates of taxation. Section 3.4 describes the DiD strategy that we adopt to test the impact of CT reduction on tangible asset growth, and the IV approach to estimate the impact of ex-ante growth on export entry. Section 3.5 presents the results we obtain from DiD and IV models. Section 3.6 concludes by interpreting our results in the light of the theoretical literature and by drawing some policy implications.

3.2 Literature review

3.2.1 Corporate taxation and firm growth

According to Neoclassical Theory firms adjust capital so that the net present value (NPV) of the marginal investment equals the 'user cost of capital', that is the rental price of a capital good. With corporate taxation the marginal return of capital is lower because part of the income generated by capital goods is absorbed by taxation. Hence in the presence of decreasing returns to factors of production, taxation reduces the levels of capital set by individual firms, because their marginal investment must yield a greater income to equal the user cost of capital. Along these lines, fiscal policies

that reduce CT rates are expected to promote firm investment because lower taxation makes it profitable to expand capital even if yields lower returns at the margin.

Since the 1980s, this theoretical framework has contributed to promote a downward trend in corporate taxation across countries, that has been often accompanied by the introduction of more favorable CT regime for SME (Nam and Radulescu, 2007). The aim of these policies is to support entrepreneurship, firm growth, and job creation (Chen et al., 2002). With lower CT, firms have also fewer incentives to use debt financing for discounting interest rate payments from taxable profit, and a less leveraged financial structure is believed to increase their resilience to contractions in the credit supply. Fiscal policies targeted to SME can also be seen as a tool to correct for market failures that more severely beset small and medium enterprises. For example SME have a limited access to debt financing, and therefore to the fiscal gains related to the deduction of interest expenses. Large firms are also better equipped to develop complex tax avoidance strategies (Nam, 2013; Slemrod and Venkatesh, 2002). Because firms with different financial structure and asset composition are differently impacted by CT rates, a proper evaluation of the effect of CT reductions on investment must consider these factors.

The methodology developed by Egger et al. (2009) responds to these concerns by bringing at the firm-level measures of marginal and average effective taxation that are more commonly computed at the country- and at the industry-level. The Effective Marginal Tax Rate (EMTR) captures the distortion introduced by taxation as the difference between the marginal cost of capital with and without taxation (King and Fullerton, 1984; Devereux and Griffith, 2003). Accordingly, we expect that higher EMTRs are associated with lower levels of capital, because firms that are more affected by taxation reduce their investment at the margin. The Effective Average Tax Rate (EATR) captures instead the difference between the infra-marginal return of a discrete investment project with or without taxation, and it is expected to affect firms' discrete decisions about undertaking new investment projects (Devereux and Griffith, 1999). These rates are also referred to as 'forward rates' because they are meant to evaluate the effective tax burden on a hypothetical investment project, and they are exogenous with respect to firms' past tax planning activities. This burden changes according to

the statutory tax rate, but also according to the financial structure of the firm and to its asset composition. For example, firms that rely more intensively on debt to finance investment have lower effective rates because they can discount interest rate payments from taxable profit. In addition, firms that invest in capital goods with higher rates of fiscal depreciation can discount the cost of investment from taxable profit more rapidly over time.

From an empirical perspective two approaches have been used to estimate the impact of corporate tax on capital accumulation. The first exploits variations across countries in tax rates and in rates of investment (Bond and Xing, 2010; Arnold et al., 2011), while the second relies on the differential impact that CT reductions induce on firms' EMTR and EATR within the same country. Because the latter approach is based on exogenous policy variations, it leads to more robust causal inference. By using this methodology, previous studies have shown that CT reductions promote investment: Becker et al. (2006) find a positive impact on FDI in Germany, while Simmler (2013) compares the effect of CT change on German firm investment in the case of binding and non-binding financial constraints. Exploiting only differences in asset composition, Cummins et al. (1995) find that the investment of US firms responds positively to unanticipated changes in corporate taxation.

3.2.2 Firm growth, productivity and export: empirical issues

Much of the empirical literature that investigates whether firm heterogeneity is the cause or the consequence of export entry is based on some form of Granger test of causality, as it exploits the sequencing of export entry and productivity growth in longitudinal datasets[2]. However, the dynamic model proposed by Costantini and Melitz (2008) questions the validity of the this strategy. This model predicts that firms may invest in productivity enhancing measures before starting to export when managers foresee complementarities with future export activity. It follows that a simple test of Granger causality would attribute a positive impact of productivity change (the antecedent event) on export entry (the posterior event), while it would wrongly reject that foreign market participation fosters productivity improvements.

[2]For a review of studies adopting this methodology see Wagner (2007).

The strategy introduced by Lileeva and Trefler (2010) addresses this issue. In this paper the effect on productivity is identified by instrumenting export entry with tariff cuts introduced by a series of Free Trade Agreements between the US and Canada. This instrument is exogenous because it does not depend on firms' strategies, and it satisfies the exclusion restriction because it does not directly affect productivity growth. The main finding obtained through this IV strategy is that export entry causes positive changes in labor productivity, even if the effect differs across firms with different initial productivity[3]. Although the authors are convincing about the exogeneity of the instrument, their identification strategy still relies on the assumption that tariff cuts are unanticipated. If this assumption does not hold, firms may invest to raise productivity before entering into export, as they predict lower trade costs in the future. Consequently if anticipation happens, the IV estimates obtained by Lileeva and Trefler would be a lower bound for the real effect of (perspective) export entry on productivity.

A more descriptive contribution on the relationship between exports, productivity and investment is provided by Fabling and Sanderson (2013). This article aims to assess the different extent to which self-selection, learning-by-exporting and investment dynamics account for productivity differences between exporters and non-exporters. By proposing a DiD methodology with matching, this paper supports the view that self-selection of the most productive firms into exporting is the main explanation for the superior attributes of exporters. With regards to the dynamics of input adjustment, they find that employment growth predicts entry into exporting of previous non-exporters. On the contrary, investment in capital asset is undertaken only by incumbent exporters before adding new export destinations. This pattern is interpreted as an indication that firms adjust capital only after entering into export because they need to acquire information on their profitability on foreign markets before making irreversible investment. However, this evidence does not exclude that ex-ante firm growth fosters export entry. For admission of the authors, their empirical methodology is not adequate to infer causality between investment and exports. In other words,

[3]This finding is interpreted in the light of the complementarity between productivity enhancing investment and market expansion.

this article does not answer the question of whether policies that promote ex-ante firm growth are effective in promoting export participation of domestic firms.

This is the question we attempt to answer in our paper. The IV strategy that we adopt is very similar to the one of Lileeva and Trefler (2010), but our research question concerns the opposite direction of causality. We exploit an exogenous change in CT rates to instrument endogenous firm growth in tangible assets and identify the effect of this factor on their propensity to export. This strategy is necessary to address the issue highlighted by Costantini and Melitz (2008), which is likely to be a concern for our focus on growth and exports as much as it is for studies on exports and productivity[4]. We contend that the eligibility (or the intensity) of CT reduction is an appropriate instrument for firm growth because it affects the NPV of future investment, while it does not relate directly with the probability of export entry[5].

To the best of our knowledge, the only existing firm-level study on the impact of corporate taxation on exports is Federici and Parisi (2012). These authors exploit cross sectional differences in EATR to estimate the impact of taxation on Italian firms' export propensity and intensity. They find that effective rates of corporate taxation are positively associated with export propensity and export intensity. The authors interpret the positive effect of taxation on exports by arguing that exporters have greater scope to shift the tax burden on foreign consumers. However, this result is at odds with the negative impact of corporate taxation on firm performance predicted by investment models, and it is liable to depend on firm-level heterogeneity that is not controlled for in the cross-sectional setting of their study. Our methodology addresses most of the empirical issues left unresolved in that paper. First, we control for firm-level unobservables in a panel setting by estimating Fixed Effect models. Second, we do not rely on cross-sectional differences in effective tax rates but we exploit an exogenous policy change in CT to estimate the effect of taxation on firm growth. Third, we investigate a specific channel through which corporate taxation affects export participation by using variations of CT as an instrument to test the impact of firm

[4]In the model of Costantini and Melitz (2008) productivity is positively affected by investment in new technologies.

[5]We expect export entry not to be directly affected by CT reduction because the profit margins on domestic and foreign sales are affected in the same way.

growth on export propensity. These methodological differences are likely to explain why we obtain results that are opposite to those presented by Federici and Parisi.

3.3 Data and measures of taxation

3.3.1 Data

The *Fichier complet unifié de Suse* (FICUS) is a database assembled by the French National Statistical Office (INSEE) whose coverage approximates the universe of French firms for the period 1996-2007. This dataset provides information for over 4 million enterprises in manufacturing and services[6]. We choose to limit our analysis to the manufacturing sector as it fits more closely the theoretical underpinnings of our hypothesis on the impact of CT reduction on firm growth and export entry. Thanks to a unique fiscal identification number (siren code) that changes across groups of longitudinal observations associated with different firms, this database can be structured as a panel with each observation corresponding to a firm-year couple. The final sample comprises 296,715 unique firms[7]. FICUS integrates data on balance sheet items collected for fiscal purposes with survey data. In this database we observe the book value of the tangible assets of firm i at time t (*immocor* in the database). Deflated values of this variable are log transformed to obtain $Tangibles_{it}$[8]. The growth rate of firms' tangible assets between time s and time t is computed as the difference $\Delta Tangibles_{t-s} = Tangibles_{it} - Tangibles_{is}$ with $s < t$. We identify as current exporters ($Exp_{it} = 1$) firms with positive revenue from foreign sales (*caexport* in the database).

According to the tax bulletin of October 2002, the 2001 French Fiscal Law requires firms eligible for reduced CT to comply with the following conditions: (i) their revenue must not exceed €7,630,000, (ii) they must have a judicial form liable for corporate

[6]FICUS excludes only firms that opt for the micro-BIC or the micro-BNC fiscal regimes. These firms have fewer than 10 employees and revenue below €81,500(manufacturing) or €32,600 (services).

[7]From the whole sample of manufacturing firms we drop firms that switch between the groups of firms eligible and ineligible for CT reduction over the period of our analysis (26,088 firms counting for 8.08% of the manufacturing sector).

[8]Tangible assets includes land, building, equipment and machinery and assets under construction.

taxation (i.e., SARL, SA, SCA), and (iii) their majority shareholder must not be a business group (DGI France, 2002). Unfortunately, FICUS does not provide specific information on firms' CT regime. We rely instead on a set of variables concerning firms' judicial form (cj_{it}), affiliation to business groups ($appgr_{it}$) and total revenue ($catotal_{it}$), to identify those that do not benefit from CT reductions[9]. Ineligible firms are identified as those with average pre-reform revenue above the threshold, with a judicial form that is not liable for CT, or those that belong to foreign or domestic business groups. Although the last condition is more restrictive than the letter of the fiscal law, we are confident that the number of firms that we incorrectly identify as ineligible is not large enough to compromise the validity of our results[10].

Table 3.1: Descriptive statistics, 1996-2007

		Num. firms	Tangible asset			Export propensity		
			Mean	St.Dev	Obs.	Mean	St.Dev	Obs.
All sample	without selection	296,715	715	18,010	1,618,708	0.167	0.373	1,619,340
	with selection	121,955	888	20,988	1,114,414	0.188	0.390	1,115,255
All eligible	without selection	122,841	188	397	699,440	0.239	0.426	699,129
	with selection	52,113	223	402	494,007	0.263	0.440	493,818
All controls	without selection	173,874	1,116	23,889	919,268	0.113	0.317	920,211
	with selection	69,842	1,418	28,116	620,407	0.128	0.334	621,437
- Non-liable	without selection	156,250	100	1,452	821,188	0.044	0.205	821,027
	with selection	60,900	115	1,673	547,788	0.047	0.212	547,706
- Large	without selection	10,874	15,125	92,650	59,430	0.822	0.382	60,435
	with selection	7,074	15,839	98,264	49,456	0.828	0.377	50,510
- Business Group	without selection	9,384	1,167	2,403	38,650	0.479	0.500	38,749
	with selection	3,607	1,455	2,592	23,163	0.512	0.500	23,221

Notes. The sample 'with selection' contains only firms that are observed in at least one period before 2001 and after 2002. Tangible asset values are expressed in thousand euros.

