Corporate Financial Structure and Export Quality: Evidence from France*

Michele Bernini†[1], Sarah Guillou[2] and Flora Bellone[3]

[1] University of Trento, School of International Studies
[2]SciencesPo - OFCE, GREDEG CNRS
[3]University of Nice - Sophia Antipolis, GREDEG CNRS

This version: September 2013

Abstract

Does the corporate financial structure determine firms' ability to compete on foreign markets through output quality? We investigate this question on a dataset including over 120,000 export flows generated by 6,229 French firms exporting within six product categories. Once we control for firms' heterogeneity and reverse causality, we find that the ratio of exporters' debt over total assets is negatively correlated with a theoretically grounded estimator of export quality. However, this result holds only for exporters with insufficient internal resources to finance current expenses. We argue that the negative impact of leverage on quality is consistent with models predicting that debt financing hampers the incentive to invest in quality upgrading. However, this distortion appears affecting only firms for which high leverage is not the outcome of a value-optimizing choice but rather a consequence of insufficient internal resources.

JEL classification: C11, D22, F14,G36.

Keywords: Export, Output Quality, Leverage.

1 Introduction

Departing from the Modigliani and Miller (1958) theorem a number of empirical papers questions 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

*The authors would like to thank Stefano Schiavo, Jaanika Merikull, Lucia Tajoli, and all the participants to the EACES and the ITSG workshops for their helpful comments and suggestions.

†Corresponding author. Email: michele.bernini@unitn.it.

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

[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.

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 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 financial factors in relation to export quality is Fan et al. (2012). These authors present

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

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 reviews the recent trade literature on output quality as a dimension of firms' competitiveness in international markets. Section 3 introduces the conceptual framework underpinning our hypotheses. Section 4 describes the data. Section 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 6 introduces the methodology we adopt to obtain an estimator of quality. Section 7 presents the empirical model of export quality and leverage and the main results. In Section 8 we conduct robustness checks. Section 9 concludes.

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 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.

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.

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

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.

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 6.[5]

5 Preliminary analysis

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 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[6]. 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 $\Delta Tang_{t/t-1}$ 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 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

[5]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.

[6]$Tang$ 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.

elements that are slower to adjust such as the value of firms' client base, licenses, brand and patents[7]. 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 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:

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

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 1 (i.e., by imposing $\beta_0 = 0$), by random effects (RE) and Fixed Effect (FE) models. RE models allows for individual 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[8]. 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

[7] 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.

[8] 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.

the model after applying within-transformation to the data[9]. 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 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.

Table 2 reports the results obtained when we regress equation 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

[9]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.

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.

Table 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).

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[10]. 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

[10]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).

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, 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.

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[11]. The firm-level variables listed in table 3 are then regressed on the set of dummies identifying the different price quartiles of exported varieties:

$$y_{ft} = c + Q2_{fpdt} + Q3_{fpdt} + Q4_{fpdt} + e_{ft} \tag{2}$$

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.

[11]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.

Table 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 4. Column 1 reports estimates for the constant that should be interpreted as the mean value of the dependent variable when this is computed 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 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.

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:

$$u_{ij} > u_{ik} \quad \forall \quad k \in K \tag{3}$$

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[12]. To allow for the nested structure of K, consumers' utility is modeled according to the following specification (McFadden, 1974):

$$\begin{aligned} u_{ij} &= \delta_j + \zeta_{ig} + (1-\sigma)\epsilon_{ij} \quad , \quad 0 \leq \sigma < 1 \\ \delta_j &= X_j'\beta + \alpha p_j + \zeta_j \quad , \quad \alpha \leq 0 \end{aligned} \tag{4}$$

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.

[12]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).

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-value distribution, utility function 4 originates the following nested logit model[13]:

$$s_j = \frac{e^{\delta_j/(1-\sigma)}}{[\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{\sigma} \times \sum_{g\in K}[\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}} \tag{5}$$

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[14]:

$$ln(s_j) - ln(s_o) = X_j'\beta + \alpha p_j + \sigma ln(s_{j/g}) + \zeta_j \tag{6}$$

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[15]. From the last equation we can obtain an estimator of product quality Q_j as:

$$\begin{aligned} Q_j &= [ln(s_j) - ln(s_o)] - [\alpha p_j + \sigma ln(s_{j/g})] \\ Q_j &\equiv X_j'\beta + \zeta_j \end{aligned} \tag{7}$$

Equation 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

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

[14]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).

[15]In the Appendix, we provide a step-by-step derivation of equation 6.

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.

