Export Quality Upgrading Under Credit Constraints

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Abstract

This paper studies whether credit constraints affect the decision of small and medium-sized enterprises (SMEs) to upgrade the quality of their exported relative to their domestically sold output. We use detailed firm-level data on Italian SMEs reporting information on output characteristics, credit rationing, international activities, and merge this with credit score data used by banks for their lending decisions. Our key finding is that credit constraints substantially affect export quality. A one standard deviation worsening in the credit score is associated with a decrease in the probability of quality upgrading of more than 35 percent. Moreover, firms exporting to distant markets cut quality upgrading more sharply when their score worsens. The negative effect of credit constraints is confirmed when taking into account firm heterogeneity in size and other relevant attributes. The main result is also robust to endogeneity considerations of the credit score. Overall, our findings suggest that quality upgrading is an important channel through which credit constraints affect the intensive margin of trade.

JEL codes: F10, F14, L15, G20, G32.

Keywords: Credit constraints, Product quality, Distance, International trade.

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1 Introduction

The negative impact of credit constraints on export has been assessed both theoretically and empirically (Minetti and Zhu, 2011; Chaney, 2013; Manova, 2013; Muûls, 2015). Exporting firms require external finance to face additional up-front costs associated with setting-up a distribution network in the destination market, product customization and advertising (Sutton, 2001; 2007). Investments associated with quality upgrading (Verhoogen, 2008; Amiti and Khandelwal, 2013; Fieler et al., 2014) and technology upgrading (Bustos, 2011) are also a critical component of export up-front costs. By upgrading output quality, manufacturers can increase export revenues and reach distant markets (Hummels and Skiba, 2004; Mayneris and Martin, 2015). Therefore, by hampering quality upgrading at the firm-level, financial constraints may strongly affect the intensive margin of trade. However, to date, empirical evidence investigating the impact of credit constraints on output quality upgrading is limited.

This paper studies the impact of credit constraints on the decision of Italian small and medium-sized enterprises (SMEs) to upgrade the quality of their exported output with respect to the one sold domestically.[1] This study, to the best of our knowledge, is the first employing firm-level data on quality upgrading and credit rationing. In fact, industry-level proxies of credit rationing would not take into account the role of firm-level heterogeneity for trade outcomes and credit availability.

SMEs have an important role in the European and the Italian economy. In 2014, SMEs represented the 80% of European exporting firms.[2] Italian SMEs accounted for 49% of total export revenues and represented 90% of exporting firms, as of 2011 (Cernat et al., 2014). Since SMEs tend to rely on bank-credit as their main source of external finance, they may be severely affected by credit market illiquidity. Indeed, evidence confirms that, during economic downturns, credit sources tend to dry-up more rapidly for small and medium firms than for large companies. As a consequence, the support to SMEs is currently considered an important target for policies aimed to improve the performance of EU manufacturing firms (ECB; 2013).

We empirically investigate the role of financing constraint using a firm-level, time-varying, measure of credit constraints, based on the credit scores of an external rating agency and study how this affects the probability that the firm supplies a product of higher quality to the foreign market. Given that output quality is positively correlated with the unit value at which a product is sold, our study sheds light on how financing constraints affect this important component of the intensive margin of trade. Results show that credit-rationed SMEs are less likely to upgrade output quality. A standard deviation worsening in the credit score is associated with a sizeable decrease in the probability of quality upgrading of more than 35 percent. We also investigate how distance to the export market and credit rationing jointly affect quality upgrading. We find that the impact of credit constraints is larger on firms exporting to distant markets.

A potential concern is that endogeneity of the credit score might affect our estimates. Quality upgrading might be considered as an indicator for the economic performance of the firm, thereby affecting its score. Moreover, unobservable characteristics might lead us to find biased results. Our first strategy to address endogeneity treats the recent economic crisis as an exogenous shock to credit supply. We exploit

[1] We define quality upgrading as the difference in the quality content of products supplied to two different markets rather than as a change in the quality of the same product over time, as in Verhoogen (2008).

[2] In fact, while few exporters account for the great part of EU export revenues (Mayer and Ottaviano; 2008), the majority of EU exporting firms are actually SMEs, see Cernat et al. (2014), and the SBA Fact Sheet 2014 of the European Commission.

variation in the score explained by the economic crisis as a proxy for credit rationing, after controlling for variables representing the economic and financial performance of the firm. Results show that, among two equally productive firms, the one whose score was negatively affected by the crisis is less likely to upgrade output quality. The second strategy employs an instrumental variable approach using the average score in the years before the crisis and the number of banks lending funds to each firm as instruments. Both strategies strongly confirm the main finding.

In order to guide our empirical investigation, we lay out a theoretical framework based on Feenstra and Romalis (2014). In this model, firms endogenously choose output quality taking into consideration distance to the foreign market. The per-unit trade cost affecting the firm's optimal quality choice increases with distance. Any increase in the per-unit trade cost leads to a relatively larger increase in the price of low-quality goods. As a consequence, high-quality products are more likely to be exported to distant markets with respect to low-quality ones, confirming the "Good apples out" theorem (Alchian and Allen, 1964; Hummels and Skiba, 2004). We extend this framework by introducing credit availability, represented by the share of revenues the firm receives as external credit to finance the fixed cost of production, similarly to Sutton (2001, 2007) and Fan et al. (2015). The optimal ratio between output quality for the foreign and the domestic market depends then on distance as well as credit availability. Our theoretical framework yields two testable predictions: (a) the lower the credit availability, the more constrained the firm is, and the less likely it is to increase the ratio between exported and domestic output quality; (b) the more distant the export destination, the larger is the negative relation between credit constraints and quality upgrading.

Model predictions are tested using Italian firm-level data. We employ the "VIIIth UniCredit Survey on Italian SMEs," ran in June-September 2011, to obtain, among others, information on firms' international activities, output characteristics and credit rationing. The dependent variable is a dummy for firms declaring, in the survey, to supply output of higher quality for the foreign market with respect to the one sold at home, as of 2010. To this rich data-set we merge balance sheet data for the period 2002-2010. Our proxy for credit rationing, the credit score, is assigned to the firm by an external rating agency.[3] This score is an independent, annually updated, measure available to each institution operating in the Italian credit market, frequently used by bank managers when deciding on whether to open or to increase a firm's credit line. By associating financial constraints with a discrete variable, rather than a dichotomous one, we are able to measure the impact of a worsening in credit rationing. Moreover, this proxy is directly linked to the variable used in our theoretical framework: as credit availability decreases, the cost of additional funds increases proportionally to the credit score.[4]

We observe that a worsening in the credit score is associated with a significant reduction in the probability of quality upgrading. We then test the prediction that firms exporting to distant markets have higher incentives to upgrade output quality, and therefore should be the most harmed by credit rationing. Results show that the negative relation between credit constraints and quality upgrading is stronger on firms selling their products outside Europe. Indeed, the negative effect of a standard-deviation worsening

[3] We obain this data from CEBI - CERVED, "Centrale Bilanci", the main independent source of information on firms' credit whortiness available to financial and credit institutions operating in Italy.

[4] Panetta et al. (2009), find that this score is positively correlated with the median interest rates charged by banks to firms.

in the external score is 28 percentage points larger on firms exporting outside Europe with respect to those exporting within Europe.

Our findings are robust when considering alternative indicators of credit rationing, such as industry-level finance dependence. Moreover, we study how firm size interacts with credit constraints in determining quality upgrading. Results show that small firms in our sample, identified as those firms reporting less than 50 employees, are significantly hit by credit constraints, while larger ones are less affected: the marginal effect of an increase in the score doubles for small firms. Finally, we take into consideration alternative proxies for the economic performance of the firm, such as earnings before interest, taxes, depreciation and amortization (Ebitda), control for revenues in the foreign market, and for different proxies of a firm output's position in the quality-ladder.

This work lies at the intersection between two strands of the literature. The first studies the relation between output quality and importing market attributes, such as distance and income. Findings show that export output quality is increasing with distance and average income in the importing country (Hummels and Skiba, 2004; Hallak, 2006; Crinò and Epifani, 2012; Martin, 2012; Mayneris and Martin, 2015).

The second strand studies the impact of credit constraints on the probability that a firm becomes an exporter and on its output-quality choice. Chor and Manova (2012) find that industries relying more on external finance report a higher sensitivity of exports to the cost of external finance and that this sensitivity increased during the financial crisis.[5] Manova (2013) introduces credit market frictions in a heterogeneous-firms trade model. The impact of a reduction in credit availability reinforces the selection mechanism already at work in the heterogenous-firms trade model: small and less productive exporting firms suffer heavily from credit rationing since they tend to rely more on external funds. As a consequence, financially developed economies export more in financially vulnerable sectors because their firms are able to enter more markets and report higher export revenues. Minetti and Zhu (2011), on data from Italian manufacturing firms, find that credit constraints negatively affect firms' export participation and foreign sales. Muûls (2015) proposes a firm-level analysis on data from Belgium to study the interaction between credit constraints and trading behaviour. Considering the Coface score as a proxy for credit constraints, Muûls (2015) finds that credit constrained firms export and import less than non-constrained ones and that the intensive margin of export is negatively and significantly associated with credit constraints.[6] Constrained exporting firms report lower revenues since they export fewer products to less destinations; it is then crucial, in our view, to determine whether the possibility of differentiating quality across markets is also affected by credit rationing.

The empirical literature on credit constraints and output quality has, so far, mainly relied on industry-level proxies of credit rationing and on measures of product quality obtained from international trade data. Fan et al. (2015), using Chinese data, find that credit constraints, proxied by industry-level finance dependence, lead firms to reduce quality, proxied by unit values of exported products.[7] Employing the methodology proposed by Khandelwal (2010) to estimate product quality, Crinò and Ogliari (2015) confirm the negative impact of financing constraints on average quality at the product/country level.

[5] On the impact of financial shocks on exporting firms see also Amiti and Weinstein (2011).

[6] Refer also to Besedeš et al. (2014).

[7] Choi and Lugovskyy (2015) suggest that the impact of financial development on export prices has different implications for countries with different levels of productivity and income. Eckel and Unger (2015) propose a theoretical framework explaining positive as well as negative correlations of firm-level FOB prices with financial frictions and variable trade costs.

Their study shows that heterogeneity in product quality is affected by the interplay of cross-industry heterogeneity in financial vulnerability and cross-country differences in financial frictions. Bernini et al. (2015), using the same proxy for product quality, confirm that a high firm's leverage negatively affects export quality.

Our study contributes to this literature by introducing a firm-level, externally assessed, measure of credit rationing to determine how credit constraints affect the probability that exporting SMEs upgrade the quality of their exported relative to their domestically sold output. Furthermore, we provide evidence on the interplay between distance to the destination market, quality upgrading and credit constraints.

This paper is organized as follows. In section 2 we illustrate the theoretical framework guiding our empirical analysis. In section 3 the data-set at our disposal is described. Section 4 discusses results, while section 5 addresses the endogeneity of our explanatory variable. In section 6 we test the robustness of our results. Section 7 concludes the paper.

2 Model

In this section, we extend the static framework proposed by Feenstra and Romalis (2014) in order to account for the role of credit constraints. We study how a firm, *j*, exporting from country *i* to country *k,* sets the ratio between output quality for the two markets, domestic and foreign, given its credit availability. We solve for the optimal quality of exported and domestic products subject to credit availability, assuming that the firm maximizes profits in the two markets independently. This implies that the lending bank has perfect knowledge on whether the firm is borrowing money to finance the production of output for the foreign or for the domestic market.[8]

2.1 The Consumer

Each consumer in country k consumes *i=1,...,N* varieties of a differentiated product in a single sector. Output is produced in different countries, i indicates the exporting country, while j refers to the single firm. The price and quality of a good exported from i to k are p_i^k and z_i^k. Demand in k is determined by the expenditure function $E^k = E(p_1^k/z_1, ..., p_N^k/z_N, U^k)$. Quality is a shift parameter in the expenditure function.[9] Taking the derivative of the expenditure function with respect to the price of variety i, we obtain the Hicksian demand for variety i in country k:

$$q_i^k = \frac{\partial E^k}{\partial p_i^k} = \frac{\partial E^k}{\partial P_i^k}\frac{1}{z_i^k}. \tag{1}$$

Quality-adjusted demand is $Q_i^k = z_i^k q_i^k$, while the quality-adjusted price is $P_i^k = \frac{p_i^k}{z_i^k}$, so to have $Q_i^k = \frac{\partial E^k}{\partial P_i^k}$.

2.2 The Firm

A firm j, in country i, makes its optimal choice on the quality, z_{ij}^k, of the good to be sold in the foreign market, k. Feenstra and Romalis (2014) introduce both specific and iceberg trade costs: T_i^k is the specific per-unit trade cost which is increasing in distance between country i and country k. The iceberg trade cost, τ_i^k, applies instead to the total value of traded products, including the specific per-unit trade cost.[10] If we denote by p_i^{*k} the f.o.b price in the exporting country, i, the c.i.f price in the importing country, k, is equal to $p_i^k \equiv \tau_i^k(p_i^{*k} + T_i^k)$. Following the original model, output is produced employing a composite input in quantity x_{ij}^k. To produce one unit of a product with quality z_{ij}^k, a firm transforms a quantity x_{ij}^k of variable input using a Cobb-Douglas technology:

$$z_{ij}^k \equiv \left(x_{ij}^k \varphi_{ij}\right)^{\gamma}. \tag{2}$$

With φ_{ij} defining firm's productivity and $0 < \gamma < 1$ indicating diminishing returns to quality.

[8] Feenstra et al. (2014) study the impact of credit constraints on exporting firms jointly maximizing their profits in the two markets. To do so, they assume that the bank has no information on whether the firm is employing borrowed funds to finance production for the foreign or the domestic market. In this case, the firm faces one constraint while the bank only observes how production is allocated between the two markets.

[9] For the sake of simplicity we do not consider non-homothetic preferences and the role of ad-valorem tariffs, denoted by tar_i^k in Feenstra and Romalis (2014).

[10] The iceberg cost is equal to one plus the ad-valorem cost.

Assuming that the unitary cost of the variable input x_{ij}^k is w_i, the marginal cost of producing a good with quality z_{ij}^k is:

$$c_{ij}(z_{ij}^k, w_i) \equiv w_i (z_{ij}^k)^{1/\gamma} / \varphi_{ij}. \tag{3}$$

Recalling that q_{ij}^k represents demanded quantity in country k, the total cost of producing for country k, TC_{ij}, is the sum of the variable cost, $c_{ij}(z_{ij}^k, w_i) q_{ij}^k$, and of the fixed cost to start producing an output with quality z_{ij}^k for market k : $F_{ij}^k = f^k w_i (z_{ij}^k)^{1/\gamma}$.[11] This cost is paid by firms exporting to k for expenditures in R&D, marketing, and innovation, as in Sutton (2001; 2007). In quality adjusted terms, $\frac{F_{ij}^k}{z_{ij}^k} = f^k \frac{w_i \left(z_{ij}^k\right)^{1/\gamma}}{z_{ij}^k}$, where f^k is a constant.[12] Higher the quality of the output, larger the costs that the firm faces. Notice that the effectiveness of the fixed cost depends on output quality and equals the one in the variable cost. The total cost function is then equal to:

$$TC_{ij} = c_{ij}(z_{ij}^k, w_i) q_{ij}^k + F_{ij}^k. \tag{4}$$

Firm's profits in market k read as follows:

$$\pi_{ij}^k = [p_{ij}^{*k} - c_{ij}(z_{ij}^k, w_i)] \tau_i^k q_{ij}^k - F_{ij}^k. \tag{5}$$

Rewriting (5) in quality-adjusted terms, using the definition of the fixed cost in quality-adjusted terms, $\frac{F_{ij}^k}{z_{ij}^k} = f^k \frac{w_i \left(z_{ij}^k\right)^{1/\gamma}}{z_{ij}^k}$, and of the quality-adjusted c.i.f price, $P_{ij}^k \equiv \tau_i^k (p_{ij}^{*k} + T_i^k)/z_{ij}$, we have:

$$\pi_{ij}^k = \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k - f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}. \tag{6}$$

2.3 Credit Constraints

We now introduce credit constraints in the firm's profit maximization problem, assuming that the firm obtains a fraction $\theta \epsilon [0,1]$ of its revenues in market k to finance the fixed cost of producing a good with quality z_{ij}^k.