Within the group of ineligible firms we identify different but not-mutually exclusive subgroups according to which eligibility condition is violated. We define as 'Large' those firms with pre-reform average revenue above €7,630,000, as 'Business group' the ones affiliated to a group, and as 'Non-liable' those whose judicial form is not subject to corporate taxation. Within the set of eligible firms instead, we identify a smaller group

[9] See Table 3.8 for details on the construction of all variables.

[10] According to the law the 'independence' condition is still satisfied if the business group controlling the firm is owned at least for the 75% by a single individual. Unfortunately, our data does not allow to check this condition, so we decide to exclude from eligibility all companies belonging to a business group, representing 11.35% of firms complying with the other 2 criteria.

which includes only companies with average profit below the threshold of €38,120. Since the reduced tax rate applies only to the profit below the threshold, this group identifies firms that benefit from the full 50% cut in the average and marginal statutory rates, both passing from 33.33% to 15%. Finally, for each group we create a second sample ('sample with selection') which only includes firms operating both before and after the reform, that is with at least one observation before 2001 and after 2002. Table 3.1 presents descriptive statistics for tangible asset ($immocor_{it}$) and export propensity (Exp_{it}), for the whole sample and for different subgroups of eligible and non-eligible firms, with or without selection. Eligible firms represent 41.40% of our sample, that is 122,841 in total. They are smaller but twice as export-oriented than those in the overall control group. Still the export propensity of non-eligible firms widely differs across subgroups, ranging from 0.82 for the 'Large' ones to 0.04 for those included in the 'Non-liable' group. The latter is mostly composed of very small unipersonal firms subject to personal income taxation. The sample with selection includes a higher proportion of larger and more export-oriented firms, because it excludes companies that are closer to failure (i.e., not present in the period after the reform) or very young (i.e., not observed in the period before the reform).

3.3.2 Computation of the effective tax rates

This section describes the methodology to compute the firm-specific effective rates of taxation $EMTR_i$ and $EATR_i$. These rates are used to identify the heterogeneous effect of the reform on investment across eligible firms. Indeed, taxation affects firms' cost of capital differently according to their capacity to discount capital expenditure, and to shield profit through debt financing. In the absence of taxation, investment at the margin yields a return that equals the opportunity cost of capital ($\bar{r}$). With taxation the marginal investment must yield a greater return ($\tilde{p}$) to compensate for the part of profit absorbed by taxation. The EMTR measures the distortion that taxation induces on investment as the difference between the return of capital at the margin with taxation ($\tilde{p}$) and without taxation ($\bar{r}$):

$$EMTR_i = \frac{\tilde{p}_i - \bar{r}}{\tilde{p}_i}$$

according to the formulation of Devereux and Griffith (2003), $\tilde{p}_i$ is computed as:

$$\tilde{p}_i = \frac{1 - A_i}{(1-\tau)(1-in)}[i + \delta_i(1+in) - in] - \frac{F(1+i)}{(1-\tau)(1+in)} - \delta_i \tag{3.1}$$

where $\bar{r}$ is the average real return of capital, and in is the inflation rate. By following Egger et al. (2009) these two parameters are respectively set at 0.05 and 0.025, and they are used to compute the nominal interest rate (and firms' opportunity cost) $i = [(1+\bar{r})(1+in) - 1]$. The parameter τ is the statutory CT rate. Eventually, A_i and δ_i are two firm-specific variables that measure respectively the net present value of the depreciation allowances per unit of investment, and the economic depreciation of firms' assets. Following the approach of Egger et al. (2009), we obtain A_i and δ_i as:

$$A_i = A_m * \theta_{mi} + A_b * \theta_{bi} + A_I * \theta_{Ii}$$

$$\delta_i = \delta_m * \theta_{mi} + \delta_b * \theta_{bi} + \delta_i * \theta_{Ii}$$

where θ_{mi}, θ_{bi} and θ_{Ii} are respectively the shares of machineries, buildings and intangibles over the total assets of firm i. FICUS data provides information on the composition of firms' assets into tangible and intangible. To disaggregate further tangible assets into buildings and machineries we use industry shares obtained from McKenzie et al. (1998) by multiplying them with the firm-specific shares. A_m, A_b and A_I are the net present values of depreciation allowances calculated with asset-specific linear depreciation rates as reported in the *Bulletin Officiel des Finances Publiques*[11]. $\delta_m = 0.1225$, $\delta_b = 0.0361$ and $\delta_i = 0.15$ are the standard parameters used in the tax literature for the economic depreciation of machineries, buildings and intangibles. Firms' financial structure (i.e., the proportion of debt financing) enters into the computation of the $EMTR$ through the term F in equation 3.1:

$$F = \begin{cases} 0, & \text{if investment is self-financed;} \\ \frac{(1-\tau\delta)[i-i(1-\tau)]}{1+i}, & \text{if investment is financed through debt;} \end{cases}$$

we calculate the effective marginal tax rate $EMTR_i$ of firm i as:

$$EMTR_i = EMTR_{si} * (1 - lev_i) + EMTR_{di} * (lev_i)$$

[11] http://bofip.impots.gouv.fr/bofip/4520-PGP?datePubl=17/04/2013.

where $EMTR_{si}$ is the rate obtained by assuming complete self-financing, $EMTR_{di}$ is the one obtained by assuming complete debt-financing, and lev_i is the proportion of debt financing of firm i computed as the debt share over total assets. To calculate the EATR we start instead from the net present value of an investment project in the presence of taxation (Devereux and Griffith, 2003):

$$R = (1-i)^{-1}\{(1+in)(i+\delta)(1-\tau) - (1-A_i)[(1+i) - (1+in)(1-\delta_i)]\} + F \quad (3.2)$$

as for the EMTR, the firm-specific return to investment R_i is calculated as a weighted average of R in case of self-financing and in case of debt-financing. The $EATR_i$ is eventually obtained as:

$$EATR_i = \frac{R^* - R_i}{p/(1+r)}$$

where R_i and $R^* = \frac{p-r}{1+r}$ are respectively the NPV of the investment with and without tax, and $p = 0.2$ is the standard parametrization of the pre-tax real return of capital (Egger et al., 2009). For each firm, we compute $EMTR(\tau_{pre})_i$, $EATR(\tau_{pre})_i$, $EMTR(\tau_{post})_i$ and $EATR(\tau_{post})_i$, where τ_{pre} and τ_{post} refer to the statutory rates to which firm i is subject before and after the reform. To compute the rates, we use pre-reform averages of firms' asset composition and financial structure. This is done to exclude from the computation the effect of changes in these attribute that are due to firms' adaptation to the new fiscal regime. Indeed, we are solely interested in identifying the heterogeneous impact of the reform across firms with different initial asset composition and financial structure. Hence, for each firm we obtain a unique (i.e., time-invariant) couple of indicators of marginal and average tax gains $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$, that are respectively computed as:

$$\begin{aligned} \Delta EMTR_{i,pre/post} &= EMTR(\tau_{pre})_i - EMTR(\tau_{post})_i \\ \Delta EATR_{i,pre/post} &= EATR(\tau_{pre})_i - EATR(\tau_{post})_i \end{aligned}$$

where $\tau_{pre} = 0.33$ for all firms, $\tau_{post} = 0.33$ if the firm is ineligible for CT reduction, $\tau_{post} = 0.15$ if the firm is eligible for CT reduction and the average pre-reform profit $\bar{AP}_i$ is below the threshold of €38,120, and $\tau_{post} = 0.15 * \left(\frac{38{,}120}{\bar{AP}_i}\right) + 0.33 * \left(\frac{\bar{AP}_i - 38{,}120}{\bar{AP}_i}\right)$ if the

firm is eligible for reduction but the pre-reform average profit is above the threshold to which the reduced tax rate applies. This approach implies that for ineligible firms both $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$ equal zero, while for eligible firms these rates vary with asset composition, financial structure, and average levels of pre-reform profit. Table 3.2 reports summary statistics of $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$ for all eligible firms and for eligible firms with average pre-reform profit below the threshold of €38,120.

Table 3.2: Tax gain from the reform (sample with selection)

	ΔEATR			ΔEMTR		
	Mean	sd	N	Mean	sd	N
All eligible	0.147	0.031	432,594	0.090	0.068	432,733
Eligible below threshold	0.158	0.012	360,628	0.108	0.061	360,628

Notes. We consider only the sample of firms that are present before the reform and survive after, that is present before 2001 and after 2002.

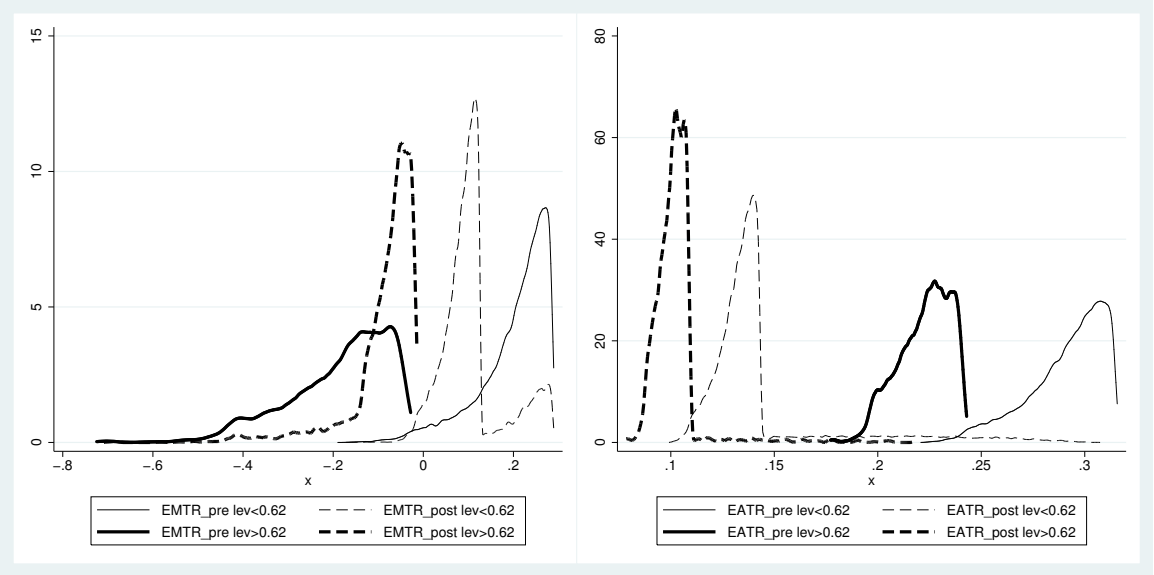
The table shows that the greater reduction in effective taxation accrues to the eligible firms with average pre-reform profit below the threshold. This evidence conforms to the progressivity of the average statutory tax rate that responds to the primary aim of the policy to support the smallest firms[12]. The extent to which eligible firms resort to debt financing is another important factor in determining the effective rates; we expect firms with higher initial levels of debt financing to benefit the least from a reduction in CT, because these are the ones that can discount greater interest rate payments form taxable profit. Indeed, one of the declared objective of the reform was to encourage small firms to shift their financial structure from debt to equity financing (Raspiller, 2007).

Figure 3.1 presents the empirical distributions of EMTR and EATR for firms with different initial levels of leverage, separately plotted for the periods before and after the introduction of the reduced CT rate. Kernel densities show that the cut in the statutory rate reduces firms' heterogeneity with respect to both the average and the marginal effective rates of taxation. Indeed, the dispersion of the distribution of both EMTR and EATR is much lower after the reform. This can be easily explained by the fact that if the statutory rate is lower, firm heterogeneity with respect to their vulnerability

[12]See Figure 3.8 in the Appendix.