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}[16] . 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[17]. 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):

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

[17]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 $MKT = \frac{2{,}000kg}{1-0.8} = 10,000Kg$.

$$\begin{aligned} ln(s_{fpdt}) - ln(s_{odt}) &= \alpha UV_{fpdt} + \sigma log(ns)_{fpdt} + \delta_t + \delta_c + \hat{Q}_{fpdt} \\ \hat{Q}_{fpdt} &\equiv \delta_{fpd} + \delta_{fpdt} \end{aligned} \tag{8}$$

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 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 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 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[18]. 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.

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 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

[18]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.

products that are defined according to this classification as 'mainly for household consumption' are retained in the dataset[19].

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[20]. Table 5 summarizes the process of selecting these products. 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.

[19] 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.

[20] 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).

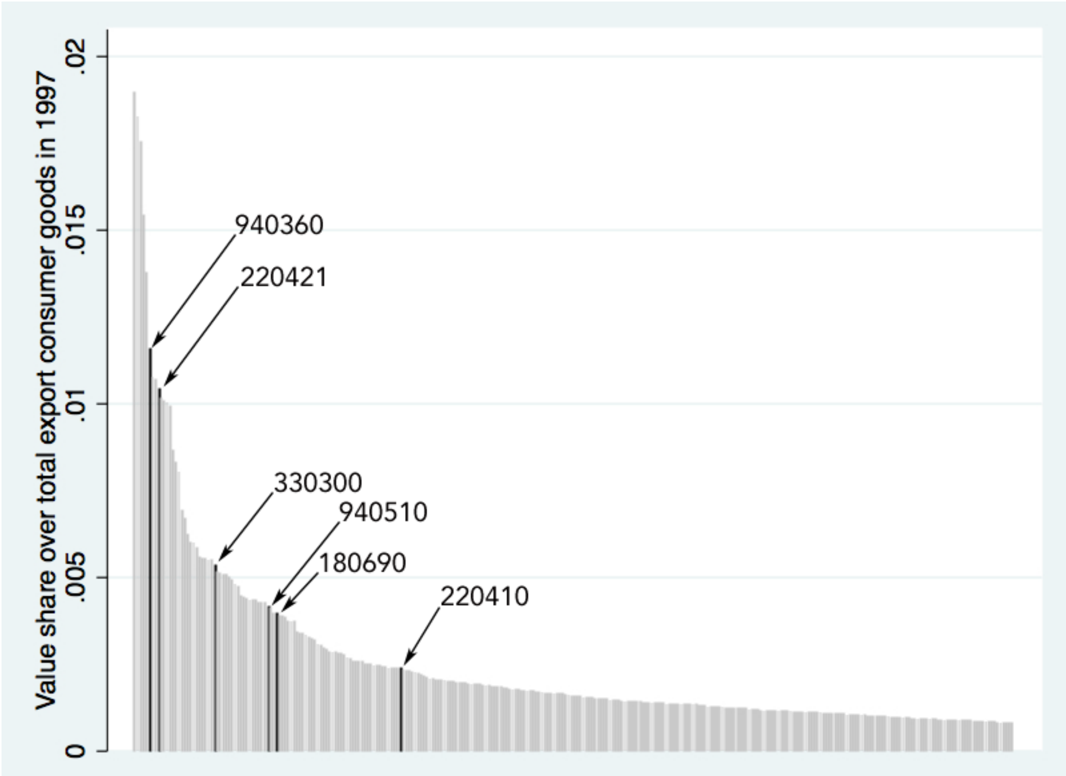
Table 5: Selection of the 6-digit products

(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 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 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.

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 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 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	-0.62	-1.02	-6.81	-0.36
High	-8.36	-1.51	-4.27	-1.65	-12.60	-0.76
Low	-3.03	-0.55	-1.16	-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 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[21]. 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[22]. 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'.

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

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

[22] 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 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.

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 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 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[23]. 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, 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).

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

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

of leverage and export quality is:

$$\hat{Q}_{fpdt} = c_{pdt} + \beta Lev_{ft} + Z'_{ft}\gamma + \eta_f + \eta_{ft} + \epsilon_{fpdt} \tag{9}$$

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., 2013), and at the same time they may benefit from quality enhancing activities carried out by other affiliates[24].

Pooled OLS with cluster robust standard errors is the first estimator we apply to equation 9. By including a full set of product-destination-year dummies, we force 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 9 to eliminate η_f from the right-hand side of the model[25]. By doing so, we prevent the correlation between leverage and some

[24] In Appendix, Table 14 shows pairwise correlation between all variables included in the model.

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

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.