The firm finances the total amount of the fixed cost with bank credit.[13] Therefore, when θ decreases the firm has less credit available. The budget constraint takes the following form:

$$\theta \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k \right\} \geq f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}. \tag{7}$$

[11] Moxnes (2010) confirms that fixed cost of exporting can be market specific.

[12] The firm has to invest x_{ij}^k units of input in its technology to start producing an output with quality z_{ij}^k for market k. This investment is equal for all firms exporting to k, and does not depend on firm's productivity but only on the effectiveness of technology, $\frac{1}{\gamma}$.

[13] It is possible to solve the model considering the possibility that the firm finances a fraction $d \epsilon [0,1]$ of the fixed cost, as in Fan et al. (2015), obtaining results in line with those presented here. Derivations for this extension are available upon request. Here we assume *d=1* to simplify our exposition.

The profit maximization problem reads as follows:

$$\max_{P_{ij}^k, z_{ij}^k} \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k - f^k \frac{w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma}}}{z_{ij}^k} \right\} \tag{8}$$

subject to (7). Using the definition for the marginal cost of production, $c_{ij}(z_{ij}^k, w_i)$, and introducing λ to represent the Lagrange multiplier, the FOC with respect to z_{ij}^k leads us to find,[14]

$$(z_{ij}^{*k})^{1/\gamma} = \frac{\tau_i^k T_i^k Q_i^k}{\left(\frac{1}{\gamma} - 1\right) w_i \left(\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k + \frac{1+\lambda}{1+\lambda\theta} f^k \right)}. \tag{9}$$

Optimal quality supplied to market k is increasing in the specific per-unit trade cost, T_i^k, in firm's productivity, φ_{ij}, and decreasing in the term $\left(\frac{1+\lambda}{1+\lambda\theta}\right)$, representing the distortion in output quality due to credit constraints. The FOC with respect to P_{ij}^k, the quality-adjusted c.i.f price, confirms that the firm charges a price equal to a mark-up over the marginal cost,

$$P_{ij} = \left(\frac{\sigma}{\sigma - 1} \right) \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k}. \tag{10}$$

It is important to notice that our solution for the quality-adjusted price does not directly depend on credit availability, which affects (10) only through z_{ij}^{*k} and $c_{ij}(z_{ij}^{*k}, w_i)$.

There exists a cutoff level of credit availability, θ, such that the budget constraint (9) is binding for $\theta^* < \theta$. Using (the inverse of) θ as a proxy for a firm's credit availability (constraint) and imposing that the budget constraint is binding, it is possible to solve for the distortion in output quality due to credit constraints. Substituting the solution for $\frac{1+\lambda}{1+\lambda\theta}$ in (10), we obtain optimal output-quality supplied to market k when the budget constraint is binding:

$$z_{ij}^k = \left[\frac{\tau_i^k T_i^k Q_i^k}{\left[\frac{\sigma-1}{\theta} f^k w_i - \tau_i^k Q_i^k \right]} \right]^{\gamma}. \tag{11}$$

Knowing that Q_i^k, the quality-adjusted quantity, does not depend on θ, we can differentiate (11) with respect to z_{ij}^k. Assuming that $\left[\frac{\sigma-1}{\theta} f^k w_i - \tau_i^k Q_i^k \right] > 0$, we find that $\frac{\partial z_{ij}^{*k}}{\partial \theta} > 0$. Less rationed the firm is, the higher the output-quality supplied to the foreign market. Moreover, the impact of θ on z_{ij}^k is increasing in T_i^k, the destination specific per-unit cost, $\frac{\partial z_{ij}^k}{\partial \theta \partial T_i^k} > 0$, provided that $\left[\frac{\sigma-1}{\theta} f^k w_i - \tau_i^k Q_i^k \right] < \frac{1}{(1-\gamma)}$.

We now assume that the exporting firm produces also for the domestic market. Our aim is to find an optimal solution for output quality in the domestic market assuming that the firm maximizes its profits in the two markets, i and k, independently. We solve the profit maximization problem for firm j in the domestic market i, assuming that it faces a fixed cost $f^i \frac{w_i \left(z_{ij}^i \right)^{\frac{1}{\gamma}}}{z_{ij}}$, which is proportional to output quality. When producing for the domestic market the firm does not pay any ad-valorem trade costs: τ_i^k is equal to one. Moreover, we assume that the specific unitary trade cost, T_i^k, is equal to one.[15] Our firm finances

[14] Refer to the appendix for derivations.

[15] This assumption is consistent with Feenstra-Romalis (2014).

the total amount of the fixed cost obtaining a fraction, $\theta\epsilon[0,1]$, of its revenues in the domestic market i as credit. When θ decreases, the firm has less credit available and it is more likely to be credit rationed.

Firm's profits in the domestic market are maximized as follows:

$$\max_{p^*_{ij},z^i_{ij}} \left\{ \left[p^*_{ij} - \frac{\left(c_{ij}(z^i_{ij},w_i)+1\right)}{z^i_{ij}} \right] Q^i_i - f^i \frac{w_i \left(z^i_{ij}\right)^{\frac{1}{\gamma}}}{z^i_{ij}} \right\} \tag{12}$$

subject to

$$\theta \left\{ \left[p^*_{ij} - \frac{\left(c_{ij}(z^i_{ij},w_i)+1\right)}{z^i_{ij}} \right] Q^i_i \right\} \geq f^i \frac{w_i \left(z^i_{ij}\right)^{\frac{1}{\gamma}}}{z^i_{ij}}. \tag{13}$$

Using the same solution method followed to find optimal quality in the foreign market, we can derive optimal output-quality supplied to the domestic market when the budget constraint is binding: $z^i_{ij} = \left[\frac{Q^i_i}{\left(\frac{\sigma-1}{\theta}\right) f^i w_i - Q^i_i} \right]^{\gamma}$. It is now possible to compute the ratio between output-quality supplied to the foreign, z^k_{ij}, and to the domestic market, z^i_{ij}:

$$\left(\frac{z^k_{ij}}{z^i_{ij}}\right)^{\frac{1}{\gamma}} = \left(\frac{Q^k_i}{Q^i_i}\right) \frac{\tau^k_i T^k_i \left[f^i w_i (\sigma-1)\theta^{-1} - Q^i_i\right]}{\left[f^k w_i (\sigma-1)\theta^{-1} - \tau^k_i Q^k_i\right]}. \tag{14}$$

Proposition 1 *When θ, the fraction of revenues that a firm obtains as credit in order to finance the fixed cost, decreases, the ratio between output quality supplied to the foreign and the domestic market decreases, if $\frac{Q^k_i}{Q^i_i}\tau^k_i > \frac{f^k}{f^i}$.*

Proof. *Refer to the appendix* ■

This first proposition states that as credit availability (rationing) is reduced (increases), the firm is less likely to increase the quality content of exported products with respect to the quality of products sold in the domestic market.[16] This result holds as long as the ratio between the quality-adjusted quantities supplied to two markets, multiplied by the iceberg trade cost, is larger than the ratio between the constant terms in the fixed cost for the foreign and the domestic market.

Proposition 2 *As T^k_i, the specific unitary cost to ship a product to the foreign market k, increases, the ratio between output quality supplied to the foreign and the domestic market augments when θ increases. Since T^k_i is increasing in distance between the domestic and the foreign market, credit constraints impact more on output quality upgrading by firms exporting to distant markets.*

Proof. *Refer to the appendix* ■

Given that firms exporting to more distant markets are more likely to export an upgraded version of their product, a reduction in credit availability should affect more this sub-group of exporting firms.

[16] Notice that the quality-adjusted quantities in the two markets, Q^k_i and Q^i_i, do not depend on credit availability. This enables us to differentiate (14) considering quality-adjusted quantity as constant.

3 Data

The econometric analysis carried out in this paper is based on data from the "VIIIth UniCredit Survey on Italian SMEs" ran in the summer of 2011. The sample was designed according to a stratified selection procedure so that findings are representative at the firm, industry and geographical level. The sample size of the survey consists of 7436 non-financial firms, among these 1057 are manufacturing. Given our research question, we focus exclusively on data from manufacturing firms. The main strength of this database is the very detailed information it collects on individual firms. In particular, the 2011 wave features information regarding firms's: (a) characteristics;[17] (b) innovation; (c) financial structure and bank-firm relationship; (d) credit availability; (e) production characteristics; (f) collaboration and cooperation agreements; (g) internationalization strategies. We also have access to annual balance sheets of all firms involved in the survey for the period 2002-2010. Along with firms' balance sheets, firms' credit ratings (Scores) from both UniCredit and CEBI ("Centrale Bilanci") are at our disposal.

3.1 Main Variables

High Quality Out. Our dependent variable is a dummy equal to one if the firm answers "higher" to the following question: "How would you define the quality of your exported output compared to the one you sell in the domestic market ?" Firms are asked to compare the quality of exported output with the one sold in the domestic market without introducing a definition of output quality. We are however confident that who answers this question in the interview is capable of disentangling quality differences between exported and domestic output by referring to the cost of inputs employed for producing the two varieties (Verhoogen, 2008). Moreover, this question is placed in the "internationalization section" of the survey, where firms are asked to describe their stance in international markets: it is unlikely that who answers other questions regarding a firm's export activity is not aware of differences in product characteristics that make exported-output quality different from the one sold in the domestic market. Moreover, preliminary evidence on our data confirms that the probability of a firm declaring to increase output quality for the foreign market is positively correlated with firm-level variables usually found in the literature to be correlated with standard measures of product quality, such as labour productivity and firm size. When answering this question, firms can also declare that they export products of lower or equal quality with respect to the one produced for the domestic market. In our main specifications, we will compare firms that declare to export a product of higher quality with those declaring to supply products of equal quality to the two markets.

Measures of Credit Rationing. Our aim is to find a proxy for credit constraints at the firm level, an observable variable representing the inverse of the term θ employed in the theoretical framework. As previously said, when θ decreases the firm has less external funds available to finance the fixed cost of exporting a product with a given quality; accessing external funds becomes more costly to the firm that, as a consequence, might decide not to increase the quality content of its exported output. Our target is then a firm-level measure for credit rationing. Ideally, this measure should be a discrete one since our aim is to measure how a worsening in credit availability affects the decision of the firm regarding product quality. In the survey, firms are asked to define their credit availability in the preceding year, specifically

[17] Date of foundation, number of employees, revenues in 2010, type of industry.

they are asked to answer the following questions: (a) "In 2010 would the firm have liked to obtain more credit at the market interest rate?" and (b) "In 2010 did the firm demand more credit than it actually obtained?" In case of positive answer to both questions, a firm is defined as "strongly rationed", while in case of positive answer only to the first question, the firm is labelled as "weakly rationed".[18] We might rely on this variable as a proxy for credit rationing, however: (i) it is available only for year 2010; (ii) does not give any information on the extent to which credit rationing differently affects firms.

Referring to balance sheets data, it is possible to extract other valuable information on a firm's economic and financial status. For the sub-group of firms in the sample that in 2011 were customers of UniCredit, we can also compute the ratio of credit used over total credit available from banking institutions.[19]

External Credit Score. Along with balance sheet data, we obtain the firm's external score, spanning from 1, for firms in good financial/economic health, to 9, for firms with a high probability of default.[20] Similarly to Muûls (2015), we consider the credit score as a reliable proxy for credit constraints under the assumption that when a firm reports a worse score it is more difficult and more costly to obtain credit at the current market's interest rate. In the following section, we support this choice with several econometric tests. The idea of using a firm's credit score as a measure for credit constraint is quite common in the Corporate Finance literature. Panetta et al. (2009) find that the score is positively correlated with the median interest rate charged by banks to Italian firms. In their sample, the best score is, on average, associated with a loan interest rate of 4%, whereas the worst score-category pays a loan interest rate of 5%. Panetta et al. (2009) also confirm that the external score is an accurate predictor of actual default-incidence among Italian firms.[21]

Balance Sheet Data. We consider a number of variables that are correlated with a firm's decision to upgrade the quality of exported output and with its credit availability. From balance sheet data, we obtain our proxy for firm's size, the number of employees. Large firms often produce for the foreign market and, since revenues are correlated with size, often have large funds available to invest in quality differentiation.[22] We also introduce a variable that is found in the empirical trade literature, as well as in our framework, to be positively correlated with output quality: firm productivity.[23] We compute labour productivity as the ratio between total value-added and the number of employees in each year. Moreover, we construct variables representing the amount of financial resources generated internally and the use of external finance by the firm. In particular we have information on (i) firm's leverage ratio, defined by firm's total liabilities over equity; (ii) liquidity ratio, obtained dividing current assets less current liabilities by total assets; (iii) cash flow, equal to net revenues over total equity; (iv) capital intensity, the ratio between total fixed assets and the number of employees and (v) Ebitda, earnings before interest, taxes, depreciation and amortization. It is important to recall that variables from (i) to (iii) have often

[18] See Guiso et al. (2004) and Minetti and Zhu (2011).

[19] Precisely, we obtain two different measures: one reporting information on long-term credit use, total credit used over total credit available in the three years preceding the survey, and another on the amount of credit used over credit available in 2010.

[20] This is the score classification: 1, highly safe, 2, safe, 3, highly solvent, 4, solvent, 5, vulnerable, 6, highly vulnerable, 7, at risk of default, 8, high risk of default, 9, very high risk of default.

[21] Rodano et al. (2012) employ it as an indicator for the likelihood of default.

[22] See Bernard et al. (2004), Minetti and Zhu (2011).

[23] See Verhoogen (2008), Baldwin and Harrigan (2011), Crinò and Epifani (2012).

been used in the literature as proxies for credit rationing.[24] In our study, these measures are employed as controls since we expect our main explanatory variable, the credit score, to be highly representative of a firm's credit rationing. A firm's leverage ratio would give us information on the amount of credit received by the firm with respect to the resources generated internally; however, the amount of external funds obtained by a firm is the result of its production technologies, investment decisions and business cycles, and, as such, it gives only a partial information on how difficult and costly accessing to external finance might be for the firm. The external score is instead an information that is known by all banking institutions across Italy. It is probably the first statistic checked by a Bank's local-branch manager when asked to increase the upper limit or to open a new credit line for a firm, and it drives his/her decision on whether to finance a firm.