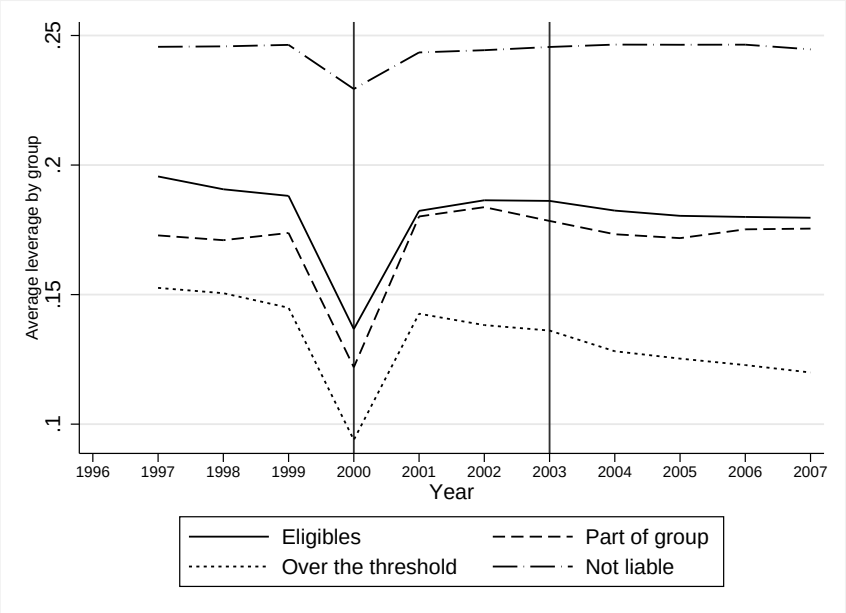
to taxation become less important. Second, firms that resort more intensively on debt financing have lower average EMTR and EATR, consistently with the 'shielding' function of debt financing. An interesting aspect that emerges by looking at the first panel of Figure 3.1 is that the reform has opposite effects on the distributions of EMTR for firms with higher or lower proportions of debt financing; for firms with lower initial leverage the distribution of EMTR shifts toward lower values, while the contrary happens for firms with higher initial leverage. This is because, when taxation is high, the cost of capital at the margin decreases in the level of debt as the deduction of interest rate expenses from taxable profits completely offsets the costs of debt financing. On the contrary, with a low statutory rate firms that maintain high levels of debt may have higher cost of capital at the margin, because interest rate expenditure is not completely offset by the possibility of declaring lower taxable profit. Therefore, the reform moves the EMTR in the right direction according to the declared objective of encouraging enterprises to reduce their reliance on debt, by removing the distortions introduced by the taxation on firms' financial structure.

Figure 3.1: Distributions of EATR and EMTR by firms' initial leverage



Notes. The figure shows kernel densities of EMTR and EATR for the period before 2001 (pre) and after 2002 (post). We plot the empirical distributions separately for firms below and above the median pre-reform level of leverage (0.62). Negative values of EMTR can be interpreted as a subsidy, however they strivtly depends on the parameter that we used for the cost of capital without taxation (0.05).

Figure 3.2: Evolution of leverage by groups of firms



Notes. Leverage is computed as the ratio of firms' debt over total assets. The figure plots the evolution of the mean values of leverage computed within the group of firms eligible for CT reduction and within different control groups.

When we investigate the impact of tangible asset growth on export propensity, we use alternatively a dummy identifying eligibility for CT reduction $Eligible_i$, or the tax gain variables $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$ as instruments for the growth of tangible assets[13]. These instruments allow to identify the effect of asset growth on export propensity under the assumption that a variation in CT affects firm exports only thought the growth of tangible assets. The potential impact of the reform on firms' financial structure generates some concerns with regard to the existence of a second channel through which the reform may affect export participation. Indeed, the exclusion restriction would be violated if firms' financial structure is itself a determinant of export behavior. We investigate the severity of this issue by comparing the evolution of firms' leverage in the group of eligible firms *vis-a-vis* its evolution in each subgroup of ineligible ones.

Figure 3.2 plots the evolution over time of the mean levels of leverage computed within each group. If the mean leverage of eligible firms were to evolve differently

[13]All these variables are interacted with a dummy for the post-reform period.

from the other groups after 2001 (i.e., the first year in which the reduced rate was introduced), we would have a clear indication that the exclusion restriction is violated. Despite the existence of initial differences across groups, we find that eligible firms do not change their patterns of financing after the reform, as their average leverage follows a trend similar to those of ineligible firms. Initial differences across groups do not constitute a problem as we will be able to control for them by including firm-level fixed effects in IV first-stage regressions[14]. Hence, there is no evidence that the reform succeeded in inducing eligible firms to reduce their levels of debt. This may suggest that the tax reduction was not strong enough to foster changes in firms' financial structure, or rather that SME targeted by this policy have limited scope for substituting debt with others sources of financing. We conclude that the impact of the reform on financial structure does not threaten the validity of our IV strategy.

3.4 Methods

3.4.1 Does CT reduction promote firm growth?

Difference-in-differences identifies the effect of a policy 'treatment' by comparing the post-policy change of an outcome variable within the group of treated firms against the change that takes place within the group of untreated firms. The main advantage of this estimator over other policy evaluation techniques is that its validity does not depend on firms' random assignment to the treatment like in randomized controlled experiments, or on the assumption that we can approximate random assignment by conditioning the probability of treatment on a set of observable variables like in propensity score matching. Nevertheless, identification of the causal impact relies on the assumption that in the absence of treatment the outcome variable would have followed a trend common to both treated and untreated firms (Angrist and Pischke, 2008).

Therefore, by using DiD to estimate the impact of CT reduction on firm growth

[14]Figures 3.6 and 3.7 in the Appendix, show the evolution of lev by groups of eligible firms belonging to different quartiles of $\Delta EMTR_{f,pre/post}$ and $\Delta EATR_{f,pre/post}$. The plots confirm that eligible firms experiencing greater reductions in effective tax rates do not decrease their debt share faster than the other groups.

we do not constraint the outcome variable (i.e., firm size) to have the same expected value across the groups of treated and untreated firms. We assume instead that any deviation in the common trend of firm growth across the two groups is fully explained by the impact of the policy. Although we cannot implement formal tests to verify the validity of the common trend assumption, we will be checking its plausibility by looking at how the median value of firm size evolves in each group before the reform. A similar pre-reform evolution in the two groups would indicate the appropriateness of the DiD estimator. From a practical perspective DiD can be easily implemented by OLS estimation of the following model on the pooled sample of treated and untreated firms:

$$Tangibles_{it} = \alpha + \beta Eligible_i + \gamma(Eligible_i \times Post_{02}) + \sum_{t=98}^{'07} \delta_t + \sum_{s=16}^{36} \delta_s + \epsilon_{it} \quad (3.3)$$

where $Eligible_i$ is a dummy variable that assumes value 1 if firm i is eligible for reduced CT and 0 otherwise, $Post_{02}$ is a variable that assumes value 1 if $t > 2002$ and 0 otherwise, $\sum_{t=98}^{'07} \delta_t$ and $\sum_{s=16}^{36} \delta_s$ are respectively full sets of year and sectoral dummies. The coefficients β and γ are respectively the pre-reform difference in expected size across groups and the average treatment effect of the policy:

$$\begin{aligned}
\beta &= \mathbb{E}[Tangibles_{it}|Eligible_i = 1, t < 2002] - \mathbb{E}[Tangibles_{it}|Eligible_i = 0, t < 2002] \\
\gamma &= \{\mathbb{E}[Tangibles_{it}|Eligible_i = 1, t > 2002] - \mathbb{E}[Tangibles_{it}|Eligible_i = 1, t < 2002]\} - \\
&\quad \{\mathbb{E}[Tangibles_{it}|Eligible_i = 0, t > 2002] - \mathbb{E}[Tangibles_{it}|Eligible_i = 0, t < 2002]\}
\end{aligned}$$

This specification controls for pre-reform differences across groups by including the term $Eligible_i$. However, the panel structure of our dataset can be better exploited to control for unobserved heterogeneity at a finer level of aggregation by substituting $Eligible_i$ with a full set of firm-specific fixed-effects δ_i. These dummies control for all time-invariant firm-specific factors that determine differences in size across individual firms. Hence the fixed-effect (FE) specification of the DiD regression is written as:

$$Tangibles_{it} = \alpha + \delta_i + \gamma(Eligible_i \times Post_{02}) + \sum_{t=98}^{'07} \delta_t + \epsilon_{it} \quad (3.4)$$

where the interpretation of γ remains unchanged. When we estimate specifications 3.3 and 3.4 we drop the observations relative to the years 2001-2002 because the reform

was initiated in 2001 and completed in 2003. In this way the coefficient γ truly captures changes in firm size from periods in which the taxation rate was 33.3% (i.e., from 1997 to 2000) to periods in which it was reduced (i.e., from 2003 to 2007). We first estimate both specifications 3.3 and 3.4 by comparing the group of treated firms ($Eligible_i = 1$) against the whole group of ineligible firms, and then against each one of the different control groups that we described in the previous section. This strategy allows to evaluate the reliability of the estimates of γ in the light of the evidence regarding the validity of the common trend assumption for different groups of firms. Lastly, we repeat this battery of estimations on the whole sample (sample' without selection') and on the sample obtained by dropping firms created after 2001 or that ceased their activity before 2003 (sample 'with selection'). In the first case (sample 'without selection') average firm size across groups is affected by post-reform entry and exit of firms. On the contrary, in the second case (with selection) coefficients are identified only by the impact of the reform on the evolution of those firms that where already present in pre-reform periods and that survive after the change in taxation.

Arguably, the group of eligibles is large enough to include firms subject to unobserved policies or shocks whose timing overlaps with that of the CT reform. If this were the case, the previous approach may wrongly attribute to the reform the effect induced by other factors on firm growth. In order to dissipate this concern we check the robustness of our results by exploiting heterogeneity in the average and marginal effective rates of taxation (EATR and EMTR) within the group of eligible firms[15]. These rates reflect the different impact that CT has on the NPV of future investment opportunities for firms with different financial structure and asset composition. We believe that heterogeneity in effective rates is less likely to be affected by policies or shocks excluded from our analysis. The specification of the DiD regression with firm FE that we use for robustness check is:

$$Tangibles_{it} = \alpha + \delta_i + \gamma_1(\Delta TAX_i \times Post_{02}) + \sum_{t=98}^{'07} \delta_t + \epsilon_{it} \tag{3.5}$$

where ΔTAX_i is either $\Delta EMTR_{i,pre/post}$ or $\Delta EATR_{i,pre/post}$. Because ΔTAX_i is a

[15]Because the reduced rate applies only to the first €38,120 of profit, we conduct our robustness check only on eligible firms below this threshold, so that all the firms in the estimation sample are subject to the same average reduction in the statutory rate.

continuous variable, the impact of the reform on asset growth of firm i is given by $\gamma_i = \gamma_1 \times \Delta TAX_i$. If the reform is effective in promoting growth we expect the coefficient γ to be positive and statistically different from zero, because firms that enjoy greater reductions in effective rates should be more responsive to the policy.

3.4.2 Asset growth and export entry

In this section we describe two different two-stage least square (2SLS) models that we use to estimate the causal impact of asset growth on export participation. The first model is estimated by Fixed Effect Instrumental Variable (FEIV). This estimator first applies within-group transformation to the data to eliminate firm-specific fixed effects from the right-hand-side of the model, and then it instruments the endogenous covariate with the fitted values from a first-stage regression on exogenous variables. The second-stage model can be written as:

$$\tilde{Exp}_{it} = \alpha + \zeta \hat{T}_{it} + \sum_{t=98}^{'07} \delta_t + \tilde{\epsilon_{it}} \tag{3.6}$$

where Exp_{it} is a dummy variable that assumes value 1 if firm i exports at time t and 0 otherwise, and $\tilde{Exp}_{it}$ is its within-group transformation. The term $\hat{T}_{it}$ is the fitted value from the following first-stage regression:

$$\tilde{T}_{it} = \alpha + \gamma \tilde{EP}_{it} + \sum_{t=98}^{'07} \delta_t + \tilde{v}_{it} \tag{3.7}$$

where $\tilde{T}_{it}$ and $\tilde{EP}_{it}$ are respectively the within-group transformations of $Tangibles_{it}$ and of the interaction term $Eligible_i \times Post_{02}$ previously used in DiD specifications[16]. In this model, we use variations in tangible assets explained by the CT reform as instruments for asset growth. While the within-group transformation prevents omitted variable bias, the IV strategy makes sure that estimates on ζ in the second-stage model are not driven by reverse causality. Because the coefficients are identified by time-variations within individual firms' series, the coefficient ζ can be interpreted as the marginal effect of tangible asset growth in time t on the probability that firm i starts exporting in the same period. As for the DiD models, we estimate equation 3.6

[16]FE-IV estimation is implemented by using the user-written command xtivreg2 in Stata (Schaffer, 2005).

on different samples obtained by pooling eligible firms together with firms belonging to different control groups. To further test the robustness of results, we also estimate equation 3.6 on the group of eligible firms only, and we substitute $\Delta TAX_{i,pre/post}$ to EP_{it} in 3.7 as an instrument for $\tilde{T}_{it}$.