7.1 Results

Table 8 reports summary statistics on firms' attributes and export patterns for each of the six product categories selected for our analysis. Leverage differs significantly 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. This 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.

Table 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.

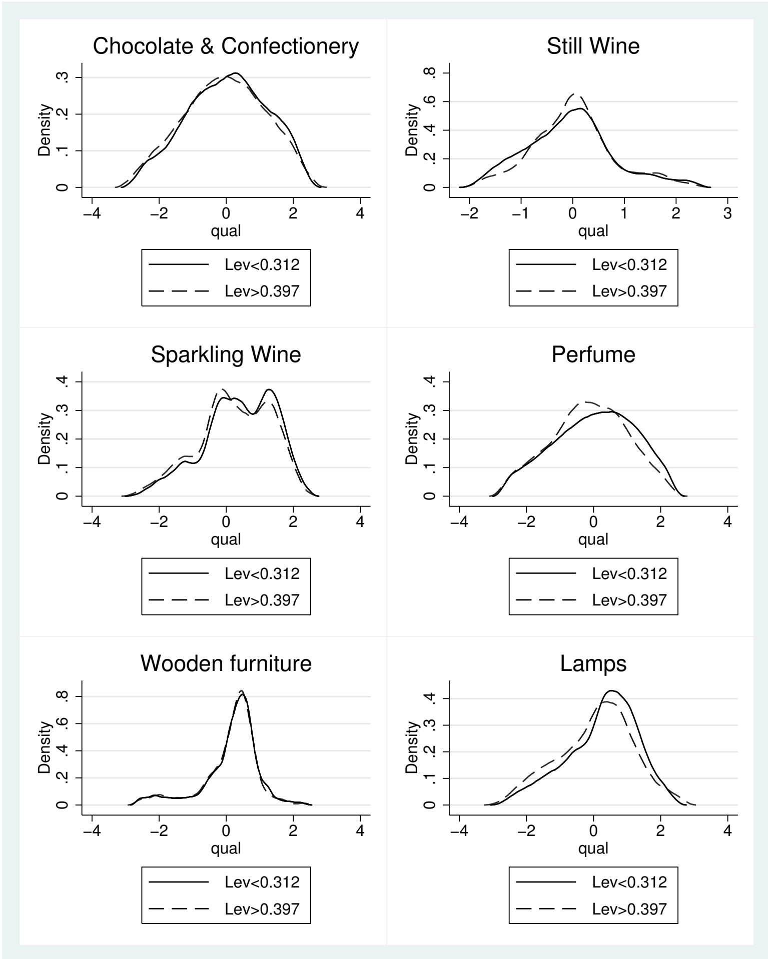
In figure 2 we show kernel densities of $\hat{Q}$ estimated by individual 6-digit product categories. For each product class we plot empirical densities estimated on the split samples of exporters with low leverage ($Lev_{ft} < 0.31$) and exporters with high leverage ($Lev_{ft} > 0.36$)[26]. Differences 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[27]. 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 9 are reported in Table 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.

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

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

Figure 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 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 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 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.

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 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[28]. Table 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 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 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 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.

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

Table 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 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 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 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 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 constraints 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 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 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[29] . In order to control for product-destination fixed effects without including a large number of dummies, we transform the variables in equation 9 by subtracting their means computed at the CN8 product-destination level to each observation[30].