Other Survey Data. We introduce several variables that are correlated with a firm's decision to upgrade the quality of its exported output. In the survey, firms are asked to state the percentage of University graduates in their labour force, when the firm was founded,[25] whether they are part of a business group, a corporation or a consortium and if they are located in the Center, the South or the North of Italy. Firms employing a skilled labour force and those active for several years are often found to be more productive and to supply high-quality products.[26] Being part of a corporation or of a business group might give incentives to invest in innovation and in quality upgrading practices and decrease the need of external finance for the firm. Moreover, given the peculiar features of the Italian economy and the fragmentation of its credit-market, it is crucial to consider the geographical location of the firm, since this is likely to affect its revenues, the characteristics of its labour force and its access to external finance.[27]

Province Level Variables. To this rich database, we add information on the economic activity at the province level: we introduce data on provincial value-added from 1998 to 2008, both in levels and growth rates, as obtained from the Italian National Statistical Office, ISTAT. This should enable us to consider the role that local economic conditions have for product quality differentiation across markets. In order to obtain a proxy for credit supply at the local level, we employ data on the average number of bank-branches per 1000 inhabitants in each Italian province during the period 1991-1998, available from the Bank of Italy.

Summary Statistics. Table 1 reports summary statistics on these variables for the group of exporting manufacturing firms in the year to which the survey refers, 2010.[28]

[Table 1 here]

It is important to underline that almost 12% of firms declare to export products of higher quality to the foreign market. The 3% of firms exports goods of lower quality while 85% supplies products of equal quality to the two markets. Firms exporting goods of lower quality with respect to the ones supplied domestically export mainly to EU countries. The mean size of firms in our sample is equal to 76 employees, but observing that the median is lower, 49, we can conclude that the majority of firms in the

[24] See Greenaway et al. (2007) and Bernini et al. (2015).
[25] Wang (2011) finds that the probability of exporting and the volume of exports are higher for older firms.
[26] See Bernard et al. (2004) and Minetti and Zhu (2011).
[27] See Guiso et al. (2004).
[28] Balance sheets data here reported pertain to the end of year 2010.

sample is significantly smaller. On average, exporting manufacturing firms have been active for 32 years and are mainly located in the North of Italy.[29] The percentage of the labour force holding a University degree is slightly higher than 10%. The mean and the median external credit score are relatively low and equal to 4.38 and 4, respectively, suggesting that the majority of interviewed firms were considered as being not likely to default by the external rating agency in 2010. However, 13.3% of firms declares in the survey to be strongly rationed while 26% defines itself as weakly rationed. We can compare these numbers with Minetti and Zhu (2011), using data from a similar survey on Italian firms ran in 2001. In their sample only 4.4% of exporting firms is strongly rationed and 18.5% weakly rationed. The sizeable increase in these percentages from 2001 to 2011 is most likely due to the recent economic crisis and to the subsequent credit crunch. The following histogram, based on annual survey data from the Bank of Italy, shows the increase in the share of rationed firms from 2005-2007 to 2008-2010. Rationed firms are here defined as those firms declaring to have asked and not obtained the amount of credit needed in the year before the survey. The share of rationed firms has increased both in the South and in the North/Center of Italy. Dividing firms with respect to their size, proxied by the number of employees, we notice that the share of rationed firms increased in all size-groups: small, medium and large.

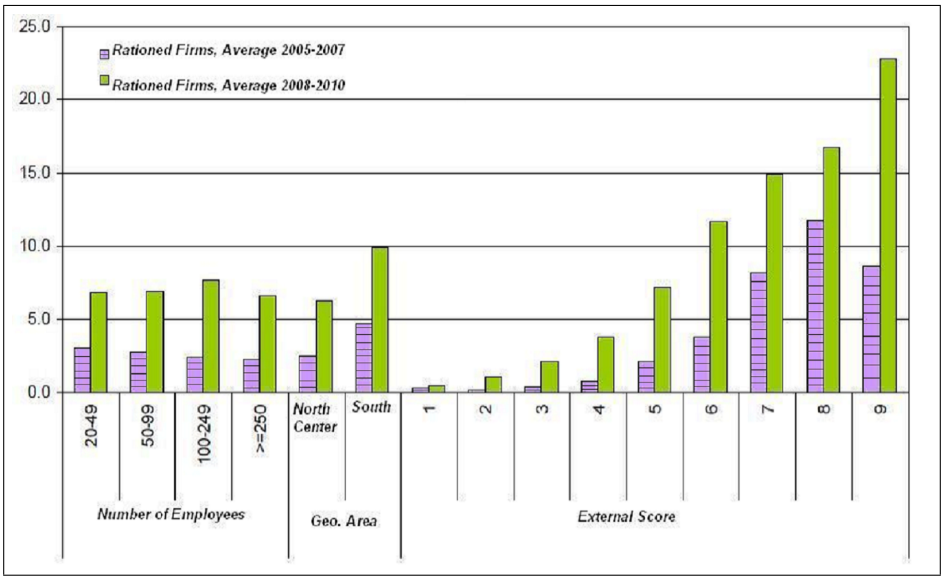

Figure 1. Increase in the Share of Rationed Firms from 2005-2007 to 2008-2010.

Selecting firms with respect to their average external score in the two periods, we observe that the share of rationed firms increases from 2005-2007 to 2008-2010 in all score categories. While the increase in the share of rationed firms among those reporting an external score equal to 4 and 5 is sizeable, the increase among the ones having the highest probability of default (score equal to 9) is extensive. We can then conclude that the years of the recent economic downturn have witnessed a worsening in access to external finance for Italian firms.

3.2 The Credit Score, supporting evidence

To support our choice of the credit score as the main explanatory variable and proxy for credit constraint, we first study the relationship between the dummy indicating whether a firm is strongly credit rationed

[29] The 74.2% is located in the North, the 15.5% in the Center and the 10.1% in the South.

in 2010, and four variables that might be considered as proxies for credit constraints. The four candidate explanatory variables are: the average of the external score for the period 2008-2010, the score assigned by UniCredit group in 2010, the average of the total credit use over total available credit in the period 2008-2010, and the average of credit use over available credit in 2010. It is crucial to underline that the last three variables are available only for those firms that were customers of UniCredit in 2010, therefore, all the evidence described in this paragraph will refer to customers of UniCredit. Notice that all these variables share the benefit of being objective and quantitative measures of credit rationing.

As previously said, our ideal measure for credit constraint would be a firm-level variable correlated with what declared by the firm in the survey on credit rationing, measuring how intensively the reduction in credit availability affects output quality upgrading. Indeed, two firms both declaring in the survey to be credit rationed might face different credit constraints. We believe it is possible to catch this cross-firm variation using the average of external credit score in the three years preceding the survey. We assess the validity of our choice reporting the following specifications where the "Strong Rationing" dummy is regressed on our four candidate explanatory variables as well as on firm and province-level control variables. In these specifications, we consider other covariates, obtained from the survey, that might impact on the probability that a firm declares to be strongly rationed: the number of creditors, the percentage of credit obtained from the principal bank over total credit, the percentage of credit over total assets and a dummy equal to one if the firm has changed principal bank in 2010.

[Table 2 here]

Results show that the external score is positively and significantly correlated with a firm declaring to be strongly rationed in 2010. The marginal effect at the means of an increase in the external score is equal to 0.067 and it is significant at the 5%. The coefficient for this variable remains significant when we run specification (5) including the other candidates: we now obtain an average marginal effect equal to 0.061, significant at the 5%. Firms with a high level of credit over assets, highly leveraged, and with a low cash-flow are also more likely to be strongly credit rationed. Interestingly, firms based in a province that has experienced a positive growth in value-added over the decade 1998-2008 are less likely to be strongly credit rationed. This last result confirms that firms face less problems in accessing external finance when they are based in a province that has experienced a positive economic growth in the recent years.

In order to further assess the validity of our quantitative measure of credit constraint, we propose a table reporting correlations between indicators for a firm's economic and financial performance and our candidate explanatory variable. Table 3 reports OLS estimates obtained when using the external score as a dependent variable. In specification (1) to (6) we exploit within-time and firm variation employing firm and time fixed-effects, while in specification (7) we use data from 2010 only and introduce industry fixed-effects. Results show that, within firms of the same size, a higher labour productivity is associated with a lower (i.e. better) external score: more productive firms are better rated and, given results reported in Table 2, have an easier access to credit.

[Table 3 here]

A higher Ebitda, liquidity ratio, and cash-flow are also associated with a lower score, while results on the leverage ratio are not uniform across specifications. Following this evidence, we conclude that

the score assigned by CEBI to Italian firms is a good predictor of credit availability and, being strongly correlated with indicators of a firm's economic and financial status, it is also a valid proxy for a firm's credit worthiness.

So far, we showed that our proxy for credit constraints is a good predictor for a firm declaring to be strongly rationed and that it is correlated with different proxies for the economic and financial performance of the firm. It is however still unclear if this variable actually differentiates firms with respect to their main characteristics and the decision to upgrade quality. In the following table we split our sample of SMEs in two different groups, "non-vulnerable" (N. V.) firms, reporting an average external score lower than 5, and "vulnerable" (V.) firms, reporting an external score equal to 5 or higher.

Table 4 reports group means, standard deviations, and T-tests for difference in means on our variables of interest in the two sub-groups. It is possible to observe that vulnerable firms are significantly less likely to upgrade output quality for the foreign market: 16% of non-vulnerable firms upgrade quality while only 6.3% of vulnerable firms do it. Moreover, in the group of vulnerable firms, 42.5% and 27.5% are weakly and strongly rationed, respectively. These percentages are significantly lower among non-vulnerable firms: almost 4% and 15% of firms in this group declare to be strongly or weakly rationed, respectively. Vulnerable firms are significantly less productive, have less cash flow, are more leveraged and less liquid. On the contrary, non-vulnerable firms are significantly older, less capital intensive and tend to be located in the North of Italy. Vulnerable exporters are then different from non-vulnerable exporters in terms of their economic performance and, most importantly, in their ability to upgrade output quality for the foreign market.

[Table 4 here]

4 Results: Upgrading Quality for the Foreign Market

In this section, we empirically test predictions obtained in the framework presented in section 2. Assuming that the dummy variable, Q_j, is equal to 1 for firms exporting an output of higher quality with respect to the one sold domestically, and employing C_j, to represent credit rationing at the firm-level, proposition 1 predicts that quality upgrading is decreasing in credit rationing: $\frac{\partial \Pr(Q_j=1)}{\partial C_j} < 0$. We rely on the following econometric model:

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta C_j + \gamma X_j + \chi T_p + \varepsilon_j > 0). \tag{4.1}$$

The probability that firm j upgrades the quality of exported output, $Q_j = 1$, depends on our explanatory variable, C_j, representing credit rationing at the firm-level, proxied by the average of the credit score in the period 2008-2010. Higher the external credit score, more rationed the firm is, the less likely it is to increase output quality for the foreign market. We control for firm-level variables correlated with firm's credit availability and with the possibility of a firm to upgrade the quality of its exported output, X_j. This vector of variables includes: firm's size, labour productivity, cash flow, liquidity ratio, capital intensity, labour skill and firm's age. We also consider variables representing economic development in the province where the firm has the headquarter, such as provincial value-added growth in the period 1998-2008, the average of provincial valued-added in the same period, and the number of bank branches

per 1000 inhabitants in each province; these variables are included in vector T_p. In these specifications, we introduce an intercept and use industry dummies, ς_{ind}, in order to account for other sources of comparative advantage and for the pattern of demand for goods.[30] If we assume that ϵ_j is i.i.d, normally distributed with mean 0 and variance 1, we have:

$$\Pr(Q_j = 1) = \Phi(\alpha + \varsigma_{ind} + \beta_1 C_j + \gamma_1 X_j + \chi_1 T_p). \tag{4.2}$$

Where Φ indicates a normal distribution function. Table 5 reports our first set of results.

[Table 5 here]

We start by considering our main explanatory variable, the average of the credit score in the period 2008-2010, and insert control variables group by group in the following Probit regressions, so to assess how the estimated coefficient changes once controlling for different covariates. The average of the external score reports, in specification (1), a negative marginal effect equal to -0.025, significant at the 1%. In specification (2), when we introduce industry level dummies, the estimated coefficient of our main variable does not change in magnitude and significance. We then insert firm-level controls obtained from balance sheets data, starting from specification (3). Results confirm that large firms are more likely to upgrade exported output quality: this coefficient is positive and significant in all of our regressions. In specification (4) we insert cash flow, liquidity ratio, leverage ratio and capital intensity. These variables all report non-significant coefficients, but, being correlated with the external score, affect the magnitude of this coefficient. We then introduce the percentage of skilled labour force in the firm and a dummy for firms declaring in the survey to have introduced an innovation in their products in the year before the survey, from specification (5) onwards. These two variables report small and non-significant coefficients. In specification (5) we also control for firm's age, and for dummies representing the organizational structure of the firm. Firms belonging to a business group are less likely to upgrade output quality, while other variables report non-significant coefficients. Our favorite specification, (7), considers the whole set of controls, including provincial value-added growth and the number of bank branches at the province level. Firms located in provinces that experienced a positive growth in value-added from 1998 to 2008 are less likely to upgrade output quality. This result confirms that firms located in more developed provinces have lower incentives to vary the quality of exported output given that their domestic demand, and the supposedly high-level of market competition, selects those firms producing an output quality closer to the one demanded by the foreign market. In specification (8), we consider the level of provincial value-added, results do not change and this variable reports a non-significant coefficient.[31]

This first set of estimations shows that the marginal effect of our proxy for credit constraint always enters with a negative and significant coefficient. Interestingly, the magnitude of the marginal effect for this variable remains quite stable across all specifications, ranging from -0.019 to -0.030. Relying on the marginal effect estimated in specification (8), we observe that, ceteris paribus, a standard deviation increase in the average external score is associated with a 35% reduction in the probability of quality

[30] Using the ateco two-digit classification, firms in our sample belong to 25 different industries.

[31] Both the level and the growth rate of provincial value added might affect output quality influencing the demand for goods produced by the firm and for goods of higher quality.

upgrading.[32] Referring to Table 6, the reader can compare results obtained in specification (7) of Table 5 with those obtained estimating a linear probability model on the same specification, in (1) and (2) respectively. Estimated coefficients are very similar. Results confirm that credit constrained firms are less likely to upgrade the quality of exported output, while larger firms are more likely to pursue this strategy.

[Table 6 here]

In specification (3), we change our dependent variable to "Quality". This variable takes three different values: it is equal to 0 if a firm declares to export output of lower quality with respect to the one supplied to the domestic market, equal to 1 if the firm states that the quality of products supplied in the two markets does not differ, and equal to 2 if the firm declares to produce output of higher quality for the export market. We run an ordered probit model using our main explanatory variable and the usual set of controls. Results for this last specification are in line with the ones previously described. The average marginal effect of the external score on the probability of quality upgrading is equal to -0.026 and it is significant at the 5%.

4.1 Export destination and credit constraints

Following the intuition of Alchian and Allen (1964), several studies investigated the relation between distance to export destination and quality of exported output.[33] These studies, mostly employing unit values as proxies for output quality, find that firms supply high-quality products to more distant markets. Our theoretical framework suggests that firms exporting to more distant markets should be more affected by a worsening in credit constraints when optimally setting the quality difference between exported and domestic products: $\frac{\partial\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}}}{\partial\theta\partial T_i^k} > 0$.