We then estimate a second 2SLS model that captures more directly the impact of asset growth on export entry. To do so we keep only firms that are permanent non-exporters before the reform, and those that become permanent exporters after the reform or that remain permanent non-exporters[17]. We decide to focus on permanent exporters and non-exporters to capture more specifically the impact of asset growth on entry into exporting as a strategic decision of the firm rather than as an occasional activity. The model assumes the following specification:

$$\Delta Exp_{i,pre/post} = \alpha + \zeta_1 \hat{\Delta T}_{i,pre/post} + \Delta\epsilon_i \tag{3.8}$$

where $\Delta Exp_{i,pre/post}$ is a dichotomous variable that assumes value 1 for non-exporters that enter into export after the reform, and value 0 for those that remain non-exporters. The term $\hat{\Delta T}_{i,pre/post}$ is the predicted change in average tangible asset from before to after the reform that is obtained from the estimation of the following first-stage model:

$$\Delta Tangibles_{i,pre/post} = \alpha + \gamma_1 Eligible_i + \Delta v_i \tag{3.9}$$

notice that in equations 3.8 and 3.9 we drop the time subscript t as we retain a unique observation per firm and we estimate the regression at the cross-sectional level. Hence, in equation 3.9 we can directly use $Eligible_i$ instead of the interaction $Eligible_i \times Post_{02}$ as an exogenous instrument for the change in tangible assets. As for previous exercises we repeat the estimation of the IV model on the group of eligible firms only, by using ΔTax_i as an external instrument for $\Delta Tangibles_{i,pre/post}$ in equation 3.9.

[17]Permanent non-exporters are firms that never export before 2001, or those that never export after 2002. Permanent exporters are firms that export during all periods after 2002.

3.5 Results

3.5.1 Graphical evidence

We begin this section by showing in Figure 3.3 the evolution over the years of the median 'backward' tax rate (upper panels) and of the median firms size (lower panels) computed for different groups of firms[18]. Plots on the left-hand side are constructed using all the firms in the database, while plots on the right-hand side are based only on those firms that we observe both before and after the reform. The sharp reduction in the median tax rate between 2001 and 2003 for the group of eligible firms indicates that this group correctly identifies those firms that benefit from CT reduction. On the contrary, the decrease that we observe for 'Large' and 'Business group' firms is explained by the fact that since 1999 there was also a progressive cut in the social contribution tax affecting all firms liable for CT. These plots also inform our choice to exclude the years 2001 and 2002 from DiD regressions. Indeed by looking at the 'Eligible' line it is clear that the last pre-reform year and the first post-reform year are respectively 2000 and 2003.

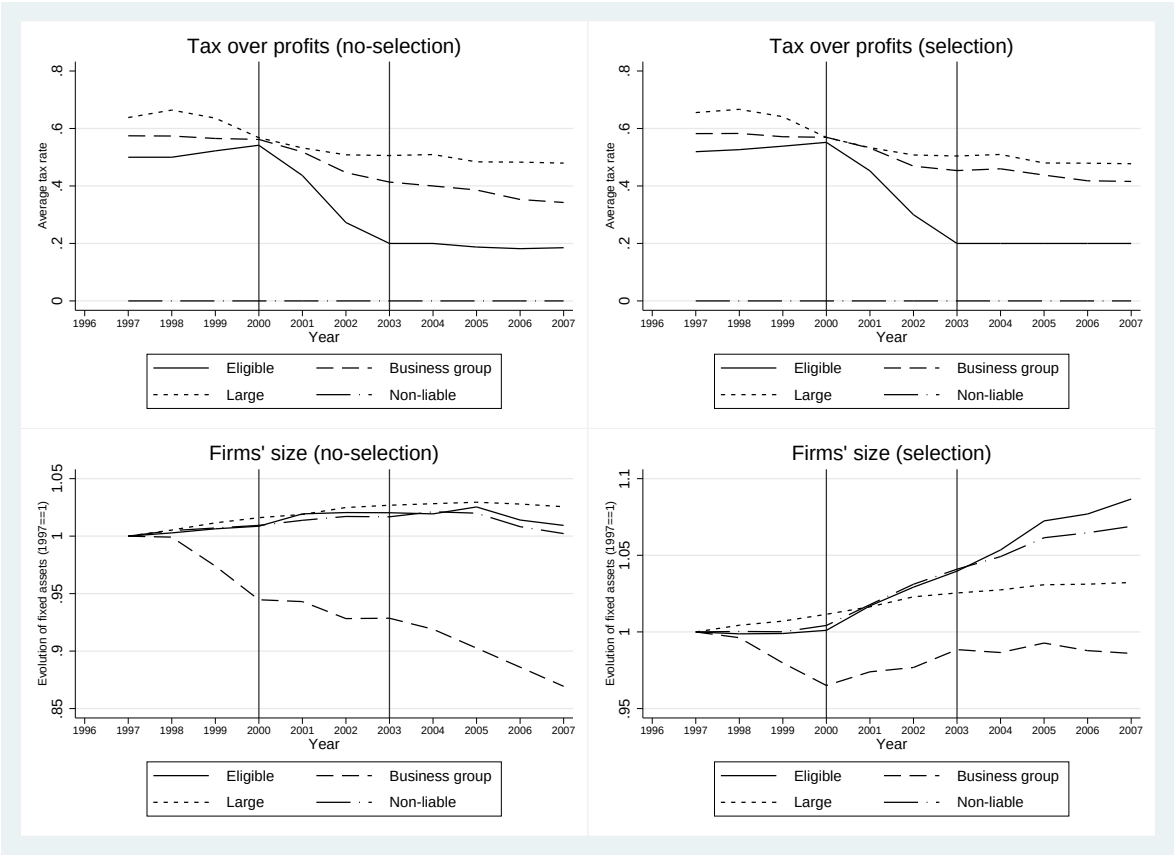
In the lower panels we show normalized series of median firm size as measured by the variable $Tangibles_{it}$[19]. Compared with the plot obtained on the sample with selection (bottom-right panel), the plot based on the sample without selection (bottom-left panel) presents a slower growth dynamics for all groups. This is due to the entry of small firms in later periods that is not controlled for in the sample without selection. We must consider this factor in DiD analyses, because if tax reduction encourages greater entry in the group of eligible firms, this would bias downward the estimated impact of the reform on the size of incumbents. In the bottom-right panel it is clear that eligible firms are those that experienced the fastest growth over the period. Although,

[18]By adopting the terminology of Egger et al. (2009), we define as 'backward' rates of taxation the rates obtained by dividing current tax payments by current profit. These rates are called 'backward' because they are the outcome of firms' past tax payment policies. On the contrary EMTR and EATR are defined as 'forward' rates since they measure the impact of taxation on firms' future investment.

[19]Each series is normalized by dividing the median values of $Tangible_i$ computed within each sub-sample in each period by its value in 1997. This makes it easier to check visually if the common trend assumption is plausible.

the growth of eligible firms peaks off in coincidence with the reform period, we also observe a similar dynamics for 'Non liable' firms. The faster growth of eligibles as compared with this control group is more evident in later years, suggesting that the reduced rate of taxation might induce a lagged response in terms of growth. The

Figure 3.3: Evolution of tax rates and firm size, treated vs. controls



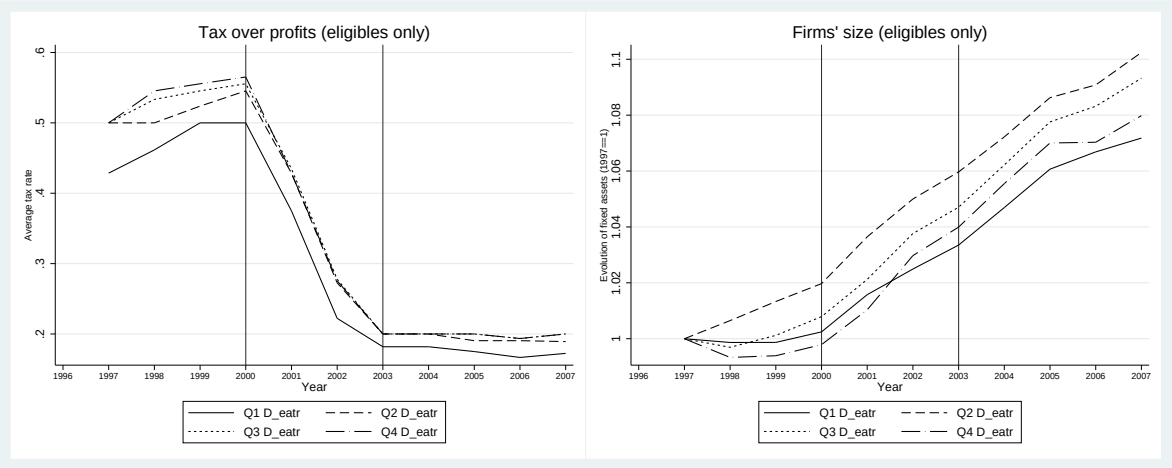
Note : We compare the unbalanced sample ("no selection") to a sample in which we control that firms are present at least one year before the reform and one year after ("selection"). The latter sample therefore contains only surviving firms after the reform and does not include entrants after the reform.

graphical analysis is also used to flag the control groups for which the common trend assumption is less tenable. Firms that are part of a business group present a pre-reform trend that diverges from the one of eligible firms. For this reason we expect DiD to overestimate the impact of the reform when eligibles are compared to this control group. The other two groups appear instead appropriate controls for conducting DiD analyses, since their pre-reform size dynamic is very similar to the one for eligible firms.

Because our robustness checks are conducted by exploiting the different impact that

the change in the statutory rate had on the effective rates of eligible firms, in Figure 3.4 we present the plots for eligible firms divided by quartiles of $\Delta EATR_{i,pre/post}$ (sample with selection). The left-hand-side panel shows the extent to which the changes in the average effective tax rate coincide with changes in 'backward' taxation and the right-hand-side considers the evolution of firm size at different quartiles of $\Delta EATR$. The figure confirms that firms with greater tax gains (in the forth quartile of $\Delta EATR_{i,pre/post}$) are those that benefit relatively more from a change in the statutory rate.

Figure 3.4: Evolution of tax rates and firm size among eligibles



Note. Plots are obtained for eligible firms with profits below the threshold of €38,120. We compare the evolution of average tax rate and size across groups of firms that experienced different reductions of *D_eatr*. Firms with the highest gain belong to the fourth quartile (Q4 *D_eatr*).

Indeed, firms that had the greatest reduction in EATR (i.e., belonging to the 4th quartile), experienced faster expansion of tangible asset from 2001 onwards compared with firms least affected by the reform (i.e., belonging to the 1st quartile).

3.5.2 Regression results from DiD models

We now introduce the main results of our analysis, starting from the output of DiD regressions (Equations 3.3 to 3.5). Table 3.3 collects all the estimates from DiD models: the upper and the lower panels refer respectively to estimates obtained on the sample without selection and on the sample with selection. In addition, the column headings

indicate which control group is used[20]. For each different control group we report both estimates from model 3.3 (OLS) and from model 3.4 (FE).

Table 3.3: CT reform and firms' tangible asset (treated vs. controls)

Control group:	Untreated		Business group		Large		Non-liable	
Estimator:	OLS	FE	OLS	FE	OLS	FE	OLS	FE
Sample without selection								
Eligible	0.218***		-3.158***		-3.952***		0.749***	
	(0.008)		(0.019)		(0.017)		(0.007)	
$Eligible * Post_{02}$	-0.048***	0.038***	0.280***	0.082***	-0.101***	0.039***	-0.018***	0.033***
	(0.007)	(0.005)	(0.019)	(0.011)	(0.015)	(0.009)	(0.006)	(0.005)
Constant	4.020***	3.919***	7.419***	4.375***	8.201***	4.340***	3.556***	3.692***
	(0.006)	(0.002)	(0.019)	(0.003)	(0.016)	(0.003)	(0.004)	(0.002)
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
R^2 (no-selection)	0.114	0.955	0.354	0.957	0.420	0.959	0.135	0.938
Obs. (no-selection)	1,233,040	1,233,040	619,852	619,852	595,941	595,941	1,156,461	1,156,461
Sample with selection								
Eligible	0.153***		-3.230***		-3.910***		0.782***	
	(0.011)		(0.022)		(0.019)		(0.009)	
$Eligible * Post_{02}$	0.046***	0.039***	0.140***	0.081***	0.098***	0.039***	0.048***	0.035***
	(0.006)	(0.004)	(0.015)	(0.010)	(0.013)	(0.009)	(0.005)	(0.004)
Constant	4.216***	4.159***	7.629***	4.663***	8.299***	4.636***	3.640***	3.904***
	(0.008)	(0.002)	(0.021)	(0.003)	(0.018)	(0.003)	(0.006)	(0.002)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (selection)	0.134	0.946	0.408	0.947	0.459	0.950	0.164	0.920
Obs. (selection)	843,356	843,356	436,285	436,285	423,674	423,674	787,078	787,078

Notes. Significance levels denoted as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level.