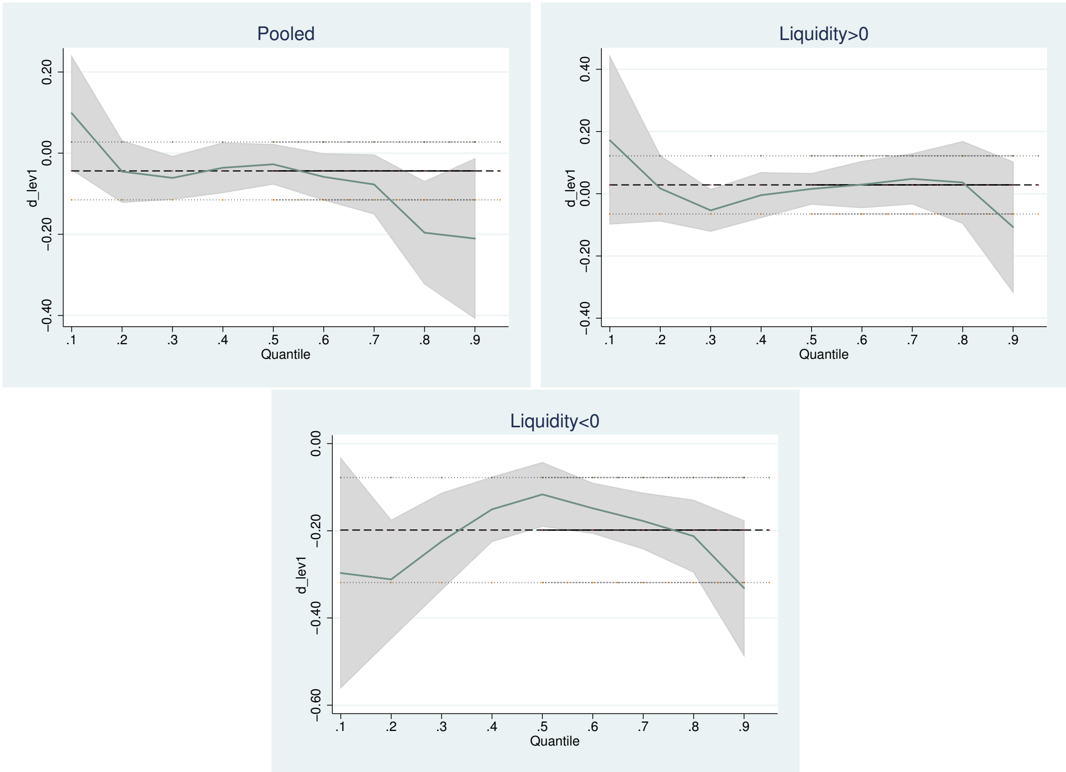
[29]Results are virtually identical when we estimate quantile regressions using the cross-sections for 1997, 2000 and 2007.

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

We provide estimates of the coefficients and standard errors in Table 16 in the Appendix. Figure 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.

sectional quantile regression on the transformed variables.

Figure 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).

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 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:

$$P_j = P_{j/g} \times P_g \tag{10}$$

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:

$$P_g = \frac{[\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}}{\sum_g [\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}} \tag{11}$$

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

$$P_{j/g} = \frac{e^{\delta_j/(1-\sigma)}}{\sum_{k\in g} e^{\delta_k/(1-\sigma)}} \tag{12}$$

by multiplying the right-hand sides of 11 and 12 we obtain:

$$P_j = \frac{e^{\delta_j/(1-\sigma)}}{[\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{\sigma} \times \sum_g [\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}} \tag{13}$$

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 $\delta_o = 0$[31]. The probability of choosing the outside variety (hence not choosing any of the inside varieties) is:

$$P_o = \frac{1}{\sum_g [\sum_{k\in g} e^{\delta_k/(1-\sigma)}]^{(1-\sigma)}} \tag{14}$$

taking the log difference of P_j and P_o we obtain:

$$ln(P_j) - ln(P_o) = \frac{\delta_j}{1-\sigma} - \sigma ln(\sum_{k\in g} e^{\delta_k/(1-\sigma)}) \tag{15}$$

by using 11, 14 and 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 15, and after some simplification we obtain:

$$ln(P_j) - ln(P_o) = X_j'\beta - \alpha p_j + \sigma(P_{j/g}) + \zeta_j \tag{16}$$

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 10 is the empirical equivalent of 16.

Derivation of the elasticity of demand

By defining $D_g = \sum_{j\in g} e^{\delta_j/1-6}$ equation (5) can be written as:

$$s_j = \frac{e^{\delta_j/(1-\sigma)}}{D_g^{\sigma}[\sum_g D_g^{(1-\sigma)}]} \tag{17}$$

then

$$\frac{\partial s_j}{\partial p_j} = \frac{e^{\delta_j/(1-6)} \frac{\partial \delta_j}{\partial p_j} D_g^{\sigma}[\sum_g D_g^{(1-\sigma)}] - e^{\delta_j/(1-\sigma)}[\frac{\partial (D_g^{\sigma})}{\partial p_j}[\sum_g D_g^{1-\sigma}] + D_g^{\sigma}\frac{\partial (D_g^{1-\sigma})}{\partial p_j}}{(D_g^{\sigma}[\sum_g D_g^{(1-\sigma)}])^2} \tag{18}$$

because $\frac{\partial \delta_j}{\partial p_j} = \frac{\alpha}{1-\sigma}$, we can use the definition of s_j in (17) and the definition of $P_{j/g} \equiv s_{j/g}$ in (8) to write (18) as:

$$\frac{\partial s_j}{\partial p_j} = \frac{\alpha}{1-\sigma} s_j(1 - \sigma s_{j|g} - (1-\sigma)s_j) \tag{19}$$

then multiplying (19) by $\frac{p_j}{s_j}$ we obtain the formula for the market share elasticity of demand:

$$\frac{\partial s_j}{\partial p_j} \times \frac{p_j}{s_j} = \frac{\alpha}{1-\sigma} p_j(1 - \sigma s_{j|g} - (1-\sigma)s_j) \tag{20}$$

[31] 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.