In the survey at our disposal, firms are asked to declare to which markets they export. These markets are identified in terms of geographic macro-areas: North-America, Latin-America, Africa, Mediterranean Countries,[34] Asia,[35] China-India, Oceania, European main markets for Italian exporters,[36] European secondary markets for Italian manufacturers,[37] and East-European countries.[38] Given this information, we differentiate firms setting a dummy equal to 1 for those exporting outside the European area (EU).[39] As found in the theoretical framework, firms exporting outside the European area should face higher per-unit transportation costs with respect to firms exporting only in Europe. We study the role of credit constraints for these firms by interacting this dummy variable with our main explanatory variable: the average external score obtained by the firm during the period 2008-2010.

[32] We obtain this number multiplying the average marginal effect of this variable, as obtained in specification (8) 0.029, by its standard deviation in the estimation sample, 1.82. We then divide the result by the share of firms that upgrade export output quality in the estimation sample: 15%.

[33] See Hummels and Skiba (2004) and Martin (2012), among others.

[34] North Africa and the Middle East.

[35] Including countries in the Arabic peninsula.

[36] Germany, France, UK and Spain.

[37] Switzerland, Sweden, Belgium, the Netherlands.

[38] New EU members, Balcanic Countries and Russia.

[39] We identify as exporters to the European area firms declaring to be exporters in European main markets, European secondary markets and East-European countries. We refer to EU as a geographical area and not as a political-economic entity in this study. Moreover, we do not consider observations from firms whose most distant export market outside the EU is in the Mediterranean.

Equation (4.3) reports the econometric model estimated in the following table.

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta C_j + \lambda OutEu_j + \delta OutEu_j * C_j + \gamma X_j + + \chi T_p + \varepsilon_j > 0) \tag{4.3}$$

[Table 7 here]

We test the following prediction: the probability of quality upgrading should be decreasing in the term interacting the proxy for credit rationing (the opposite of credit availability, θ) and export destination, $\frac{\partial \Pr(Q_j=1)}{\partial(C_j * OutEu_j)} < 0$. Table 7, reporting coefficients and not average marginal effects, shows two interesting results. First, firms exporting outside the European area would be more likely to upgrade exported output quality, would the average credit score be equal to zero. Moreover, these firms are the ones whose probability of quality upgrading is more affected by credit availability. A standard deviation worsening of the credit score is 28% larger on firms exporting outside Europe.[40] This finding, which has not been documented so far in the literature, might be explained in two ways. First, Italian firms exporting inside Europe might be less likely to upgrade quality since these markets are more similar to the domestic one, therefore they might be less affected by credit rationing when deciding on output quality. A second explanation might be related to the Alchian-Allen effect: in order to export their products to non-European markets, firms need to upgrade the quality of their output so to reduce the incidence of the per-unit trade cost on the final price of their products in the destination market. Coefficients reported in Table 7 also confirm that more productive and large firms are capable to upgrade the quality of exported output. Figure 2, based on the marginal effects obtained in the last specification reported in Table 7, shows the average marginal effect for different values of the credit score (X axis) on the probability of quality upgrading for firms exporting outside Europe (Y axis).[41] An increase in the score is associated with a reduction in the probability of quality upgrading. The magnitude of this effect is negative and significant for exporters outside the EU reporting an average external score higher than 4, and remains negative, and of a similar magnitude, for larger values of the score.

[40] To obtain this number we compute the average marginal effect of the interaction term, as in Norton et al. (2004) and Karaca-Mandic et al. (2012).

[41] We rely on the methodology proposed in Norton et al. (2004) to compute marginal effects for interaction terms in non-linear models.

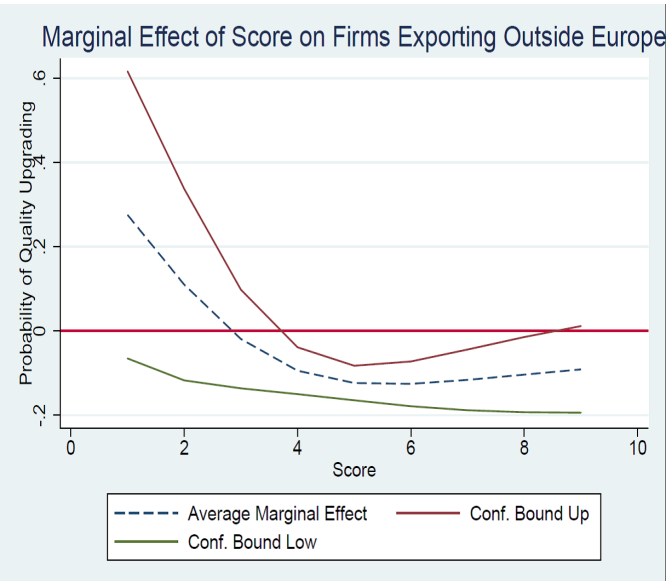

Figure 2. Score, Impact on Quality Upgrading for Firms Exporting Outside EU.

Considering all export destinations as equally affecting quality upgrading might be considered as a strong assumption. In order to further investigate on this, we now employ an alternative estimation strategy. We focus on the sub-sample of firms exporting to the main European markets for Italian exporters: France, Germany, UK and Spain. Among these firms, we select those also exporting to North America. The United States are the largest market for Italian manufacturing firms after the European: many Italian firms export to this market on top of exporting to one or more EU destinations. A dummy equal to one for firms exporting to North America is then interacted with our proxy for credit rationing, as in 4.3. Results, reported in Table 8, confirm previous findings.

[Table 8 here]

Among exporters to the main European destinations, firms exporting also to North America are more affected by a worsening in the external score. The coefficient for the dummy variable is positive and significant: if the external score and the interaction term would be equal to zero, exporting to North America would be positively correlated with quality upgrading. This result strongly reinforces conclusions drawn on the previous Table. Adding a distant foreign market (i.e. North America) is associated with a larger impact of credit constraints on quality upgrading by firms already exporting to the largest EU markets. Figure 3 reports the marginal effect of an increase in the credit score (X axis), obtained from specification (4) of Table 8, on the probability of quality upgrading by exporters to North America (Y axis). A worsening in the credit score is associated with a reduction in the probability of quality upgrading. The coefficient is negative and significant for exporters to North America reporting an average score between 5 and 8.

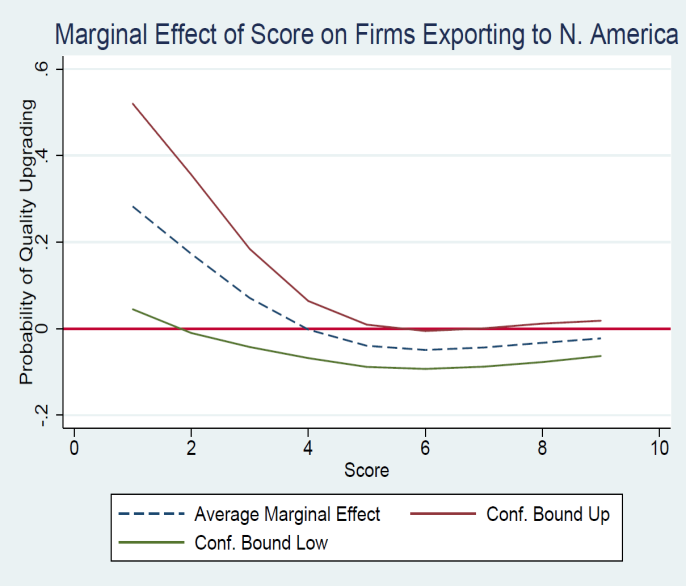

Figure 3. Score, Impact on Quality Upgrading for Firms Exporting To North America.

5 Addressing Endogeneity

Endogeneity of the main explanatory variable might bias the estimates discussed in the previous section. First of all, even if a firm's score is determined by the external agency after analyzing its economic performance, it might be influenced by the impact of the recent economic crisis. Credit supply and credit demand factors may jointly affect the external score, giving rise to a simultaneity bias. Evidence confirms that during the recent economic crisis, Italian credit institutions decreased the amount of loans and strongly reduced the number of loans to risky debtors.[42] This factor might have influenced the external rating agency when determining firms' external scores during the crisis.

We address this issue trying to isolate the supply-side effect of the recent economic-downturn on Italian firms. We retrieve the amount of variation in the external score explained by the crisis once controlling for firm-level economic and financial variables. We then employ this exogenous variation in the main specification to study the effect of credit rationing due to the economic crisis on quality upgrading.

Furthermore, we do not have explicit information on how the external rating agency defines a firm's external score: it is computed using a proprietary algorithm. If the rating agency gives better (i. e. lower) scores to those firms that are capable to differentiate the quality of exported output with respect to the output sold domestically, we face a classical reverse causality problem. Since quality upgrading firms might be more likely to obtain a better (i.e. lower) external score, our estimates would then be downward biased. Based on this reasoning, if we could find a proper instrument for our explanatory variable, we should find a less negative or even a positive coefficient when instrumenting. Lastly, even if we are controlling for a good number of factors correlated with our main explanatory variable, there might be unobservables, such as managers' connections with the banking sector, that might be negatively correlated with both the firm's score[43] and with exported-output quality upgrading, leading us to find

[42] See Albareto and Finaldi Russo (2012).

[43] Entrepreneurs that are more connected with the banking sector might be able to obtain better (i.e. lower) scores.

upward biased estimates.[44] The marginal effects at the means commented in the previous section would then be an upper bound of the unbiased marginal effect.

5.1 The Impact of the Great Recession

We study the impact of the recent economic crisis on credit constraints at the firm level. Our aim is to consider the great recession as an external shock to credit availability for Italian firms. The recession started at the end of 2007 with a financial crisis in the US and then spread across the Globe through a significant fall in the demand for durable goods and a credit crunch.[45] This shock impacted on the economic and financial performance of Italian firms both reducing revenues and reducing their credit availability. As long as we are able to control for firm-level determinants of variations in the score, we can consider the crisis a supply-side shock affecting firm's credit availability. In the following graph, we report the average of within-industry variation in the external score. We divide firms in two groups, quality upgraders and firms that did not upgrade quality, as of 2010. The graph clearly shows that score's variation significantly increased during the crisis within both groups of firms.

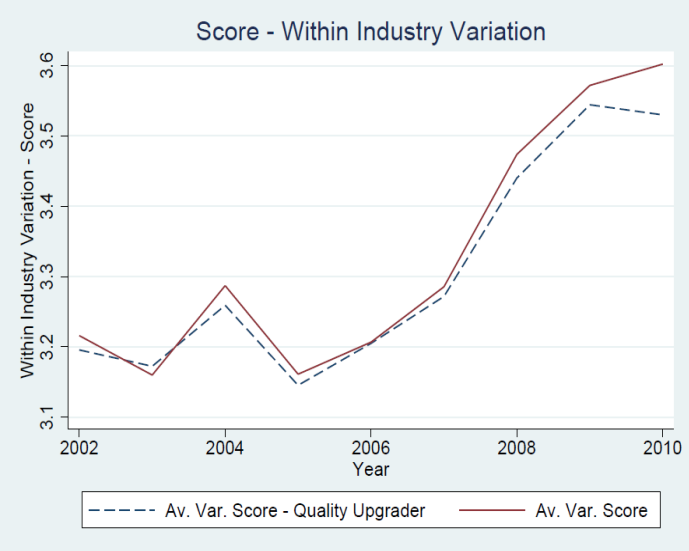

Figure 4. External Score, Within Industry Average Variation.

The recent economic crisis, coincides then with a polarization in the scores reported by the SMEs in our sample. To further investigate on this, we empirically assess whether a firm's external score was influenced by the crisis. In the following specification, we estimate the correlation between a dummy for the crisis' years, *After 2007*, and our explanatory variable, the external score, controlling for time fixed effects, γ_t, firm fixed effects, ρ_j, and for time-varying indicators of a firm's economic and financial performance, X_{jt}.

[44] Firms producing high quality products, both for the domestic and the foreign market, might hire managers more capable of maintining close linkages with the banking sector.

[45] According the NBER the US recession began in December 2007 and finished in June 2009. Italy was in a recession from Q2-2008 until Q2-2009.

We estimate the following model:

$$C_{jt} = \alpha + \gamma_t + \rho_j + \lambda After2007 + \gamma X_{jt} + \varepsilon_{jt}. \tag{5.1}$$

Coefficients reported in column (1) of Table 9 confirm that the crisis affected firms by raising (i. e. worsening) their score. This variable reports a positive and significant coefficient.

[Table 9 here]

Given that we find this positive correlation, we proceed to the following step and run specification (5.1) on two different sub-samples. We separately employ observations before and after the crisis to estimate:

$$C_{jt} = \alpha + \gamma_t + \rho_j + \gamma X_{jt} + \varepsilon_{jt}. \tag{5.2}$$

After obtaining firm level time-varying residuals, $\widehat{\varepsilon}_{jt}$, from (5.2), we regress $\widehat{\varepsilon}_{jt}$ on our dummy for the crisis period, $After2007$:

$$\widehat{\varepsilon}_{jt} = \alpha + \beta_j After2007 + \mu_{jt}. \tag{5.3}$$

Using the coefficients, $\widehat{\beta_j}$, estimated in this last specification, we create the variable *(Impact of)Crisis*. It is now possible to employ this variable to identify the impact of credit rationing on quality upgrading. This identification strategy relies on assuming that, after controlling for firm specific, time-varying, determinants, it is possible to capture the exogenous impact of the economic crisis on firm's credit access through the variation in the credit score. We run the following specification to compare, for a given level of labour productivity, firms reporting different variations in their external score due to the recent economic crisis, conditioning on the set of controls previously employed:

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta Crisis_j + \lambda LabP_j + \delta LabP_j Crisis_j + \gamma X_j + \chi T_p + \varepsilon_j > 0). \tag{5.4}$$

The variable representing the impact of the crisis on a firm's external score, $Crisis_j$, is interacted with labour productivity, $LabP_j$.[46] Employing coefficients obtained in specification (6) of Table 9, we report the marginal effects of $Crisis_j$ for different levels of labour productivity, in Table 10.[47] Results show that more productive firms, the ones more likely to pursue quality upgrading, are more affected by the worsening in the credit score due to the recent economic crisis. Results are confirmed when controlling for the time-trend of economic and financial variables in our "first stage", reported in (5.2).

[Table 10 here]

Considering the crisis as an external shock to the credit score, we find that firms whose score increased (i.e. worsened) during the recent economic crisis and that, consequently, experienced a reduction in

[46] We bootstrap standard errors (500 replications) to take into account that the variable $Crisis_j$ is a, firm-level, coefficient estimated in 5.3.

[47] As in Karaca-Mandic et al. (2012).

credit availability, are less-likely to upgrade the quality of exported output with respect to the one sold domestically. Credit rationing significantly reduced the probability of quality upgrading for the foreign market.