The OLS estimate of the coefficient on $Eligible * Post_{02}$ is significantly negative when it is estimated on the sample without selection that includes all untreated firms. As it has been shown in the graphical analysis, this coefficient is likely to be driven by greater entry of new firms in the group of eligibles after the reform. Because new firms tend to be smaller than incumbents, entry would lead to a misleading picture of the effect of CT reduction on firm size. On the contrary, when the same specification is estimated by excluding post-reform entrants (i.e., sample with selection) the estimated impact of the reform is positive and significant. According to the estimates obtained from the sample with selection, the reform induces an average increase in tangible assets of about 4%[21]. This result is confirmed when we use FE models that identify the coefficients by

[20]The heading 'Untreated' indicates that we compare the eligible firms against all the ineligible firms.

[21]Because we estimate a log-level model we can interpret the coefficient as percentage change induced on the dependent variable.

giving greater weight to variations within individual firms' longitudinal series than to variations across firms. Although the effect appears quantitatively modest, it should be remembered that the reduced taxation introduced by the reform applies only to the first €38,120 of profit. Therefore, when we estimate the impact of the reform on the whole group of eligible firms, we tend to underestimate the effectiveness of tax reduction, because for firms with profit greater than €38,120 the reduction in average taxation can be much smaller than the full 50% cut enjoyed by firms below this threshold (see Figure 3.8 in the Appendix).

As a standard robustness check, we look at the coefficients obtained by comparing the group of treated firms with the different control groups ('Large', 'Business group' and 'Non-liable'). By focusing our attention on the sample with selection, we find that the positive impact of the reform is found also when we use 'Large' firms only and 'Non-liable' firms only as control groups. FE estimates appear more stable across different control groups than those obtained by OLS, and this is due to the greater effectiveness of firm-level fixed effects in controlling for unobserved heterogeneity across firms within the same group. Instead, when we compare eligibles against 'Business group' firms, the estimated coefficients on $Eligible * Post_{02}$ are greater than those obtained by including other control groups in the estimation sample. This is explained by the violation of the common trend assumption as it is clearly shown in Figure 3.3; the descending trend of firm size experienced by this control group leads to overestimate the impact of the reform.

Table 3.4 shows the coefficients obtained by restricting the estimation sample to the group of eligible firms with profit below €38,120; here we identify the impact of the reform by exploiting heterogeneous variations across firms in $EATR$ and $EMTR$. This robustness check confirms the positive impact of the reform on firm growth as the coefficients on $\Delta EATR * Post_{02}$ and $\Delta EMTR * Post_{02}$ are positive and significant in both OLS and FE models. Indeed, these estimates reveal that across firms affected by the same cut in the statutory rate, those that experienced the greater reduction in the effective rates grew faster than the others. As expected, the impact of the reform on firm size is larger in this sample, where all firms enjoyed a 50% cut in the average statutory rate, corresponding to an average reduction in EATR of 14.7% ($\Delta EATR_i$),

and a reduction in EMTR of 8.6% ($\Delta EMTR_i$). According to our estimates, these changes in effective rates are respectively associated with an increase of tangible asset of 36% (for $\Delta EATR_i$=14.7%) and of 4%. (for $\Delta EMTR_i$=8.6%)

Table 3.4: CT reform and asset growth (eligibles)

	EATR		EMTR	
Estimator:	OLS	FE	OLS	FE
$\Delta EATR$	-4.761***			
	(0.635)			
$\Delta EATR * Post_{02}$	2.690***	2.515***		
	(0.413)	(0.355)		
$\Delta EMTR$			-0.227*	
			(0.123)	
$\Delta EMTR * Post_{02}$			0.581***	0.558***
			(0.081)	(0.069)
$Constant$	5.033***	4.179***	4.306***	4.179***
	(0.100)	(0.004)	(0.015)	(0.004)
Year FE	Yes	Yes	Yes	Yes
R^2	0.094	0.896	0.093	0.896
Obs.	282,201	282,201	282,201	282,201

Notes. Significance levels denoted as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level. We retain in the estimation sample eligible firms with pre-reform average profits below €38,120.

The large difference between the two effects is consistent with the argument developed by Devereux and Griffith (2003) on the different kind of investment decisions that are affected by the two rates. Indeed, a reduction in marginal effective taxation ($EMTR$) is expected to cause mostly upward adjustment in the size of current investment projects, while a reduction in $EATR$ may push firms into implementing new projects whose average NPV becomes positive with lower CT. Therefore we expect firms that enjoy greater reductions in $EATR$ to increase their stock of tangible asset relatively more than those experiencing an equivalent change in $EMTR$.

3.5.3 Asset growth and export propensity

The evidence presented in the previous section confirms that $Eligible_i{*}Post_{02}$, $\Delta EMTR_i$ and $\Delta EATR_i$ are strong instruments for tangible asset growth. In Table 3.5 we show the estimates obtained from first-stage regressions of $Tangibles_{it}$ on $Eligible_i * Post_{02}$, and those obtained from second-stage regressions of Exp_{it} on the predicted values of $Tangibles_{it}$.

Table 3.5: Export entry and firms' tangible asset (treated vs. controls)

Control group:	Untreated		Business group		Large		Non-liable	
IV Stage:	2nd	1st	2nd	1st	2nd	1st	2nd	1st
FE models (dependent: $\Delta Export_{t,t-1}$)								
$Tangibles(log)$	0.366***		0.450***		0.919***		0.323***	
	(0.055)		(0.068)		(0.219)		(0.059)	
$Eligible * Post_{02}$		0.039***		0.083***		0.040***		0.035***
		(0.004)		(0.010)		(0.009)		(0.004)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	-0.393	0.124	-0.447	0.116	-2.050	0.125	-0.302	0.127
Obs.	837,688	837,688	431,606	431,606	418,541	418,541	785,902	785,902
F	288.356	2602.978	108.366	1233.805	55.682	1313.013	332.665	2534.487
Models in differences (dependent: $\Delta Export_{00-04}$)								
$\Delta Tangibles_{00-04}$	0.430***		0.573***		0.366***		-0.972	
	(0.111)		(0.175)		(0.106)		(0.916)	
$Eligible$		0.025***		0.032***		0.025***		-0.011
		(0.005)		(0.008)		(0.005)		(0.009)
$Constant$	-0.068***	0.173***	-0.096***	0.166***	-0.055***	0.174***	0.210	0.209***
	(0.020)	(0.003)	(0.033)	(0.007)	(0.019)	(0.003)	(0.183)	(0.008)
R^2	-0.947	0.001	-1.156	0.001	-0.749	0.001	-4.055	0.000
Obs.	52,141	52,141	28,376	28,376	45,721	45,721	25,052	25,052
F	14.990	29.066	10.775	17.389	12.032	25.779	1.127	1.495

Notes. Significance level denoted as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level.

In second-stage regressions we find that changes in tangible assets are positively associated with firms' probability to serve foreign markets across all control groups. The second-stage estimates on $Tangibles$ obtained by comparing eligible firms against the overall groups of 'Untreated' firms, or against the subgroups of firms belonging to 'Business group' and 'Non-liable' firms approximate 0.4, suggesting that 10% increase in tangible assets increases the probability of exporting on average by 4%. The coefficient obtained on the estimating sample including 'Eligibles' and 'Large firms' is higher (0.9). However, this estimate is much less precise than those obtained against other control groups and for this reason we are cautious in attributing economic meaning to this difference.

The results from the estimation of model 3.9 on export entry are reported in the lower panel of Table. 3.5. Estimates from this model appear in line with those obtained on export propensity when we compare eligibles against all control groups except for 'Non liable' firms. When we use this control group, the F statistics from the first-stage regression is very small (1.4) suggesting that the instrument is weak in this sample. The weakness of the instrument is likely to depend on the methodology that we followed to construct the estimation sample for this specification that retains insufficient observations in the control group to identify correctly the impact of the reform on asset growth[22]. Therefore, we conclude that this battery of regressions provides convincing evidence that tangible asset growth increases firms' propensity to export, and that this channel can be exploited by policies that aim at promoting domestic firms' access to foreign markets.

Table 3.6 presents the output from replicating the analysis within the group of eligible firms with average profit below €38,120, and by using the interactions of $\Delta EATR_i$ and $\Delta EMTR_i$ with the $Post_{02}$ dummy as instruments in first-stage regressions. Second-stage estimates on $Tangibles$ are very similar to those that we obtained by comparing eligible and ineligible firms in FE models. When we bring this robustness check to model 3.9, we find that tangible asset growth still increases the probability of 'permanent' entry into exporting. However, the effect that is found within this group of firms is smaller than the one obtained on the whole sample (i.e., estimates of the coefficient are respectively 0.15 and 0.17 when $\Delta EATR_i$ and $\Delta EMTR_i$ are used as instruments). This may be caused by the rare occurrence of 'permanent' entry among firms in this control group. We conclude that tangible asset growth has a stronger positive impact on small firms' probability of exporting while its impact is weaker when we look at small firms' probability of becoming 'permanent' exporters.

[22]Table 3.7 in the Appendix shows that in the group of 'Non liable' firms we have the greatest proportion of permanent non-exporters before the reform (92%), of these non-exporters only a very small fraction (1%) transit to a 'permanent' exporter status after the reform.

Table 3.6: Asset growth and export entry (eligibles)

	EATR		EMTR	
IV Stage:	2nd	1st	2nd	1st
FE models (dependent: $\Delta Export_{t,t-1}$)				
$Tangibles(log)$	0.408***		0.363***	
	(0.074)		(0.060)	
$\Delta EATR_i * Post_{02}$		2.517***		
		(0.331)		
$\Delta EMTR_i * Post_{02}$				0.558***
				(0.064)
Year FE	Yes	Yes	Yes	Yes
R^2	-0.363	0.113	-0.277	0.113
N	281,994	281,994	281,994	281,994
F	93.727	786.070	99.744	789.507
Models in differences (dependent: $\Delta Export_{00-04}$)				
$\Delta Tangibles_{00-04}$	0.152*		0.173**	
	(0.085)		(0.087)	
$\Delta EATR_i$		2.206***		
		(0.403)		
$\Delta EMTR_i$				0.422***
				(0.079)
$Constant$	-0.012	-0.164**	-0.016	0.138***
	(0.016)	(0.064)	(0.016)	(0.010)
R^2	-0.067	0.002	-0.091	0.002
N	16,170	16,170	16,170	16,170
F	3.237	29.984	3.934	28.712

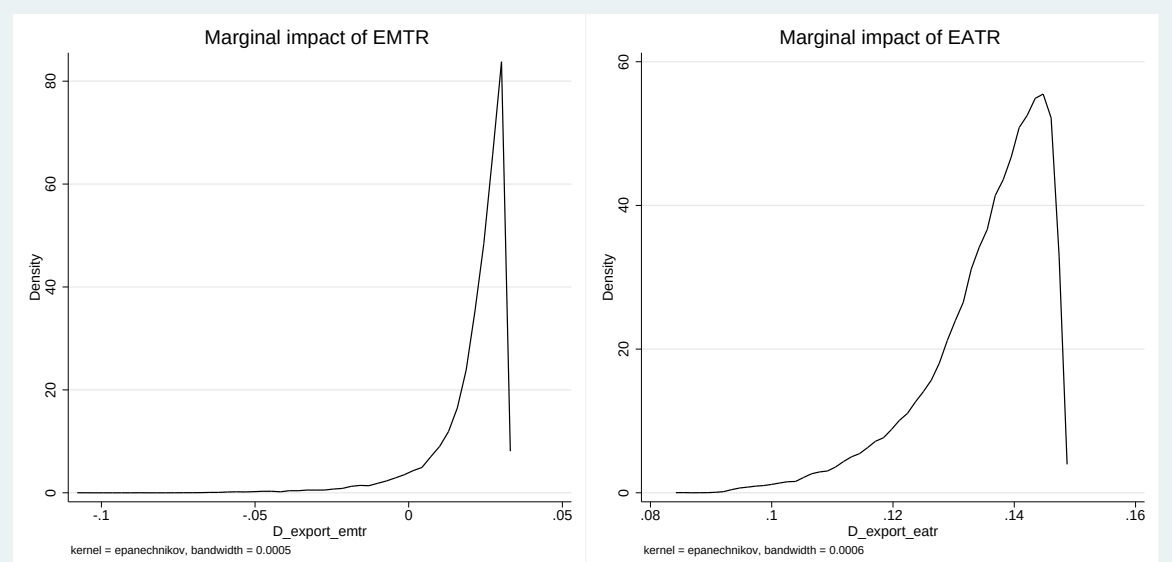
Notes. Significance levels denoted as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level. We retain in the estimation sample only eligible firms with average pre-reform profits below €38,120.