Additional tables

Table 14 reports pairwise correlation between all variables included in the models of export quality and financial structure.

Table 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 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 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 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.

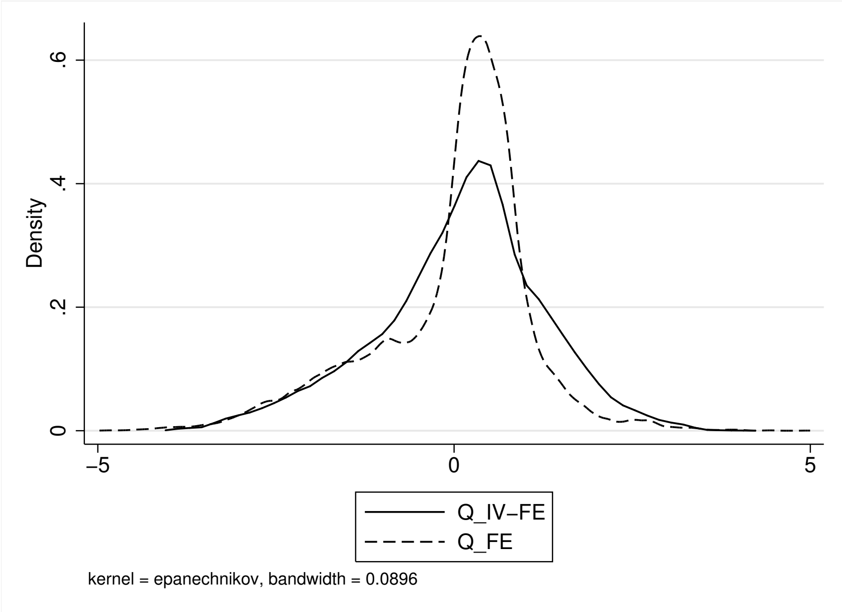
Table 16 reports estimates of the coefficient of Lev_{ft} in quantile regressions on $\hat{Q}_{ft}$ for all deciles of the dependent variable's distribution. We run the regression on the whole sample and on the samples of firms that have sufficient liquidity to cover current expenses ($Liquidity > 0$) 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 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.

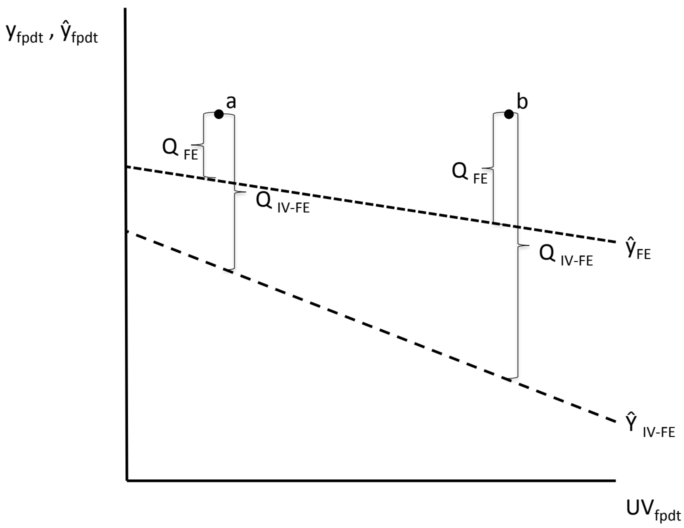
In diagram 5 we provide the intuition of why $\hat{Q}_{FE}$ underestimates the quality of high-quality varieties when compared to $\hat{Q}_{FEIV}$. On the y-axis we represented observed market-shares y_{fpdt} and predicted market shares $\hat{y}_{fpdt}$, that are computed from the estimated coefficients 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 4.

Figure 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 6. Densities are estimated using the Epanechnikov kernel function. Bandwidth are selected automatically by Stata (kdensity command).

Figure 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.

References

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.

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.

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.

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.

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. 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., 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.

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

Boutin, X., Cestone, G., Fumagalli, C., Pica, G., and Serrano-Velarde, N. (2013). The deep-pocket effect of internal capital markets. *Journal of Financial Economics*, 109(1):122–145.

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

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

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.

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.

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*.

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.

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.

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

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

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.

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.

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

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.

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.

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

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

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.

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.

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.

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

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.

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).

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