5.2 Instrumental Variable Approach

We extend our analysis by implementing an instrumental variable approach. Suppose that our main econometric model,

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta C_j + \gamma X_j + \chi T_p + \varepsilon_j > 0) \tag{5.5}$$

is valid, while the proxy for a firm's credit rationing, C_j, is endogenous and instrumented by the covariates used in the main specification and by a vector of instrumental variables, Z_j :

$$C_j = \mu + \varsigma_{ind} + \eta Z_j + \gamma X_j + \chi T_p + \iota_j. \tag{5.6}$$

We can rely on other researches dealing with the endogeneity of the main explanatory variable while working on data-sets and research questions similar to ours.[48]

In the following Probit regressions, we use the average score obtained by firms in the period 2002-2006 as an instrument for our main explanatory variable, the average score in the period 2008-2010. We employ this variable assuming that external scores four to eight years before the survey are not influenced by the fact that a firm declares to produce an upgraded version of its output for the foreign market in 2010. We are aware that identification based on this instrument may be weaken by the fact that our dummy for quality upgrading could be a result of investment decisions made before 2007. However, descriptive evidence on our data confirms that, among firms obtaining more than 50% of their revenues in the export market, those adopting an innovation for the export market in the period 2007-2010 were likely to upgrade output quality.[49] We expect our instrument to be related to the dependent variable only through the instrumented variable: the lagged external score affects quality upgrading only through its effect on the average external score in the period 2008-2010, once controlling for our complete set of covariates. Indeed, considering those variables representing the economic/financial performance of the firm in the period 2008-2010 we should be able to partially account for the variation in our dependent variable depending on credit availability before 2008. In Table 11, we report results obtained using our instrumental variable approach.

[Table 11 here]

This Table reports the first and the second stage coefficients of our specifications. As expected, we find that the instrument is not weak, given that it is highly and significantly correlated with the endogenous regressor. Results confirm that constrained firms are less likely to upgrade the quality of exported output, while larger ones have an advantage in pursuing this strategy. Firms with a high cash-flow are more likely

[48] Minetti and Zhu (2011) and Secchi et al. (2015) employ province-level variables representing credit supply at the local-level as instruments for credit rationing at the firm-level.

[49] A variable on innovation for the main market is available in a section of the survey in which firms are asked to describe the type of innovations pursued during the three years before the survey. We find that almost 20% of firms adopting an innovation for the main market, in the period 2007-2010, declare to export an upgraded output quality to the foreign market.

to upgrade output quality, as well. Table 11 reports coefficients and not marginal effects at the means, we then have to rely on part (a) of Table 12 to assess how the magnitude of the marginal effects changes when addressing endogeneity with IV.

[Table 12 here]

The results reported in specification (1a) suggest that the omitted variable bias was affecting our previous results. The marginal effect for the instrumented variable is larger in magnitude and equal to -0.052, a value that almost doubles the one obtained without instrumenting. In the second specification, we report coefficients obtained running a two-stage least-squares model. We use this regression to obtain a series of important statistical tests. First of all, our F-test of excluded instruments reports a high F-statistic, showing us that excluded instruments are irrelevant. The Cragg-Donald Wald test F-statistic is well above the Stock-Yogo weak-ID critical value, while the endogeneity test confirms that results obtained when instrumenting are statistically different with respect to those obtained without instrumenting. In part (b) of Table 12 we report marginal effects obtained when employing a different version of our main instrumental variable. We now employ the difference between the average score in 2002-2006 and the average score in the same period at the province level, as an alternative IV. Relying on variation across firms within provinces to proxy for the impact of credit availability on quality upgrading, we are then able to address concerns on our estimates deriving from the fact that the identification strategy employed in the previous estimates relies only on variation across firms. Results reported in this part of the Table are similar to the ones previously described, while larger in magnitude and significance.

We complete our investigation considering another instrument for the average external score in the period 2008-2010. In the survey, we have information on the number of banks from which the firm obtains external finance in the year 2010. Obtaining funds from a large number of banks during a crisis may signal a reduction in credit availability from the principal financier. This is particularly true for SMEs that normally rely on a limited number of creditors. Therefore, we consider a high number of creditors as a proxy for credit rationing. We then expect a higher number of creditors to be associated with a higher average score in 2008-2010. In Table 13, we report results obtained when using both the number of banks and the average of the external score during 2002-2006 as instruments.

[Table 13 here]

In specifications (1) to (3) we report second-stage coefficients obtained when introducing our set of controls by groups. Specification (4) reports instead average marginal effects obtained when estimating a two-stage least-squares model. The marginal effect for our variable of interest is still negative but larger in magnitude with respect to the one obtained in part (a) of the previous Table, it is now equal to: -0.059 and it is significant at the 5%. Statistical tests report results comparable to the ones obtained for specifications reported in Table 12. For this last estimation, we also report the Hansen-J statistic of the over-identification test. Since it is possible to reject the null-hypothesis of this test, we can conclude that our instruments are valid.

Results reported in this section confirm that credit constraints significantly reduce the probability of quality upgrading at the firm level. We first find that, conditional on having the same labour productivity,

the firm whose credit availability was negatively affected by the crisis is less likely to upgrade output quality for the foreign market. Moreover, using IV, we find that the effect of a worsening in credit rationing is still negative but larger in magnitude than the one reported in our main estimations. Based on these results, a standard deviation increase in the external score lowers the probability of quality upgrading by more than 50 percent.[50]

6 Robustness Checks

Strongly Rationed Exporters. As shown in the previous section, our main explanatory variable is positively and significantly correlated with the dummy for firms declaring in the survey to be strongly rationed. This variable is a reliable measure of credit rationing since it is an information provided by the firm on its impossibility to obtain the desired amount of credit in the year preceding the survey. We introduce this variable in specification (1a) of Table 14 as an alternative proxy for credit constraint.

[Table 14 here]

The dummy variable enters our regressions with a negative, not-significant marginal effect. We continue by introducing, in specification (2a), our main explanatory variable, the average of the external score, jointly with the "Strongly Rationed" dummy variable. Interestingly, when we consider both variables, only the average external score is significantly and negatively associated with the dependent variable. The external score confirms then to be highly correlated with the "Strongly Rationed" dummy when predicting the probability of quality upgrading. In specification (3a) we introduce an interaction term between the dummy variable and the external score, in order to assess whether our results are driven by firms reporting a higher average score and declaring to be rationed in the survey. This interaction is an important test for our empirical analysis since it uses the external measure of credit rationing jointly with a proxy for credit rationing assessed at the firm-level, and accounting for the mismatch between credit demand and credit supply in 2010. Results confirm that strongly rationed firms reporting a high external score are less likely to upgrade quality. Interestingly, the negative relation between the score and quality upgrading holds also for those firms that actually do not declare to be rationed in the survey.

External Finance Dependence. Manova (2013) followed by Fan et al. (2015) employs an indicator on external finance dependence at the industry level as a proxy for credit rationing.[51] The rationale behind this choice being that a firm operating in a specific industry needs, on average, a determined amount of external funds given the inherent characteristics of the production technology usually employed in that industry. The ranking of finance dependence across industries tends to be quite similar across countries and, being based on US data, should not be influenced by financial markets' imperfections. We introduce this variable to assess if the effect of credit rationing on quality upgrading is mainly due to industry-level determinants of external finance dependence.

Specifications in part (b) of Table 14 show that industry finance dependence reports non-significant marginal effects, when clustering standard errors at the province level. The positive sign of the effect, in

[50] To obtain this number, we multiply the average marginal effect of the external score, obtained in specification (1a) of Table 12, by the ratio between its standard deviation and the share of quality upgrading firms in the estimation sample.

[51] This industry level indicator of finance dependence has been first proposed by Rajan and Zingales (1998) and it is based on US data.

our view, might be a consequence of the fact that firms operating in industries requiring large financial resources are more likely to upgrade the quality of their products because of the peculiar characteristics of those industries. For example, firms producing electrical equipment, an industry highly dependent on external financing, might be able to quality-differentiate across markets more often than producers of tobacco, an industry which is relatively less dependent on external finance. This measure, however, is unlikely to give information on how costly or difficult obtaining external funds might be for a single firm. Indeed, when we introduce our explanatory variable, the average external score, this reports the usual negative and significant marginal effect. In specification (3b) we consider the interaction between external finance dependence and the credit score to assess whether the effect of the score on quality upgrading is stronger in industries having a higher dependence on external finance. The interaction term reports a negative non-significant marginal effect, while our main explanatory variable enters this specification with the usual negative and significant effect, equal to -0.034.

Ebitda and Debt/Ebitda. In Table 15, we introduce an alternative indicator for the economic and financial performance of the firm. The Ebitda, earnings before interest, taxes, depreciation and amortization, available from balance sheet data, is often used to analyse and compare profitability between companies and industries. The other variable considered in these regressions is the ratio between debt and Ebitda, computed as the ratio between firm's total outstanding debt with banks and financial institutions, and the Ebitda. This last variable is considered a strong predictor for a firm's ability to repay its outstanding debt given its earnings. As a consequence, this is one of the measures that might significantly reduce the variation in quality upgrading explained by the credit score. However, results reported in this Table, strongly confirm the negative relation between the score and the probability of quality upgrading for the foreign market. Ebitda reports a positive significant marginal effect, as expected, while Debt/Ebitda is never significant. Our explicative variable retains its explanatory power for quality differences across markets above and beyond the role of other direct indicators of firm's access to external finance.

[Table 15 here]

Export Revenues. As reported in equation (14) of our theoretical framework, the ratio between the quality of exported output and the quality of the output sold domestically depends positively on Q_i^k and negatively on Q_i^j. A higher quality-adjusted demand in the export market raises incentives for a firm to increase the quality of its exported output with respect to the one sold domestically. In our data, it is possible to recover information on the total turnover in the foreign market, and on revenues both in the foreign and in the domestic market, as of 2010. We use the first measure to generate a dummy variable for firms declaring to obtain more than 75% of their turnover abroad and the other two variables to compute the ratio between revenues in the export market and total revenues. Following implications discussed above, we expect to find a positive correlation between these variables and the probability of producing an output of higher quality for the export market. Table 16 confirms that this is indeed the case.

[Table 16 here]

In specification (1) and (2) we observe that firms obtaining more than 75% of their turnover in the export market are more likely to increase the quality of their output. The marginal effect at the means

of reporting a high turnover in the foreign market is positive and equal to 0.067, significant at the 10%. This result is confirmed when introducing the external score, which reports a marginal effect at the means equal to -0.044, significant at the 5%. Controlling for the share between revenues obtained in the export market and revenues obtained in the domestic one, in (3) and (4), does not affect our previous results. Firms reporting higher revenues in the export are more likely to export an output of higher quality, the marginal effect is equal to 0.106 and it is significant at the 10%.

Firm Size. To further investigate on our main result, we now focus on how firm size affects quality upgrading, when interacted with our proxy for credit constraint. Firm size is clearly a crucial issue when a bank decides on whether to lend funds: large firms might be perceived as safer debtors since they hold more collateralizable assets. Large firms might also have stronger connections with credit institutions because they require their services more often and in larger amounts with respect to small firms, consequently the former might have an easier and cheaper access to external finance. The following figure, reports on how firm-size, proxied by the number of employees, affects the probability of quality upgrading. We here estimate a probit model in which our dependent variable is regressed on the usual set of controls and on a term interacting firm size and the credit score.[52] This specification enables us to plot the marginal effect of an increase in firm size for different values of the external score. Figure 5 reports the marginal effect of size on the probability of quality upgrading, conditioning on other variables being at their means. The graph shows that the predicted probability of quality upgrading increases as the firm becomes larger. Conditioning on reporting the same credit score, a small firm is less likely to upgrade quality than a large firm.

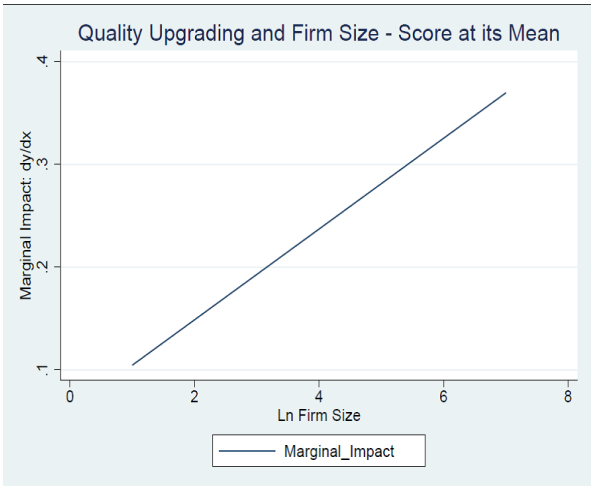

Figure 5. Firm Size, External Score and Probability of Quality Upgrading.

In the following table, we report results obtained when interacting our proxy for credit constraints with four firm-size dummies. We divide firms in four groups: (a) firms with less than 50 employees; (b) firms with 50 to 99 employees; (c) firms with 100 to 249 employees; and (d) firms with 250 to 499 employees.[53] Results, as reported in Table 17, show that this interaction term reports a negative significant coefficient for firms having less than 50, 50-99, and 100-249 employees. Comparing the marginal effects at the means,

[52] Estimates not reported, available upon request.

[53] The residual category is the group of firms with 500 to 1387 employees, representing the 2% of firms in our sample.

it is possible to observe that the impact of a standard deviation increase in the score on quality upgrading is twice as large for firms having less than 50 employees.

[Table 17]

We rely on the following graphs, reporting the change in the probability of quality upgrading for firms in the different size-groups, to easily grasp results obtained in the previous table. The X axis shows the credit score, while the Y axis reports the difference in probability. Marginal impacts are computed using average marginal effects at the means, as estimated in specification (6) of Table 17. It is possible to observe that, as the external score worsens (i.e. increases), firms having less than 50, 50 to 99, and 100 to 249 employees are less likely to upgrade output quality. However, since the upper confidence bound lies above the zero line, results for firms having more than 50 and less than 249 employees become less reliable for high values of the score. The graph on the marginal impact for firms having 250 to 499 employees shows that, for this group of firms, we cannot draw any conclusion on the relation between quality upgrading and our interaction term, since the confidence intervals lie above and below the zero line.

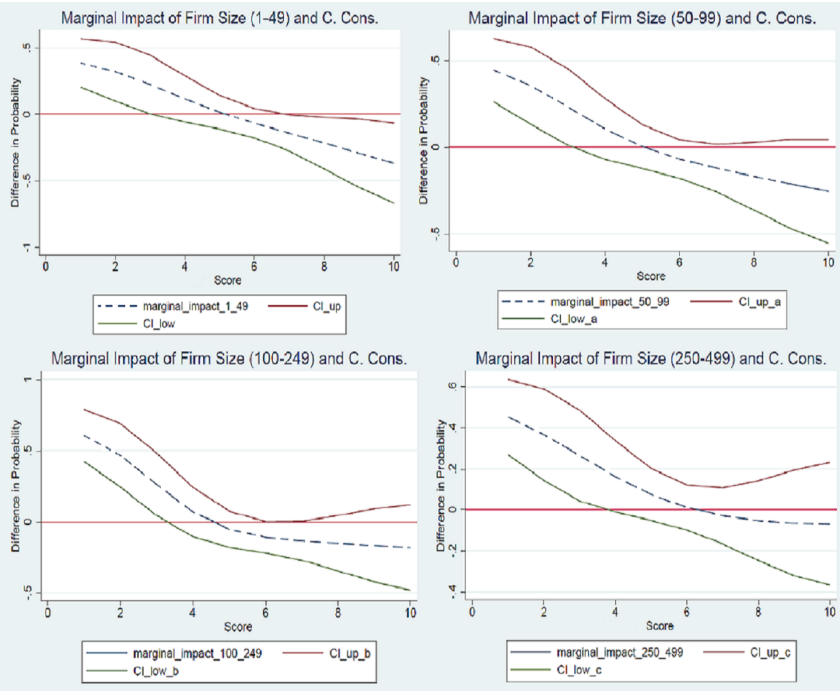

Figure 6. External Score and Probability of Quality Upgrading, Different Firm Size.