3.5.4 Evaluating the overall impact of the reform

After determining that the reduction in the CT rate promoted SME investment, and that the growth in tangible assets impacted positively on export propensity, we are left to assess the indirect effect of the reform on SME participation to international trade. We have shown that a unique change in the statutory rate translates into heterogeneous reductions of effective rates across firms with different asset composition and financial structure. Therefore, the reform had a different impact on the export propensity of firms experiencing different changes in effective taxation $\Delta EATR_i$ and $\Delta EMTR_i$. We compute the treatment effect of the reform on export propensity at each point of the distributions of the gains in terms of effective rates across eligible firms. More precisely, the treatment effect of the reform on firm i is $TE_{EATR,i} = \hat{\gamma}_{EATR} \times \Delta EATR_i \times \hat{\zeta}$ and $TE_{EMTR,i} = \hat{\gamma}_{EMTR} \times \Delta EMTR_i \times \hat{\zeta}$, where $\hat{\gamma}_{EATR} \times \Delta EATR_i$ and $\hat{\gamma}_{EMTR} \times \Delta EMTR_i$ are respectively the predicted changes in the tangible assets of firm i caused respectively

by average and marginal effective tax gains. These are multiplied by the estimated marginal effect of tangible asset growth on export propensity ($\hat{\zeta}$) reported in the upper panel of Table 3.6[23].

Figure 3.5: Heterogeneous impact of the reform on export entry



Notes. The two plots show the kernel densities of $TE_{EMTR,i}$ (left panel) and $TE_{EATR,i}$ (right panel). These are obtained on the population of firms eligible for the tax cut and with average pre-reform profit below the threshold of €38,120.

The right panel of Figure 3.5 shows the distribution of $TE_{EATR,i}$ across eligible firms with profits below €38,120. The effect of the reform on export propensity ranges from +8% to +15% with the majority of firms concentrating in the range between +12% and +14%. On the contrary, $TE_{EMTR,i}$ ranges from -10% to +3%, with the majority of firms concentrating in the upper part of the distribution. The impact of the reform on exports differs between the average and the marginal taxation channels. This is due to the different impact of changes in EATR and EMTR on investment. A reduction of the cost of capital at the margin ($\Delta EMTR$) causes an upward adjustment of firms' capital stock due to the upscaling of current projects, while a reduction in average taxation ($\Delta EATR$) induces firms to undertake new discrete investment projects that were previously unprofitable (Devereux and Griffith, 2003). Because a reduction in

[23] $\hat{\zeta}$ is set at 0.4 on the basis of the the point estimates of the coefficient of $Tangibles$ that are obtained in second stage regressions on $\Delta Export_{t,t-1}$.

infra-marginal taxation induces greater expansion in tangible assets, then $TE_{EATR,i}$ are much higher than $TE_{EMTR,i}$[24]. Firms with negative values of $TE_{EMTR,i}$ are those for which the cost of capital at the margins increases after a reduction of taxation, given their intensive use of debt financing. With lower taxation their user cost of capital is higher, because higher costs of debt financing are not fully compensated by the tax-shield function of debt embodied in the equation 3.1. If these firms cannot adjust their financial structure by reducing debt, we expect them to downscale investment at the margin and reduce their export participation.

3.6 Conclusions

By comparing firms that benefit from a favorable tax regime to those excluded from it, we provide evidence that reductions in CT rates are effective policies to promote the growth of small and medium enterprises and through this channel their export participation. By computing the effect of a change in the statutory rate on firms' effective rates of average (EATR) and marginal (EMTR) taxation, we also highlighted that similar fiscal measures would have an heterogeneous impact on firms, depending on their different ability to shield profit from taxation by using debt financing and discounting investment costs over time. When we focus on firms with average pre-reform profit below the threshold to which the tax cut applies (€38,120), we find that 50% reduction in the average statutory rate corresponds on average to 16% reduction in the Effective Average Tax Rate (EATR). A firm experiencing such a reduction increases its stock of tangible assets of 40% and its probability of exporting of 16%.

Our results are particularly in line with a recent model in the trade literature that introduces increasing marginal costs of production in the Melitz framework (Blum et al., 2013). As predicted by this model, our estimates suggest that firms that increase their stock of tangible assets become more willing to serve foreign markets. If this is true, ex-ante differences in size, capital intensity and labor productivity between exporters and non-exporters are not only related to the fixed entry costs of exporting,

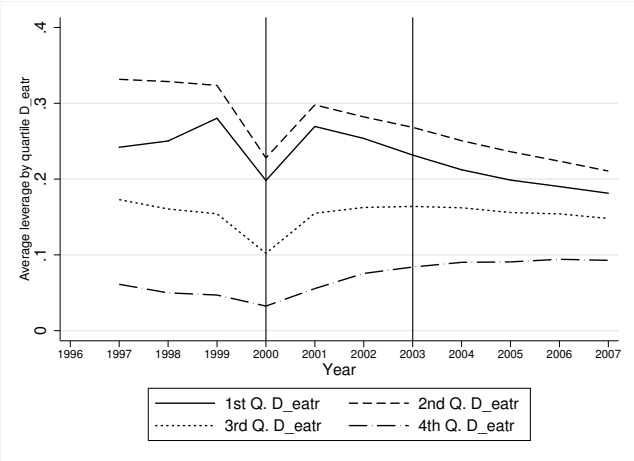
[24]Indeed in Table 3.6 we show that the first-stage coefficient of $\Delta EATR_i * Post_{02}$ on $Tangible_i$ is five time larger than the one of $\Delta EMTR_i * Post_{02}$.

but also to the different costs of producing greater volumes of output. While the literature is inconclusive on the merits of export promotion through subsidies, our results suggest that policies encouraging SME growth are effective alternatives in fostering their participation to foreign markets.

Appendix

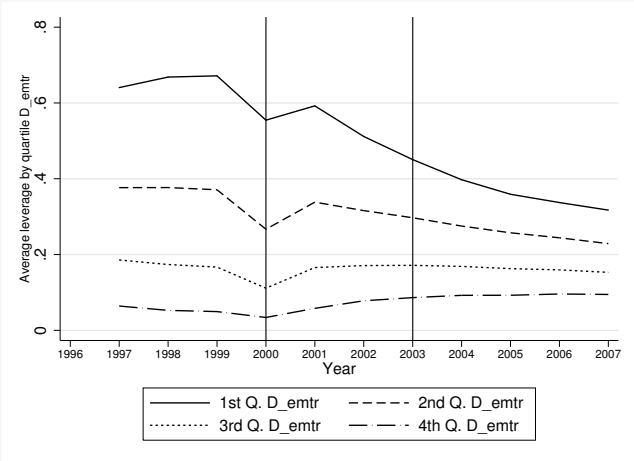
Evolution of leverage by quartiles of $\Delta EATR$ and $\Delta EMTR$

Figure 3.6: Evolution of leverage by quartiles of $\Delta EATR$



Notes. Leverage is computed as the ratio of firms' debt over total assets. The figure plots mean values of leverage computed within groups of eligible firms belonging to the same quartile of $\Delta EATR$. Firms in the first quartile are those experiencing the smaller reduction in effective average taxation between 2001 and 2003.

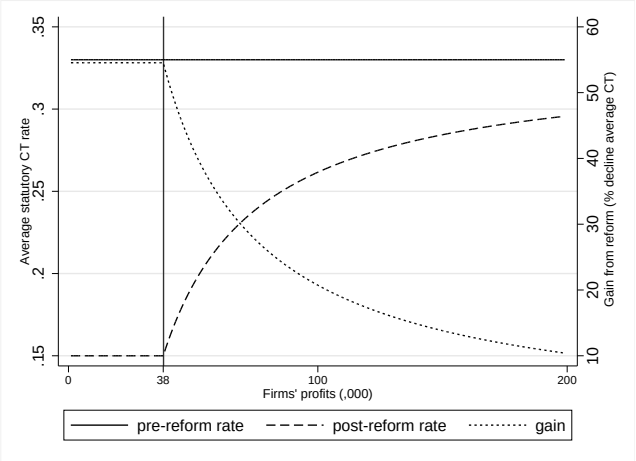
Figure 3.7: Evolution of leverage by quartiles of $\Delta EMTR$



Notes. Leverage is computed as the ratio of firms' debt over total assets. The figure plots mean values of leverage computed within groups of eligible firms belonging to the same quartile of $\Delta EMTR$. Firms in the first quartile are those experiencing the smaller reduction in effective marginal taxation between 2001 and 2003.

Expected gain from the reform and firm profit

Figure 3.8: Pre- and post-reform average statutory CT rates by levels of firm profit



Additional tables

Table 3.7: Permanent non-exporters and permanent exporters

	Share of permanent non-exporters before the reform	Share of permanent exporters after the reform if permanent non-exporter before
All sample	0.663	0.034
All eligible	0.598	0.054
Eligible below threshold	0.656	0.047
All controls	0.720	0.021
Non-liable	0.924	0.011
Business group	0.263	0.103
Large	0.117	0.178

Note. The balanced sample comprises firms present in all years before the reform (1998-2000) and after the reform (2004-2007).

Table 3.8: Variables

Variable	Description	Construction from FICUS database
Tax ratio	Ratio of corporate tax expenses over total profit.	$impoben_{it}/(resubic_{it} + impoben_{it})$
$Tangibles_{it}$	log of the book value of tangible assets	$log(immocor_{it})$
Exp_{it}	Binary variable, firms with positive foreign sales	= 1 if $caexpor_{it} > 0$, 0 otherwise
elj_i	Identifier for judicial form	= 1 if $cj_{it} \in [5399, 5800]$, $cj_{it} = 5308$ or or $cj_{it}! = 5498$
elo_i	Identifier for 'Business group'	= 1 if $appgr_{it} = 0$, 0 otherwise
elc_i	Identifier for 'Large' group	= 1 if $catotal_{it} <=$ €7,630,000, 0 otherwise
$Eligible_i$	Eligibility dummy	= 1 if $elj_{it} = 1$, $elo_{it} = 1$ and $elc_{it} = 1$, 0 otherwise
$Post_{02}$	Reform dummy	= 1 if $t > 2002$, 0 otherwise

Note. The balanced sample comprises firms present in all years before the reform (1998-2000) and after the reform (2004-2007). We trim the extreme percentiles for each variable (1%) and we deflate at the sectoral level.

Concluding Remarks

This thesis sheds light on the complex relationship between financial factors and firm export behavior by presenting novel empirical findings. Chapter 1 shows that, in the context of relatively underdeveloped financial systems, firms that are exposed to more intense domestic competition are less likely to obtain credit on favorable conditions. However, export entry appears as an effective strategy to escape the competition-financial constraints trap, because it provides a positive signal about the performance of borrowing firms, hence attenuating information asymmetries in credit relationships that arise from borrowers' unobservable ability to withstand competition. This conclusion provides an additional rationale for export promotion policies, as they may trigger a virtuous cycle by relaxing firms' financial constraints.