Quality within the firm. In the main specification we control for two variables usually considered in the literature to be predictors of output quality: labour productivity and firm size.[54] In various estimations we also control for the percentage of university graduates in the firm's labour force, supposing that higher is the human capital employed in the firm, higher is the probability of quality upgrading. The coefficient for this variable is, yet, never significant. From survey data, we can recover information on R&D strategies pursued by the firm in the three years before 2011. In specification (1) of Table 18 we insert a dummy for firms declaring to invest a part of their revenues in R&D.

[54] See Veerhogen (2008), Minetti and Zhu (2011), Manova (2013).

[Table 18 here]

The marginal effect for this variable enters this specification with a negative and non-significant coefficient, while the marginal effect for our variable of interest does not change magnitude, sign and significance. We continue our investigation introducing other indirect proxies for firm's average output quality. In specification (2) we control for R&D expenditures as a share of revenues, as declared by the firm in the survey. This variable enters with a negative significant coefficient: firms that invest more in R&D produce a high-quality output for both markets and are less likely to be in need of upgrading quality for the foreign market. In specification (3) we insert two dummies equal to one when a firm has adopted, in the three years before the survey, an innovation that was new to the firm's main destination market or that was new only to the firm. We expect firms that introduced innovations for the export market to be more likely to upgrade output quality. Indeed, the coefficient for this variable enters our specification with a positive and significant magnitude. The marginal effect at the means for this dummy variable is equal to 0.114 and it is significant at the 10%. In specification (4), following studies claiming that firms producing output of higher quality are the ones having a better economic performances, compared to other firms operating in the same sector, we control for firm's value-added in 2010. Results show that firms reporting a higher value-added are more likely to pursue quality upgrading.

Our explanatory variable, the credit score, enters each of these estimations with the usual negative, and significant, coefficient. The estimated marginal effect varies from -0.029 to -0.045, and it is significant in all specifications. Therefore, controlling for proxies of a firm's output position in the product quality-ladder does not affect our result on the negative relation between credit constraints and quality upgrading: when the credit score worsens, and credit availability is reduced, a firm is less likely to upgrade output quality for the foreign market.

7 Conclusion

We investigated how credit constraints affect the choice to upgrade output quality for the foreign market using survey data on a representative sample of Italian manufacturing SMEs. Ameliorating the quality of exported output is an activity that requires significant external resources, yet crucial in order to guarantee constant revenues to a firm. Our findings confirm that the more binding credit constraints are, the less likely a firm is to increase the quality of its exported output. As predicted by our theoretical framework, we find that the negative relation between credit rationing and quality upgrading is stronger on those firms having higher incentives to pursue it, i.e. the ones exporting to distant markets.

We employ two different strategies in order to address the endogeneity of our explanatory variable, estimates reinforce our results. Robustness checks corroborate our findings. We observe that small firms are the ones more affected by credit rationing when taking the decision on whether to upgrade output quality.

From a policy perspective, our study suggests that exporting SMEs willing to upgrade output quality for the foreign market are likely to suffer the impact of credit rationing. Interestingly, these are the firms that by obtaining higher revenues from exporting, would sustain domestic demand during economic downturns. Targeting exporting SMEs with policies aimed at easing their access to external finance is therefore crucial.

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8 Appendix: Profit Maximization under Credit Constraints in the Feenstra-Romalis (2014) Model

The profit maximization problem for a firm producing in country i and exporting to country k reads as follows:

$$\max_{z_{ij}^k} \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k - f^k \frac{w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma}}}{z_{ij}^k}$$

subject to,

$$\theta \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k \right\} \geq f^k \frac{w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma}}}{z_{ij}^k}.$$

We can write the following Lagrangian:

$$\begin{aligned} \underset{P_{ij}, z_{ij}^k}{MaxL} = & \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k - f^k \frac{w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma}}}{z_{ij}^k} \right\} + \\ & + \lambda \left\{ \theta \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k - f^k \frac{w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma}}}{z_{ij}^k} \right\}. \end{aligned} \tag{1a}$$

The FOC with respect to z_{ij}^k reads as follows:

$$\begin{aligned} & (1 + \lambda\theta)\tau_i^k \left[\frac{\partial c_{ij}(z_{ij}^k, w_i)}{\partial z_{ij}^k} \left(z_{ij}^k \right)^{-1} - \left(z_{ij}^k \right)^{-2} (c_{ij}(z_{ij}^k, w_i) + T_i^k) \right] Q_i^k \\ = & -(1 + \lambda) z_{ij}^{-1} f^k w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma} - 1} \left(\frac{1}{\gamma} - 1 \right), \end{aligned} \tag{2a}$$

dividing both sides by $\left(z_{ij}^k \right)^{-1}$:

$$\begin{aligned} & (1 + \lambda\theta)\tau_i^k \left[\frac{\partial c_{ij}(z_{ij}^k, w_i)}{\partial z_{ij}^k} - \left(z_{ij}^k \right)^{-1} (c_{ij}(z_{ij}^k, w_i) + T_i^k) \right] Q_i^k \\ = & -(1 + \lambda) f^k w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma} - 1} \left(\frac{1}{\gamma} - 1 \right). \end{aligned}$$

Since $c_{ij}(z_{ij}^k, w_i) = \frac{w_i (z_{ij}^k)^{1/\gamma}}{\varphi_{ij}}$ and $\frac{\partial c_{ij}(z_{ij}^k, w_i)}{\partial z_{ij}^k} = \frac{w_i (z_{ij}^k)^{1/\gamma - 1}}{\gamma \varphi_{ij}}$,

$$(1+\lambda\theta)\tau_i^k \left[\frac{w_i (z_{ij}^k)^{1/\gamma - 1}}{\gamma \varphi_{ij}} - \left(z_{ij}^k\right)^{-1} \left(\frac{w_i (z_{ij}^k)^{1/\gamma}}{\varphi_{ij}} + T_i^k \right) \right] Q_i^k \tag{3a}$$

$$= -(1+\lambda) f^k w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}-1} \left(\frac{1}{\gamma} - 1 \right).$$

Diving both sides by $\left(z_{ij}^k\right)^{-1}$, after some algebraic manipulations, we can solve for optimal output quality in the foreign market:

$$(z_{ij}^k)^{1/\gamma} = \frac{\tau_i^k T_i^k Q_i^k}{\left(\frac{1}{\gamma} - 1\right) w_i \left[\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k + \frac{(1+\lambda)}{(1+\lambda\theta)} f^k \right]}. \tag{4a}$$

Now, suppose, as in Feestra-Romalis (2014), an expenditure function of the CES form:

$$E^k = U^k \left[\int_i \left(p_i^k / z_{ij}^k \right)^{1-\sigma} di \right]^{\frac{1}{1-\sigma}}. \tag{5a}$$

That, given the definition for the quality-adjusted price, $P_i^k = \frac{p_i^k}{z_{ij}^k}$ becomes,

$$E^k = U^k \left[\int_i \left(P_i^k \right)^{1-\sigma} di \right]^{\frac{1}{1-\sigma}}, \tag{6a}$$

so that $Q_i^k(P_{ij}) = E_i^k(P_1^k, ...P_N^k,\ U^k)$. Rewriting our Lagrangian accordingly:

$$\underset{P_{ij}, z_{ij}^k}{MaxL} = \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k(P_{ij}) - f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k} \right\} + \tag{7a}$$

$$+\lambda \left\{ \theta \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k(P_{ij}) \right\} - f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k} \right\}.$$

The FOC with respect to P_{ij} reads as follows,

$$\left[Q_i^k(P_{ij}) + \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}} P_{ij} - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}} \right] (1+\lambda\theta) = 0, \tag{8a}$$

dividing by $(1+\lambda\theta)$ and rearranging, we obtain,

$$\left[Q_i^k(P_{ij}) + \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}} P_{ij} = \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}} \right], \tag{9a}$$

divide now by $Q_i^k(P_{ij})$ and use $\frac{-\partial Q_i^k(P_{ij})}{\partial P_{ij}}\frac{P_{ij}}{Q_i^k}=\sigma$, to find,

$$1-\sigma=(-\sigma)\tau_i^k\frac{\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right)}{z_{ij}^k P_{ij}}. \tag{10a}$$

That is equal to:

$$P_{ij}=\left(\frac{\sigma}{\sigma-1}\right)\tau_i^k\frac{\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right)}{z_{ij}^k}. \tag{11a}$$

Using $P_{ij}\equiv\frac{p_i^k}{z_{ij}^k}=\frac{\tau_i^k(p_i^{*k}+T_i^k)}{z_{ij}^k}$, we have

$$\frac{(p_i^{*k}+T_i^k)}{z_{ij}^k}=\left(\frac{\sigma}{\sigma-1}\right)\frac{\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right)}{z_{ij}^k}, \tag{12a}$$

that leads us to find a usual result: the f.o.b price, p_i^{*k}, is equal to a mark-up over marginal cost. While the quality-adjusted c.i.f. price, $P_{ij}\equiv\frac{\tau_i^k(p_i^{*k}+T_i^k)}{z_{ij}^k}$, equals a mark-up over marginal cost and the specific trade cost,

$$\left(p_i^{*k}+T_i^k\right)=\left(\frac{\sigma}{\sigma-1}\right)\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right). \tag{13a}$$

Using (11a) in the budget constraint, $\theta\left\{\left[P_{ij}^k-\tau_i^k\frac{\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right)}{z_{ij}^k}\right]Q_i^k\right\}\geq f^k\frac{w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}$, we have:

$$\theta\tau_i^k\left\{\left[\left(\frac{1}{\sigma-1}\right)\frac{\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right)}{z_{ij}^k}\right]Q_i^k\right\}\geq f^k\frac{w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}, \tag{14a}$$

multiplying by z_{ij}^k and using $c_{ij}(z_{ij}^k,w_i)=\frac{w_i(z_{ij}^k)^{1/\gamma}}{\varphi_{ij}}$, it is possible to obtain,

$$\theta\tau_i^k\left\{\left[\left(\frac{1}{\sigma-1}\right)\left(\frac{w_i(z_{ij}^k)^{1/\gamma}}{\varphi_{ij}}+T_i^k\right)\right]Q_i^k\right\}\geq f^k w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}, \tag{15a}$$

substituting (4a), $(z_{ij}^k)^{1/\gamma}=\frac{\tau_i^k T_i^k Q_i^k}{\left[\frac{1}{\gamma}-1\right]w_i\left[\tau_i^k\frac{1}{\varphi_{ij}}Q_i^k+\frac{(1+\lambda)}{(1+\lambda\theta)}f^k\right]}$, in (15a), the budget constraint becomes:

$$\begin{aligned}&\theta\tau_i^k\left\{\left[\left(\frac{1}{\sigma-1}\right)\tau_i^k T_i^k Q_i^k+\left(\frac{1}{\sigma-1}\right)T_i^k\left[\frac{1}{\gamma}-1\right]w_i\left(\tau_i^k\frac{1}{\varphi_{ij}}Q_i^k+\frac{(1+\lambda)}{(1+\lambda\theta)}f^k\right)\right]Q_i^k\right\} \\ &\geq f^k w_i\tau_i^k T_i^k Q_i^k.\end{aligned} \tag{16a}$$

Dividing (16a) by τ_i^k and $T_i^k Q_i^k$:

$$\left\{\left[\tau_i^k Q_i^k + \left(\frac{1}{\gamma}-1\right) w_i \left(\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k + \frac{(1+\lambda)}{(1+\lambda\theta)} f^k\right)\right]\right\} \tag{17a}$$
$$\geq \frac{(\sigma-1)}{\theta} f^k w_i.$$

Imposing that the budget constraint is binding, we can solve for λ as a function of θ :

$$(1+\lambda\theta)\tau_i^k Q_i^k + (1+\lambda\theta)\left(\frac{1}{\gamma}-1\right)\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k w_i + (1+\lambda) f^k w_i \left(\frac{1}{\gamma}-1\right) = \frac{(\sigma-1)}{\theta} f^k w_i (1+\lambda\theta), \tag{18a}$$

$$\lambda(\theta) = \frac{\left[f^k w_i \left(\frac{\sigma-1}{\theta} - \frac{1-\gamma}{\gamma}\right) - \left[\tau_i^k Q_i^k + \left(\frac{1}{\gamma}-1\right)\tau_i^k \frac{w_i}{\varphi_{ij}} Q_i^k\right]\right]}{\left\{f^k w_i \left[\frac{1-\gamma}{\gamma} - (\sigma-1)\right] + \theta\left[\tau_i^k Q_i^k + \left(\frac{1}{\gamma}-1\right)\tau_i^k \frac{w_i}{\varphi_{ij}} Q_i^k\right]\right\}}. \tag{19a}$$

Define now $\left[\tau_i^k Q_i^k + \left(\frac{1}{\gamma}-1\right)\tau_i^k \frac{w_i}{\varphi_{ij}} Q_i^k\right] \equiv \Psi > 0$, we can then solve for the term $\frac{1+\lambda}{1+\lambda\theta}$,

$$\lambda = \frac{f^k w_i \left(\frac{\sigma-1}{\theta} - \frac{1-\gamma}{\gamma}\right) - \Psi}{f^k w_i \left[\left(\frac{1-\gamma}{\gamma}\right) - (\sigma-1)\right] + \theta\Psi}, \tag{20a}$$

$$\lambda\theta = \frac{f^k w_i \left[(\sigma-1) - \left(\frac{1-\gamma}{\gamma}\right)\theta\right] - \theta\Psi}{f^k w_i \left[\left(\frac{1-\gamma}{\gamma}\right) - (\sigma-1)\right] + \theta\Psi}, \tag{21a}$$

$$\frac{1+\lambda}{1+\lambda\theta} = \frac{f^k w_i \left(\frac{\sigma-1}{\theta}\right) - \Psi}{f^k w_i \left(\frac{1}{\gamma}-1\right)}. \tag{22a}$$

Now, recall that $z_{ij}^k = \left[\frac{\tau_i^k T_i^k Q_i^k}{\left[\frac{1}{\gamma}-1\right] w_i \left[\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k + \frac{1+\lambda}{1+\lambda\theta} f^k\right]}\right]^\gamma$, substituting (22a) in z_{ij}^k, we obtain:

$$z_{ij}^k = \left[\frac{\tau_i^k T_i^k Q_i^k}{w_i\left(\frac{1}{\gamma}-1\right)\left[\frac{\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k \left(\frac{1}{\gamma}-1\right) + f^k\left(\frac{\sigma-1}{\theta}\right) - \frac{\Psi}{w_i}}{\left(\frac{1}{\gamma}-1\right)}\right]}\right]^\gamma.$$

Using the definition, $\left[\tau_i^k Q_i^k + \left(\frac{1}{\gamma}-1\right)\tau_i^k \frac{w_i}{\varphi_{ij}} Q_i^k\right] \equiv \Psi$, and simplifying:

$$z_{ij}^k = \left[\frac{\tau_i^k T_i^k Q_i^k}{f^k w_i \left(\frac{\sigma-1}{\theta}\right) - \tau_i^k Q_i^k}\right]^\gamma. \tag{23a}$$

Taking the partial derivative of (23a) with respect to θ, we find:

$$\frac{\partial z_{ij}^k}{\partial \theta} = \gamma \left[\frac{\tau_i^k T_i^k Q_i^k}{f^k w_i \left(\frac{\sigma-1}{\theta}\right) - \tau_i^k Q_i^k} \right]^{\gamma-1} \frac{\tau_i^k T_i^k Q_i^k f^k w_i \theta^{-2}}{\left(f^k w_i \left(\frac{\sigma-1}{\theta}\right) - \tau_i^k Q_i^k\right)^2} > 0. \tag{24a}$$

As θ, the amount of external funds that can be used in order to finance the fixed cost is reduced, exported output quality decreases. Moreover, after defining $\left[f^k w_i \left(\frac{\sigma-1}{\theta}\right) - \tau_i^k Q_i^k\right] \equiv \Lambda$, it is possible to observe that the impact of θ on z_{ij}^k is increasing in T_i^k, the specific unit-cost paid to ship products from i to k:

$$\frac{\partial z_{ij}^k}{\partial \theta \partial T_i^k} = \left\{ (\gamma-1)\gamma \left(\frac{\Lambda}{\tau_i^k T_i^k Q_i^k} \right) \left(\frac{\left(\tau_i^k Q_i^k\right)^2 T_i^k f^k w_i \theta^{-2}}{\Lambda^2} \right) \right\} + \gamma \frac{\tau_i^k Q_i^k f^k w_i \theta^{-2}}{\Lambda^2}, \tag{25a}$$

$$\frac{\partial z_{ij}^k}{\partial \theta \partial T_i^k} = \gamma \frac{\tau_i^k Q_i^k f^k w_i \theta^{-2}}{\Lambda} \left[(\gamma-1) + \frac{1}{\Lambda} \right]. \tag{26a}$$

The first term in the equation presented above is positive. While the second-one is positive if $\Lambda \equiv \left[f^k w_i \left(\frac{\sigma-1}{\theta}\right) - \tau_i^k Q_i^k\right] < \frac{1}{(1-\gamma)}$. In this case it is possible to conclude that

$$\frac{\partial z_{ij}^k}{\partial \theta \partial T_i^k} > 0. \tag{27a}$$

The impact of θ on z_{ij}^k is increasing in T_i^k, the specific unitary cost paid to ship to market k. In order to obtain optimal output-quality in the domestic market, we solve the following maximization problem:

$$\max_{p_{ij}^*, z_{ij}^i} \left\{ \left[p_{ij}^* - \frac{\left(c_{ij}(z_{ij}^i, w_i) + 1\right)}{z_{ij}^i} \right] Q_i^i - f^i \frac{w_i \left(z_{ij}^i\right)^{\frac{1}{\gamma}}}{z_{ij}^i} \right\} \tag{28a}$$

subject to

$$\theta \left\{ \left[p_{ij}^* - \frac{\left(c_{ij}(z_{ij}^i, w_i) + 1\right)}{z_{ij}^i} \right] Q_i^i \right\} \geq f^i \frac{w_i \left(z_{ij}^i\right)^{\frac{1}{\gamma}}}{z_{ij}^i}. \tag{29a}$$

Following identical steps to the ones previously shown, it is possible to find a solution for optimal output-quality supplied to the domestic market when the budget constraint is binding:

$$z_{ij}^i = \left[\frac{Q_i^i}{f^i w_i \left(\frac{\sigma-1}{\theta}\right) - Q_i^i} \right]^{\gamma}. \tag{30a}$$

The ratio between output quality supplied to the foreign market, z_{ij}^k, and output quality supplied to the domestic market, z_{ij}^i, is equal to:

$$\left(\frac{z_{ij}^k}{z_{ij}^i} \right)^{\frac{1}{\gamma}} = \frac{Q_i^k}{Q_i^i} \frac{\tau_i^k T_i^k \left[f^i w_i (\sigma-1)\theta^{-1} - Q_i^i\right]}{\left[f^k w_i (\sigma-1)\theta^{-1} - \tau_i^k Q_i^k\right]}. \tag{31a}$$

Proof of proposition 1. Taking the partial derivative of $\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}}$ with respect to θ, we obtain:

$$\frac{\partial\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}}}{\partial\theta}=\left(\frac{\tau_i^k T_i^k Q_i^k}{Q_i^i}\right)\frac{\theta^{-2}w_i(\sigma-1)\left(\frac{Q_i^k}{Q_i^i}\tau_i^k-\frac{f^k}{f^i}\right)}{\left[f^i w_i\left(\sigma-1\right)\theta^{-1}-\tau_i^k Q_i^k\right]^2}. \tag{32a}$$

This term is positive when $\frac{Q_i^k}{Q_i^i}\tau_i^k>\frac{f^k}{f^i}$. An increase (decrease) in credit availability (credit rationing), θ, leads to an increase in the ratio between output quality supplied to the foreign market and output quality supplied to the domestic market.

Proof of proposition 2. Taking the partial derivative of (32a) with respect to T_i^k, we find:

$$\frac{\partial\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}}}{\partial\theta\partial T_i^k}=\left(\frac{\tau_i^k Q_i^k}{Q_i^i}\right)\frac{\theta^{-2}w_i(\sigma-1)\left(\frac{Q_i^k}{Q_i^i}\tau_i^k-\frac{f^k}{f^i}\right)}{\left[f^i w_i\left(\sigma-1\right)\theta^{-1}-\tau_i^k Q_i^k\right]^2}. \tag{33a}$$

This term is positive provided that $\frac{Q_i^k}{Q_i^i}\tau_i^k>\frac{f^k}{f^i}$. The impact of an increase (decrease) in credit availability (credit rationing), θ, on the output-quality ratio is increasing in T_i^k, the per-unit trade cost proportional to distance. The larger the distance, the stronger the impact of credit availability, θ, on the output-quality ratio.

9 Tables

Table 1: Summary statistics, 2010

	Mean	Median	SE-Mean	Min	Max	p5	p95	Obs.
High Quality Out (d)	.119	0	.013	0	1	0	1	621
Low Quality Out (d)	.032	0	.007	0	1	0	0	621
Equal Quality Out (d)	.851	1	.014	0	1	0	1	621
Strongly Rationed (d)	.133	0	.013	0	1	0	1	622
Weakly Rationed (d)	.260	0	.018	0	1	0	1	626
Corporation (d)	.704	0	.018	0	1	0	1	642
Consortium (d)	.026	0	.006	0	1	0	0	642
Business Group (d)	.336	0	.018	0	1	0	1	642
North (d)	.742	0	0.17	0	1	0	1	642
Center (d)	.155	0	.014	0	1	0	1	642
South (d)	.101	0	.012	0	1	0	1	642
External Score	4.380	4	.084	1	9	1	7	513
Firm Size	76.042	49	4.368	5	1387	14	208	513
Ln Labour Productivity	4.113	4.122	.024	.356	6.722	3.330	4.926	505
Ln Capital Intensity	4.260	4.375	.045	.676	7.657	2.598	5.829	513
Ln Cash Flow	1.062	.971	.023	.011	7.025	.458	1.856	513
Leverage Ratio	1.890	.928	.401	-111.143	80.803	0	7.609	513
Liquidity Ratio	.174	.154	.009	-.628	.810	-.139	.543	513
Labour Skill	10.805	5	.648	0	100	0	40	592
Firm Age	32.663	29	.964	1	179	5	69	607

Notes: This table reports descriptive statistics on our variables of interest. Data here reported refer only to exporting manufacturing firms. High Quality Out is a dummy equal to one for those firms that declare to produce an output of higher quality for the foreign market, it is equal to zero when the firm does not change the quality of its output for the foreign market. Low Quality Out is a dummy equal to one for those firms declaring to produce an output of lower quality for the foreign market. Equal Quality Out is a dummy for those firms declaring to supply products of equal quality to the two markets. A firm is strongly rationed if it receives less external funds than what demanded in 2010 and if it would have accepted to obtain more credit at the current market interest rate. A firm is defined as weakly rationed if it answers positively only to the first question. Corporation, consortium and business group are dummy variables indicating whether a firm is a corporation, belongs to a consortium or to a business group. North, Center and South indicate in which part of the Italian territory the firm is headquartered. External Score is the score received by the firm from the external rating agency in 2010, it ranges from 1 to 9. The number of employees is our proxy for firm's size. Labour productivity is measured as value added per employee. Fix assets/employment measures capital intensity. Cash flow is computed as profits net of tax expenditures plus depreciation, and is normalized by total assets. The leverage ratio is computed as firm's total liabilities over total equity. Liquidity ratio is defined as firm's current assets minus current liabilities over total assets. The number of years since the foundation is our proxy for firm's age.

Table 2: Strongly Rationed Firms in 2010 - Exporters, Probit

	(1) Strong Rationing	(2) Strong Rationing	(3) Strong Rationing	(4) Strong Rationing	(5) Strong Rationing
External Score - Av.	0.067**				0.061**
	(0.030)				(0.029)
Bank Rate		0.028*			0.015
		(0.015)			(0.023)
Short Term Credit Use			0.130		0.041
			(0.168)		(0.292)
Total Credit Use				0.124	-0.130
				(0.207)	(0.354)
Number of Creditors	0.015	0.016	0.018*	0.019*	0.014
	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)
Perc. Principal Bank credits over total	-0.000	-0.000	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Perc. Credit Over Assets	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Bank Switchers	0.064	0.065	0.078	0.078	0.060
	(0.126)	(0.124)	(0.124)	(0.124)	(0.125)
Ln Firm Size - Av.	-0.046	-0.076*	-0.087	-0.092*	-0.044
	(0.053)	(0.046)	(0.053)	(0.051)	(0.054)
Ln Labour Productivity - Av.	-0.021	-0.017	-0.019	-0.019	-0.019
	(0.047)	(0.045)	(0.048)	(0.050)	(0.046)
Ln Cash Flow - Av.	-0.444***	-0.476***	-0.530***	-0.540***	-0.428**
	(0.161)	(0.140)	(0.158)	(0.162)	(0.167)
Leverage Ratio - Av.	0.008***	0.008**	0.007**	0.007**	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Liquidity Ratio - Av.	0.298	-0.044	-0.106	-0.132	0.296
	(0.298)	(0.189)	(0.219)	(0.213)	(0.280)
Ln Capital Intensity - Av.	-0.063	-0.107*	-0.121*	-0.124*	-0.061
	(0.078)	(0.062)	(0.069)	(0.071)	(0.077)
Center	-0.030	-0.034	-0.028	-0.025	-0.036
	(0.061)	(0.052)	(0.056)	(0.056)	(0.059)
South	-0.167	-0.142	-0.150	-0.145	-0.164
	(0.105)	(0.113)	(0.112)	(0.116)	(0.109)
Provincial Value Added Growth, 98-08	-0.131***	-0.126***	-0.125***	-0.125***	-0.131***
	(0.036)	(0.039)	(0.037)	(0.036)	(0.037)
Firm Age	-0.044	-0.047	-0.047	-0.046	-0.045
	(0.033)	(0.032)	(0.033)	(0.033)	(0.033)
N. Branches per 1000 inhab.	-0.004	-0.004*	-0.003	-0.003	-0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Observations	153	153	153	153	153
Percent correctly predicted	84.31	84.97	86.27	85.62	83.66
Log pseudolikelihood	-48.99	-49.90	-50.44	-50.61	-48.77
Pseudo R^2	0.413	0.402	0.396	0.394	0.415

Notes: This table studies the impact of our four candidates proxies for credit rationing, the first four regressors, on the probability that a firm declares to be "Strongly Rationed" in 2010. Average Marginal Effects are reported. All specifications include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010. All probit regressions include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 3: External Score and Firm Characteristics, OLS

	(1) External Score	(2) External Score	(3) External Score	(4) External Score	(5) External Score	(6) External Score	(7) External Score
Ln Firm Size	0.062	-0.009	-0.378***	-0.051	-0.074	-0.258***	-0.270***
	(0.077)	(0.078)	(0.098)	(0.076)	(0.077)	(0.086)	(0.093)
Ebitda	-0.017***						-0.002
	(0.002)						(0.002)
Ln Cash Flow		-0.881***				-0.430***	-0.221
		(0.084)				(0.063)	(0.139)
Ln Labour Productivity			-0.918***			-0.710***	-0.795***
			(0.120)			(0.086)	(0.145)
Liquidity Ratio				-0.450***		-0.412***	-0.529***
				(0.017)		(0.018)	(0.028)
Leverage Ratio					0.001	0.000	0.043***
					(0.001)	(0.001)	(0.011)
Firm F. E.	Y	Y	Y	Y	Y	Y	N
Year F.E.	Y	Y	Y	Y	Y	Y	N
Industry F.E.	N	N	N	N	N	N	Y
Observations	4093	4093	4093	4093	4093	4093	467
R^2	0.825	0.824	0.830	0.856	0.810	0.875	0.597

Notes: This table studies the relation between Firm Size, Ebitda, Cash Flow, Labour Productivity, Leverage Ratio, Liquidity Ratio and the External Score reported by firms during the period 2002-2010, from (1) to (5), and in year 2010, in specification (6). Regressions (1) to (5) include firm and year fixed effects. Regression (6) is ran using industry fixed effects. All specifcations include a constant term. Robust standard errors reported in parentheses. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 4: Differences in Means for Vulnerable (V.) and Non-Vulnerable (N.V.) Exporting Firms, 2010

Variable	**Mean N.V.**	**Std. Dev. N.V.**	**Mean V.**	**Std. Dev. V.**	**TTest**
High Quality Out (d)	0.161	0.368	0.063	0.244	0.098**
Strongly Rationed (d)	0.039	0.194	0.275	0.447	-0.236***
Weakly Rationed (d)	0.147	0.355	0.425	0.496	-0.278***
North (d)	0.769	0.422	0.690	0.464	0.080*
Center (d)	0.138	0.345	0.196	0.398	-0.058
South (d)	0.093	0.291	0.115	0.320	-0.022
Firm Size	67.152	58.743	67.751	80.259	-0.599
Ln Labour Productivity	4.236	0.487	3.970	0.532	0.266***
Ln Cash Flow	1.149	0.552	0.971	0.406	0.179***
Leverage Ratio	0.609	0.726	3.911	11.241	-3.302***
Liquidity Ratio	0.280	0.191	0.050	0.161	0.230***
Ln Capital Intensity	4.099	1.131	4.364	1.038	-0.265**
Labour Skill	10.972	16.027	9.641	12.734	1.331
Age	34.421	22.394	29.995	23.424	4.425*
Firms	499				

Notes: This table reports differences in means for our variables of interest. Vulnerable (V) firms report an External Score higher or equal than 5. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 5: Exported Vs Domestic Quality, Determinants, Probit