In Chapter 2, we find that the financial structure and the internal liquidity of French exporters are relevant attributes to explain the heterogeneous quality of exported varieties. In this regard, the negative relationship between firms' use of debt financing and a theoretically grounded measure of 'perceived' export quality is consistent with the hypothesis that information asymmetries in credit relationships are most serious when it comes to financing quality upgrading activities. From a policy perspective, our results suggest that public policies supporting investment in intangibles may be relatively more effective in promoting quality upgrading within firms with scarce liquidity and high reliance on debt.

In Chapter 3, we found that policies that encourage small and medium firm investment in tangible assets are effective in increasing export participation. This finding is particularly relevant for those economies, such as Italy, where the prevalent small size of companies is an obstacle to internationalization. Because the literature on financial constraints has abundantly documented suboptimal investment by smaller, younger

and more innovative firms, it should be expected that growth-promoting policies will be particularly beneficial for these companies. Even thus the tax cut that we investigated was applied to a limited fraction of firms' profit, it nevertheless encouraged firm growth and through this channel export propensity. Because taxation on corporate profit contributes limitedly to the total tax revenue of OECD countries[25], there is scope for governments to support SME by adopting favorable rates of corporate taxation or by further reducing existing ones.

Each of the three studies offers opportunities for future extensions. While the first chapter provides evidence consistent with a signaling function of firms' international activities, there is still ample room for obtaining a clearer picture about the relationship between competitive pressure, financial constraints and firms' international activities. A step forward in this respect would be achieved by employing more objective measures of market structure and competitive pressure than those employed in the first chapter. The FICUS dataset that we used in the second and third chapters would precisely allow to obtain these indicators by exploiting information on firms' entry and exit within narrowly defined industries. Unfortunately, in FICUS we cannot observe directly firms' access and cost of credit. A possible solution to this problem would be to estimate the risk premium of individual firms by exploiting information on firms' total interest rate payments and total debt. The next step would be to exploit differences in market structure, demographic dynamics and import penetration across industries or geographic areas to test whether firms operating in 'tougher' environments experience higher costs of credit.

By using the same estimator of export quality that we employed in the second chapter, it is possible to investigate quality heterogeneity across exported varieties in relation to other aspects of firm export behavior. For instance, one of the central question in international macroeconomic is why international prices do not fully adjust to nominal and real exchange rates movements. Empirical research have largely documented that the percentage change in the prices of imported goods is smaller than the percentage change in exchange rates of the exporting country and that price ad-

[25]According to OECD statistics corporate taxation contributed approximatively for 10% to total tax revenues of all group of OECD countries in the last decade.

justments differ across destinations. The degree of incomplete pass-through, and its determinants, have played a central role in the international trade literature because of its implications for the conduct of monetary policy, for the macroeconomic stability and for the welfare of producers and consumers. From a theoretical point of view, models developed by Chen and Juvenal (2013) and Yu (2013) predict that exchange rate pass-through is lower for higher quality goods. In addition, Strasser (2013) find that financially constrained firms' are less capable to offset exchange rate fluctuations by adjusting prices. This evidence suggests exploiting our estimator of quality to investigate how the free-on-board prices of varieties with different quality adjust to exchange rate fluctuations.

Lastly, the results obtained in the third chapter encourage further investigation on the effectiveness of fiscal policies for firm internationalization. A simple extension of our research consists in testing whether the same fiscal reform fostered small and medium firms' import of intermediate goods. In turn, we can also test whether firms' import caused productivity gains. This hypothesis is based on previous studies documenting a positive effect of firms' import on productivity, due to the substitution of more expensive domestic varieties of intermediate goods for cheaper foreign ones, or to the imports of foreign technology (e.g., Amiti and Konings, 2007; Halpern et al., 2011). A reduction of marginal and average taxation on firms' profits may indeed make it profitable for SME to start substituting domestic for foreign varieties, especially so if import activities involve sunk costs (i.e., searching and screening costs).

A more general result of this thesis is that firm-level heterogeneity truly matters for exports and it is bound to determine the effectiveness of public policies. On one hand, this conclusion accords with the recent literature that substitutes heterogeneous for representative firms within trade models. On the other hand, it encourages greater targeting of public interventions towards categories of firms that are more severely affected by different kind of market failures or distortions. For example, it is shown that firms' response to a reduction in corporate taxation, in terms of investment and export participation, depends on their individual financial structure and asset composition.

Bibliography

Aghion, P., Fally, T., and Scarpetta, S. (2007). Credit constraints as a barrier to the entry and post-entry growth of firms. *Economic Policy*, 22(52):731–779.

Aivazian, V. A., Ge, Y., and Qiu, J. (2005). The impact of leverage on firm investment: Canadian evidence. *Journal of Corporate Finance*, 11(1-2):277–291.

Amiti, M. and Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *The Americal Economic Review*, 97(5):1611–1638.

Amiti, M. and Weinstein, D. E. (2011). Exports and financial shocks. *The Quarterly Journal of Economics*, 126(4):1841–1877.

Angrist, J. D. and Pischke, J.-S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press, first edition.

Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2):277–97.

Arnold, J. M., Brys, B., Heady, C., Johansson, A., Schwellnus, C., and Vartia, L. (2011). Tax policy for economic recovery and growth. *The Economic Journal*, 121(550):59–80.

Askenazy, P., Caldera, A., Gaulier, G., and Irac, D. (2011). Financial constraints and foreign market entries or exits: Firm-level evidence from France. Banque de France Working Papers 328.

Azevedo, J. P. (2004). Grqreg: Stata module to graph the coefficients of a quantile regression. Statistical Software Components, Boston College Department of Economics.

Baldwin, R. and Harrigan, J. (2011). Zeros, quality, and space: Trade theory and trade evidence. *American Economic Journal: Microeconomics*, 3(2):60–88.

Barba Navaretti, G., Bugamelli, M., Schivardi, F., Altomonte, C., Horgos, D., and Maggioni, D. (2011). The global operations of European firms: the second EFIGE policy report. Technical report.

Bastos, P. and Silva, J. (2010). The quality of a firm's exports: Where you export to matters. *Journal of International Economics*, 82(2):99–111.

Baum, C. F., Schaffer, M. E., and Stillman, S. (2002). Ivreg2: Stata module for extended instrumental variables/2SLS and GMM estimation. Statistical Software Components, Boston College Department of Economics.

Beck, T., Demirgüç-Kunt, A., Laeven, L., and Levine, R. (2008). Finance, firm size, and growth. *Journal of Money, Credit and Banking*, 40(7):1379–1405.

Beck, T., Demirgüç-Kunt, A., Laeven, L., and Maksimovic, V. (2006). The determinants of financing obstacles. *Journal of International Money and Finance*, 25(6):932–952.

Beck, T., Demirgüç-Kunt, A., and Levine, R. (2000). A new database on the structure and development of the financial sector. *World Bank Economic Review*, 14(3):597–605.

Beck, T., Demirgüç-Kunt, A., and Maksimovic, V. (2005). Financial and legal constraints to growth: Does firm size matter? *Journal of Finance*, 60(1):137–177.

Beck, T., Demirgüç-Kunt, A., and Pería, M. S. M. (2010). Bank financing for SMEs: Evidence across countries and bank ownership types. *Journal of Financial Services Research*, 39(1-2):35–54.

Becker, J., Fuest, C., and Hemmelgarn, T. (2006). Corporate tax reform and foreign direct investment in Germany? Evidence from firm-level data. CESifo Working Papers Series 1722.

Bellone, F., Musso, P., Nesta, L., and Schiavo, S. (2010). Financial constraints and firm export behaviour. *The World Economy*, 33(3):347–373.

Bernard, A. and Jensen, B. (1999). Exceptional exporter performance: Cause, effect, or both? *Journal of International Economics*, 47(1):1–25.

Bernard, A. B., Eaton, J., Jensen, J. B., and Kortum, S. (2003). Plants and productivity in international trade. *The Americal Economic Review*, 93(4):1268–1290.

Bernard, A. B., Jensen, J. B., and Lawrence, R. Z. (1995). Exporters, jobs, and wages in U.S. manufacturing: 1976-1987. *Brookings Papers on Economic Activity. Microeconomics*, 1995:67–119.

Bernard, A. B., Redding, S. J., and Schott, P. K. (2007). Comparative advantage and heterogeneous firms. *The Review of Economic Studies*, 74(1):31–66.

Bernard, A. B., Redding, S. J., and Schott, P. K. (2011). Multiproduct firms and trade liberalization. *The Quarterly Journal of Economics*, 126(3):1271–1318.

Berry, S. T. (1994). Estimating discrete-choice models of product differentiation. *RAND Journal of Economics*, 25(2):242–262.

Blum, B. S., Claro, S., and Horstmann, I. J. (2013). Occasional and perennial exporters. *Journal of International Economics*, 90(1):65–74.

Blundell, R. and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1):115–143.

Bond, S. and Xing, J. (2010). Corporate taxation and capital accumulation. Working Paper 10/15, Oxford University Centre for Business Taxation.

Boutin, X., Cestone, G., Fumagalli, C., Pica, G., and Serrano-Velarde, N. (2011). The deep-pocket effect of internal capital markets. IGIER Working Papers 403.

Bridges, S. and Guariglia, A. (2008). Financial constraints, global engagement, and firm survival in the United Kingdom: Evidence from micro data. *Scottish Journal of Political Economy*, 55(4):444–464.

Brown, M., Jappelli, T., and Pagano, M. (2007). Information sharing and credit: Firm-level evidence from transition countries. CSEF Working Papers 178.

Brown, M., Ongena, S., Popov, A., and Yesin, P. (2011). Who needs credit and who gets credit in Eastern Europe? *Economic Policy*, 26(65):93–130.

Bustos, P. (2011). Trade liberalization, exports, and technology upgrading: Evidence on the impact of MERCOSUR on Argentinian firms. *The Americal Economic Review*, 101(1):304–40.

Canay, I. A. (2011). A simple approach to quantile regression for panel data. *Econometrics Journal*, 14(3):368–386.

Carlin, W., Haskel, J., and Seabright, P. (2001). Understanding 'The Essential Fact about Capitalism': Markets, competition and creative destruction. *National Institute Economic Review*, 175(1):67–84.

Carlin, W., Schaffer, M., and Seabright, P. (2004). A minimum of rivalry: Evidence from transition economies on the importance of competition for innovation and growth. *The B.E. Journal of Economic Analysis & Policy*, 3(1):1–45.

Carlin, W., Schaffer, M., and Seabright, P. (2010). A framework for cross-country comparisons of public infrastructure constraints on firm growth. CEPR Discussion Papers 7662.

Chan, Y.-S. and Thakor, A. V. (1987). Collateral and competitive equilibria with moral hazard and private information. *Journal of Finance*, 42(2):345–63.

Chaney, T. (2013). Liquidity constrained exporters. NBER Working Papers 19170.

Chen, D., Lee, F. C., and Mintz, J. (2002). Taxation, SMEs and entrepreneurship. OECD Science, Technology and Industry Working Papers 2002/09.

Chen, M. and Guariglia, A. (2013). Internal financial constraints and firm productivity in china: Do liquidity and export behavior make a difference? *Journal of Comparative Economics*, Forthcoming.

Chen, N. and Juvenal, L. (2013). Quality, trade, and exchange rate pass-through. CAGE Online Working Paper Series 164.

Chor, D. and Manova, K. (2010). Off the cliff and back? credit conditions and international trade during the global financial crisis. NBER Working Paper 16174.

Claessens, S. and Konstantinos, T. (2006). Measuring firms' access to finance. Technical report, Paper prepared for Conference: Access to Finance: Building Inclusive Financial Systems, organized by Brooking Institution and the World Bank in Washington, D.C, May 30-31, 2006.

Clerides, S. K., Lach, S., and Tybout, J. R. (1998). Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico, and Morocco. *The Quarterly Journal of Economics*, 113(3):903–947.

Cooley, T. and Quadrini, V. (2001). Financial markets and firm dynamics. *The Americal Economic Review*, 91(5):1286–1310.

Coricelli, F., Driffield, N., Pal, S., and Roland, I. (2012). When does leverage hurt productivity growth? A firm-level analysis. *Journal of International Money and Finance*, 31(6):1674–1694.

Costantini, J. A. and Melitz, M. J. (2008). The dynamics of firm-level adjustment to trade. In Elhanan Helpman, D. M. and Verdier, T., editors, *The Organization of Firms in a Global Economy*. Harvard University Press, Cambridge MA.

Crinò, R. and Epifani, P. (2010). Productivity, quality, and export intensities. UFAE and IAE Working Papers 824.10.

Crozet, M., Head, K., and Mayer, T. (2011). Quality sorting and trade: Firm-level evidence for French wine. *The Review of Economic Studies*.

Cummins, J. G., Hassett, K. A., and Hubbard, R. G. (1995). Have tax reforms affected investment? In *Tax Policy and the Economy, Volume 9*, NBER Chapters, pages 131–150. National Bureau of Economic Research, Inc.

Demirgüç-Kunt, A. and Maksimovic, V. (1996). Financial constraints, uses of funds, and firm growth: An international comparison. The World Bank Policy Research Working Paper Series 1671.

Devereux, M. and Schiantarelli, F. (1990). Investment, financial factors, and cash flow: Evidence from UK panel data. In Hubbard, R. G., editor, *Asymmetric Information, Corporate Finance, and Investment*, pages 279–306. University of Chicago Press, Chicago.

Devereux, M. P. and Griffith, R. (1999). The taxation of discrete investment choices. IFS Working Paper W98/16.

Devereux, M. P. and Griffith, R. (2003). Evaluating tax policy for location decisions. *International Tax and Public Finance*, 10(2):107–26.

DGI France (2002). Bulletin officiel des impots. Technical report, Direction General des Impots France.

Drakos, K. and Giannakopoulos, N. (2011). On the determinants of credit rationing: Firm-level evidence from transition countries. *Journal of International Money and Finance*, 30(8):1773–1790.

EBRD (2006). Finance in transition. EBRD Transition Report.

Egger, P., Loretz, S., Pfaffermayr, M., and Winner, H. (2009). Firm-specific forward-looking effective tax rates. *International Tax and Public Finance*, 16(6):850–870.

Fabling, R. and Sanderson, L. (2013). Exporting and firm performance: Market entry, investment and expansion. *Journal of International Economics*, 89(2):422–431.

Fan, H., Lai, E. L.-C., and Li, Y. A. (2012). Credit constraints, quality, and export prices: Theory and evidence from China. MPRA Paper 40857.

Fazzari, S. M., Hubbard, R. G., Petersen, B. C., Blinder, A. S., and James, M. (1988). Financing constraints and corporate investment. *Brooking Papers on Economics Activity*, 1(1):141–206.

Federici, D. and Parisi, V. (2012). Corporate taxation and exports. Università di Cassino Working Paper 01/2012.

Feenstra, R. C., Li, Z., and Yu, M. (2011). Exports and credit constraints under incomplete information: Theory and evidence from China. NBER Working Papers 16940.

Fitch Ratings China (2012). Fitch Ratings China website Accessed in date 16/05/2012.

Gallois, L. (2012). Pacte pour la compétitivité de l'industrie française. Rapport au premier ministre, Commissariat Général à l'Investissement.

Gaulier, G. and Zignago, S. (2010). BACI: International trade database at the product-level. the 1994-2007 version. CEPII Working Papers 2010-23.

Gervais, A. (2013). Product quality and firm heterogeneity in international trade. Working Papers 13-08, Center for Economic Studies, U.S. Census Bureau.

Girma, S., Greenaway, D., and Kneller, R. (2004). Does exporting increase productivity? A microeconometric analysis of matched firms. *Review of International Economics*, 12(5):855–866.

Gorodnichenko, Y. and Schnitzer, M. (2010). Financial constraints and innovation: Why poor countries don't catch up. NBER Working Papers 15792.

Gorodnichenko, Y., Svejnar, J., and Terrell, K. (2010). Globalization and innovation in emerging markets. *American Economic Journal: Macroeconomics*, 2(2):194–226.

Greenaway, D., Guariglia, A., and Kneller, R. (2007). Financial factors and exporting decisions. *Journal of International Economics*, 73(2):377–395.

Greenaway, D. and Kneller, R. (2007). Firm heterogeneity, exporting and foreign direct investment. *The Economic Journal*, 117(517):134–161.

Hall, B. H. (2002). The Financing of Research and Development. *Oxford Review of Economic Policy*, 18(1):35–51.

Hallak, J. C. and Schott, P. K. (2008). Estimating cross-country differences in product quality. NBER Working Papers 13807.

Halpern, L., Koren, M., and Szeidl, A. (2011). Imported inputs and productivity. CeFiG Working Papers 8.

Harrison, A. E. and McMillan, M. S. (2003). Does direct foreign investment affect domestic credit constraints? *Journal of International Economics*, 61(1):73–100.

Helpman, E. (2006). Trade, FDI, and the organization of firms. NBER Working Papers 12091.

Helpman, E., Melitz, M., and Yeaple, S. (2004). Export versus FDI with heterogeneous firms. *The Americal Economic Review*, 94(1998):300–316.

Iacovone, L. and Javorcik, B. (2008). Shipping the good tequila out: investment, domestic unit values and entry of multi-product plants into export markets. Mimeo, University of Oxford.

ISGEP (2008). Understanding cross-country differences in exporter premia: Comparable evidence for 14 countries. *Review of World Economics (Weltwirtschaftliches Archiv)*, 144(4):596–635.

Jappelli, T. (1990). Who is credit constrained in the U.S. economy? *The Quarterly Journal of Economics*, 105(1):219–34.

Jensen, M. C. and Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4):305–360.

Kaplan, S. N. and Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? *The Quarterly Journal of Economics*, 112(1):169–215.

Khandelwal, A. (2010). The long and short (of) quality ladders. *The Review of Economic Studies*, 77(4):1450–1476.

King, M. A. and Fullerton, D. (1984). The taxation of income from capital: A comparative study of the United States, the United Kingdom, Sweden, and Germany. *NBER Books*.

Koenker, R. W. and Bassett, Gilbert, J. (1978). Regression quantiles. *Econometrica*, 46(1):33–50.

Kravis, I. and Lipsey, R. (1971). *Price Competitiveness in World Trade*. Number No. 6 in NBER Studies in international Economic Relations.

Kugler, M. and Verhoogen, E. (2012). Prices, plant size, and product quality. *The Review of Economic Studies*, 79(1):307–339.

Laeven, L. (2002). Does financial liberalization reduce financing constraints? *Financial Management*, 31(4).

Lileeva, A. and Trefler, D. (2010). Improved access to foreign markets raises plant-level productivity...for some plants. *The Quarterly Journal of Economics*, 125(3):1051–1099.

Long, M. S. and Malitz, I. B. (1985). Investment patterns and financial leverage. In *Corporate Capital Structures in the United States*, NBER Chapters, pages 325–352. National Bureau of Economic Research, Inc.

Maksimovic, V. and Titman, S. (1991). Financial policy and reputation for product quality. *Review of Financial Studies*, 4(1):175–200.

Manova, K. (2008). Credit constraints, heterogeneous firms, and international trade. NBER Working Papers 14531.

Manova, K., Wei, S.-J., and Zhang, Z. (2011). Firm exports and multinational activity under credit constraints. NBER Working Paper 16905.

Manova, K. and Zhang, Z. (2012). Export prices across firms and destinations. *The Quarterly Journal of Economics*, 127(1):379–436.

Manove, M., Padilla, A. J., and Pagano, M. (2001). Collateral versus project screening: A model of lazy banks. *RAND Journal of Economics*, 32(4).

Matsa, D. A. (2011). Running on empty? financial leverage and product quality in the supermarket industry. *American Economic Journal: Microeconomics*, 3(1):137–73.

Mayer, T., Melitz, M. J., and Ottaviano, G. I. (2011). Market size, competition, and the product mix of exporters. NBER Working Papers 16959.

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior. In Zarembka, P., editor, *Frontiers in econometrics*, pages 105–142. Academic Press, New York.

McKenzie, K., Mansour, M., and Brule, A. (1998). The calculation of marginal effective tax rates. Working paper 97-15, Dept. of Finance, Canada. Technical Committee on Business Taxation.

Melitz, M. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725.

Melitz, M. and Ottaviano, G. I. P. (2008). Market size, trade, and productivity. *The Review of Economic Studies*, (75):295–316.

Minetti, R. and Zhu, S. C. (2011). Credit constraints and firm export: Microeconomic evidence from Italy. *Journal of International Economics*, 83(2):109–125.

Modigliani, F. and Miller, M. (1958). The cost of capital, corporation finance and the theory of investment. *The Americal Economic Review*, 53:261–297.

Musso, P. and Schiavo, S. (2008). The impact of financial constraints on firm survival and growth. *Journal of Evolutionary Economics*, 18(2):135–149.

Myers, S. C. and Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2):187–221.

Nam, C. W. (2013). Comparison of reduced corporate tax rate in the EU. CESifo Forum 1/2013.

Nam, C. W. and Radulescu, D. M. (2007). Effects of corporate tax reforms on SMEs' investment decisions under the particular consideration of inflation. CESifo Working Papers 1478.

Nevo, A. (2000). A practitioner's guide to estimation of random-coefficients logit models of demand. *Journal of Economics & Management Strategy*, 9(4):513–548.

Nucci, F., Pozzolo, A. F., and Schivardi, F. (2005). Is firm's productivity related to its financial structure? Evidence from microeconomic data. *Rivista di Politica Economica*, 95(1):269–290.

Nunes, P. M., Sequeira, T. N., and Serrasqueiro, Z. (2007). Firms' leverage and labour productivity: a quantile approach in Portuguese firms. *Applied Economics*, 39(14):1783–1788.

OECD, UNCTAD and WTO (2009). Report on G20 trade and investment measures. Technical report.

Podsakoff, P. M. and Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, 12(4):531–544.

Powell, D. (2010). Unconditional quantile regression for panel data with exogenous or endogenous regressors. RAND Working Papers 710-1.

Rajan, R. and Zingales, L. (1998). Financial Dependence and Growth. *The Americal Economic Review*, 88(3):559–86.

Raspiller, S. (2007). Reduced-rate corporation tax for SMEs. Tresor-Economics Letter 23, Direction Generale du Tresor et de la Politique Economique.

Roberts, M. J., Xu, D. Y., Fan, X., and Zhang, S. (2012). A structural model of demand, cost, and export market selection for Chinese footwear producers. NBER Working Papers 17725.

Roodman, D. (2003). Xtabond2: Stata module to extend xtabond dynamic panel data estimator. Statistical Software Components, Boston College Department of Economics.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in stata. *Stata Journal*, 9(1):86–136.

Schaffer, M. E. (2005). Xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models. Statistical Software Components, Boston College Department of Economics.

Schiantarelli, F. and Sembenelli, A. (1996). Form of ownership and financial constraints: Panel data evidence from leverage and investment equations. The World Bank Policy Research Working Paper Series 1629.

Secchi, A., Tamagni, F., and Tomasi, C. (2011). Exporting under financial constraints: margins, switching dynamics and prices. LEM Papers Series 2011/24.

Silver, M. (2007). Do unit value export, import and terms of trade policies indices represent or misrepresent price indices. *IMF Working Paper*, May(WP/07/121).

Simmler, M. (2013). How do taxes affect investment when firms face financial constraints? DIW Discussion Papers 1181.

Slemrod, J. and Venkatesh, V. (2002). The income tax compliance cost of large and mid-size businesses. Ross School of Business Papers 914.

Stiebale, J. (2011). Do financial constraints matter for foreign market entry? A firm-level examination. *The World Economy*, 34(1):123–153.

Stiglitz, J. and Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The Americal Economic Review*, 71(3):393–410.

Strasser, G. (2013). Exchange rate pass-through and credit constraints. *Journal of Monetary Economics*, 60(1):25–38.

Vagliasindi, M. (2001). Competition across transition economies: an enterprise-level analysis of the main policy and structural determinants. EBRD Working Papers 68.

Wagner, J. (1995). Exports, firm size, and firm dynamics. *Small Business Economics*, 7(1):29–39.

Wagner, J. (2002). The causal effects of exports on firm size and labor productivity: first evidence from a matching approach. *Economics Letters*, 77(2):287–292.

Wagner, J. (2007). Exports and productivity: A survey of the evidence from firm-level data. *The World Economy*, 30(1):60–82.

Wooldridge, J. M. (2001). *Econometric Analysis of Cross Section and Panel Data*, volume 1. The MIT Press.

Yu, Z. (2013). Exchange rate pass-through, firm heterogeneity and product quality: a theoretical analysis. Globalization and Monetary Policy Institute Working Paper 141, Federal Reserve Bank of Dallas.