	(1) High Quality Out	(2) High Quality Out	(3) High Quality Out	(4) High Quality Out	(5) High Quality Out	(6) High Quality Out	(7) High Quality Out	(8) High Quality Out
External Score - Av.	-0.025***	-0.025***	-0.019**	-0.030**	-0.026*	-0.026*	-0.030**	-0.029**
	(0.008)	(0.008)	(0.008)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)
Ln Firm Size - Av.			0.044**	0.039*	0.049**	0.050**	0.047**	0.047**
			(0.022)	(0.022)	(0.024)	(0.024)	(0.024)	(0.024)
Ln Labour Productivity - Av.			0.045	0.058*	0.060*	0.061*	0.052	0.052
			(0.028)	(0.030)	(0.032)	(0.033)	(0.033)	(0.033)
Ln Capital Intensity - Av.				-0.017	-0.014	-0.015	-0.011	-0.011
				(0.020)	(0.021)	(0.021)	(0.021)	(0.021)
Ln Cash Flow - Av.				-0.027	-0.023	-0.023	-0.033	-0.033
				(0.021)	(0.023)	(0.023)	(0.023)	(0.023)
Leverage Ratio - Av.				-0.000	-0.000	-0.000	-0.000	-0.000
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity Ratio - Av.				-0.137	-0.101	-0.099	-0.123	-0.120
				(0.137)	(0.136)	(0.135)	(0.134)	(0.136)
Innovation (d)					-0.029	-0.027	-0.024	-0.024
					(0.033)	(0.033)	(0.032)	(0.032)
Labour Skill					0.000	0.000	0.000	0.000
					(0.001)	(0.001)	(0.001)	(0.001)
Firm Age					0.012	0.011	0.011	0.011
					(0.022)	(0.021)	(0.020)	(0.020)
Corporation (d)					-0.009	-0.014	-0.008	-0.008
					(0.033)	(0.034)	(0.035)	(0.035)
Consortium (d)					-0.120	-0.119	-0.103	-0.100
					(0.105)	(0.106)	(0.102)	(0.100)
Business Group (d)					-0.099**	-0.097**	-0.094**	-0.093**
					(0.044)	(0.044)	(0.041)	(0.041)
Center (d)						-0.047	-0.022	-0.025
						(0.040)	(0.036)	(0.037)
South (d)						0.010	-0.019	-0.045
						(0.044)	(0.056)	(0.086)
Provincial Value Added Growth, 98-08							-0.066***	-0.070***
							(0.018)	(0.019)
N. Branches per 1000 inhab.							-0.002	-0.002
							(0.001)	(0.001)
Provincial Value Added - Av.								-0.055
								(0.127)
Observations	428	428	428	428	428	428	428	428
Percent correctly predicted	84.81	84.35	84.58	84.81	84.81	84.81	84.81	84.81
Log pseudolikelihood	-178.83	-172.67	-170.84	-170.28	-166.66	-166.22	-162.15	-162.10
Pseudo R^2	0.019	0.052	0.063	0.066	0.085	0.088	0.110	0.110

Notes: This table studies the relation between the proxy for credit constraint, "External Score - Av." and the probability that a firm declares to produce higher quality for the foreign market. Average Marginal Effects are reported. All specifications, except (1), include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010. All regressions include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 6: Exported Vs Domestic Quality, Determinants, Probit, OLS and Ordered Probit

	(1)	(2)	(3)
	High Quality Out - Probit	High Quality Out - OLS	Quality - Ordered Probit
External Score - Av.	-0.030**	-0.026*	-0.026**
	(0.014)	(0.014)	(0.012)
Ln Firm Size - Av.	0.047**	0.047*	0.041**
	(0.024)	(0.025)	(0.020)
Ln Labour Productivity - Av.	0.052	0.045	0.045
	(0.033)	(0.031)	(0.029)
Firm Level Financial Controls	Y	Y	Y
Other Firm Level Controls	Y	Y	Y
Location Dummies	Y	Y	Y
Province Level Controls	Y	Y	Y
Observations	428	428	495
Percent correctly predicted	84.81		
Log pseudolikelihood	-162.15		-162.15
Pseudo R^2 or R^2	0.110	0.087	0.157

Notes: This table studies the relation between the proxy for credit constraint, "External Score - Av.", and the probability that a firm declares to produce higher quality for the foreign market. We report estimates obtained using the Probit model (1) reported in the last specification of the previous table and a linear probability model, in (2). In (3) we also consider firms that declare to export an output of lower quality with respect to the one sold domestically, Zi,j>Zk,j , using an Ordered Probit model. For this last specification, we report marginal effects for the sub-sample of firms declaring to produce a higher quality for the export market. Average marginal effects are reported in (1) and (3) All specifications include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010. All specifications include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 7: Exported Vs Domestic Quality and Exporting Outside EU, Determinants, Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	High Q. Out	High Q. Out	High Q.Out	High Q.Out	High Q. Out	High Q. Out	High Q. Out
External Score - Av.	-0.045	-0.048	-0.030	-0.074	-0.062	-0.062	-0.081
	(0.042)	(0.040)	(0.043)	(0.074)	(0.073)	(0.072)	(0.077)
Outside EU (d)	1.425**	1.422**	1.355**	1.357**	1.267**	1.226**	1.289**
	(0.585)	(0.642)	(0.630)	(0.616)	(0.622)	(0.622)	(0.642)
Outside EU (d) X External Score - Av.	-0.487***	-0.503***	-0.476***	-0.476***	-0.458***	-0.446***	-0.457***
	(0.136)	(0.149)	(0.143)	(0.138)	(0.140)	(0.140)	(0.145)
Ln Firm Size - Av.			0.173*	0.150	0.192*	0.199*	0.194*
			(0.104)	(0.104)	(0.114)	(0.114)	(0.115)
Ln Labour Productivity - Av.			0.180	0.237*	0.242	0.258	0.223
			(0.127)	(0.139)	(0.151)	(0.157)	(0.164)
Firm Level Financial Controls	N	N	N	Y	Y	Y	Y
Other Firm Level Controls	N	N	N	N	Y	Y	Y
Location Dummies	N	N	N	N	N	Y	Y
Province Level Controls	N	N	N	N	N	N	Y
Observations	428	428	428	428	428	428	428
Percent correctly predicted	84.35	83.88	84.58	84.81	84.11	84.11	84.11
Log pseudolikelihood	-171.77	-165.99	-164.68	-164.21	-161.04	-160.88	-156.63
Pseudo R^2	0.058	0.090	0.097	0.099	0.116	0.117	0.141

Notes: This table studies the relation between the proxy for credit constraint, "External Score - Av.", interacted with the dummy variable "Outside EU", and the probability that a firm declares to produce higher quality for the foreign market. All specifications, except (1), include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010. All regressions include a constant term and cluster standard errors, reported in parentheses, at the province level, (d) indicates a dummy variable. Estimated oefficients are reported. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 8: Exported Vs Domestic Quality and Exporting to North America, Determinants, Coefficients

	(1)	(2)	(3)	(4)
	High Quality Out	High Quality Out	High Quality Out	High Quality Out
External Score - Av.	-0.196**	-0.201*	-0.190*	-0.215**
	(0.092)	(0.103)	(0.098)	(0.097)
North America (d)	1.211***	1.179**	1.142**	1.164**
	(0.460)	(0.479)	(0.473)	(0.483)
North America (d) X External Score - Av	-0.326***	-0.310***	-0.297***	-0.294***
	(0.110)	(0.113)	(0.112)	(0.110)
Ln Firm Size - Av.	0.017	0.079	0.093	0.087
	(0.122)	(0.131)	(0.129)	(0.133)
Ln Labour Productivity - Av.	0.138	0.126	0.155	0.124
	(0.253)	(0.254)	(0.249)	(0.247)
Firm Level Financial Controls	Y	Y	Y	Y
Other Firm Level Controls	N	Y	Y	Y
Location Dummies	N	N	Y	Y
Province Level Controls	N	N	N	Y
Observations	291	291	291	291
Percent Correctly Predicted	84.15	85.33	85.19	84.62
Log pseudolikelihood	-163.71	-62.16	-152.40	-161.93
Pseudo R^2	0.140	0.160	0.169	0.188

Notes: This table studies the relation between the proxy for credit constraint, "External Score - Av.", interacted with the dummy variable "North - America", and the probability that a firm declares to produce higher quality for the foreign market. Variables indicated with - Av. are averages for the period 2008-2010. All regressions include a constant term and cluster standard errors, reported in parentheses, at the province level, (d) indicates a dummy variable. Coefficients are reported. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 9: Productivity and External Score, Impact of Crisis

	(1)	(2)	(3)	(4)	(5)	(6)
	External Score	High Q. Out	High Q.Out	High Q.Out	High Q. Out	High Q. Out
After 2007	0.139***					
	(0.028)					
Ln Firm Size	-0.448***					
	(0.093)					
Ln Labour Productivity	-0.284***					
	(0.080)					
Ln Cash Flow	-0.562***					
	(0.043)					
Ln Capital Intensity	-0.195***					
	(0.048)					
Leverage Ratio	0.000					
	(0.000)					
Liquidity Ratio	-4.614***					
	(0.151)					
Impact of Crisis		1.081**	1.086**	1.238**	1.185**	1.299**
		(0.492)	(0.508)	(0.569)	(0.591)	(0.616)
Ln Labour Productivity - Av.		0.087	0.274**	0.304**	0.327**	0.290*
		(0.068)	(0.107)	(0.141)	(0.146)	(0.161)
Impact of Crisis X Ln Labour Productivity - Av.		-0.253**	-0.248**	-0.269**	-0.259**	-0.283**
		(0.110)	(0.112)	(0.123)	(0.127)	(0.133)
Ln Firm Size - Av.			0.210**	0.257**	0.270**	0.263**
			(0.093)	(0.124)	(0.117)	(0.117)
Firm Level Financial Controls	N	N	N	Y	Y	Y
Other Firm Level Controls	N	N	N	Y	Y	Y
Location Dummies	N	N	N	N	Y	Y
Province Level Controls	N	N	N	N	N	Y
Observations	9188	428	428	428	428	428
R^2 or Pseudo R^2	0.848	0.015	0.027	0.055	0.058	0.081

Notes: In specification (1) of this table we study the impact of the recent economic crisis on "External Score", we control for firm fixed effects, time fixed effects and consider the usual firm level indicators of economic and financial performance. From specification (2) onwards we use a firm-level variable for the impact of the crisis on the external score, as a proxy for credit rationing. In these specifications we cluster and bootstrap (500 replications) standard errors, reported in parentheses, at the province level and introduce industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010. Estimated coefficients are reported. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively

Table 10: Productivity and Impact of Crisis, Marginal Effects

	(1)
Ln Labour Productivity	
1.0	0.087
	(0.084)
1.5	0.084
	(0.074)
2	0.081
	(0.063)
2.5	0.075
	(0.052)
3	0.066
	(0.041)
3.5	0.053*
	(0.031)
4	0.033
	(0.024)
4.5	0.005
	(0.021)
5	-0.031
	(0.030)
5.5	-0.074
	(0.047)
6	-0.121*
	(0.065)
6.5	-0.166**
	(0.080)
7	-0.209**
	(0.089)
7.5	-0.246***
	(0.095)
8	-0.276***
	(0.099)
Observations	428

Notes: This table reports the marginal effect of "Impact of Crisis" for different levels of "Ln Labour Productivity". In order to compute marginal effects we employ the last specification of the previous Table. Bootstrapped standard errors (500 replications) are reported in parentheses. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 11: Exported Vs Domestic Quality, Determinants, IV-Probit, Coefficients

	(1)		(2)		(3)	
	High Quality Out		High Quality Out		High Quality Out	
	High Q. Out	Ext. Score - Av. F.S.	High Q. Out	Ext. Score - Av. F.S.	High Q. Out	Ext. Score - Av. F.S.
External Score - Av.	-0.234*		-0.230*		-0.249*	
	(0.122)		(0.125)		(0.131)	
Ln Firm Size - Av.	0.138	-0.350***	0.175	-0.381***	0.166	-0.381***
	(0.112)	(0.071)	(0.121)	(0.069)	(0.127)	(0.071)
Ln Labour Productivity - Av.	0.243*	-0.419***	0.256	-0.406***	0.211	-0.413***
	(0.147)	(0.096)	(0.165)	(0.101)	(0.172)	(0.102)
Ln Cash Flow - Av.	-0.220**	-0.392**	-0.186	-0.395**	-0.240*	-0.400**
	(0.109)	(0.158)	(0.114)	(0.161)	(0.123)	(0.163)
Leverage Ratio - Av.	-0.000	0.002***	0.001	0.002**	0.001	0.002**
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Liquidity Ratio - Av.	-1.321	-3.853***	-1.262	-3.959***	-1.378	-3.951***
	(0.931)	(0.431)	(0.958)	(0.443)	(0.994)	(0.445)
Ln Capital Intensity - Av.	-0.135	-0.104	-0.136	-0.133*	-0.120	-0.126
	(0.098)	(0.078)	(0.108)	(0.080)	(0.113)	(0.080)
Labour Skill			-0.000	0.001	0.000	0.001
			(0.004)	(0.003)	(0.004)	(0.003)
Innovation			-0.031	0.074	-0.010	0.081
			(0.143)	(0.089)	(0.146)	(0.089)
Firm Age			0.167	0.095	0.167	0.091
			(0.120)	(0.075)	(0.122)	(0.075)
Corporation			-0.003	0.034	0.023	0.043
			(0.156)	(0.106)	(0.164)	(0.106)
Business Group			-0.549**	0.211**	-0.537***	0.220**
			(0.213)	(0.103)	(0.204)	(0.107)
Consortium			-0.556	0.025	-0.478	0.048
			(0.512)	(0.231)	(0.501)	(0.247)
Center			-0.203	0.177	-0.086	0.185
			(0.212)	(0.113)	(0.199)	(0.117)
South			0.159	0.150	0.041	0.073
			(0.207)	(0.136)	(0.261)	(0.173)
Provincial Value Added Growth, 98-08					-0.311***	-0.049
					(0.081)	(0.057)
N. Branches per 1000 inhab.					-0.008	-0.003
					(0.006)	(0.004)
External Score - Av. 02-06		0.485***		0.484***		0.483***
		(0.045)		(0.046)		(0.046)
Observations	400		400		400	
Percent correctly predicted	84.50		85.00		85.00	
Log pseudolikelihood	-681.90		-672.07		-668.00	
Wald test of Exogeneity, Prob. > Chi2	0.09		0.08		0.08	

Notes: This table studies the impact of our proxy for credit constraint, "External Score - Av." on the probability that a firm declares to produce higher quality for the foreign market using an IV strategy. Our IV for "External Score - Av." is the average of the External Score in the period 2002-2006. All specifications include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010, (d) indicates a dummy variable. All probit regressions include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 12: Exported Vs Domestic Quality, Determinants, IV-Probit

	(1a)	(2a)
	High Quality Out, 2nd Stage	High Quality Out, 2SLS, 2nd Stage
External Score - Av.	-0.052*	-0.053*
	(0.029)	(0.028)
Ln Firm Size - Av.	0.034	0.035
	(0.025)	(0.028)
Ln Labour Productivity - Av.	0.044	0.043
	(0.035)	(0.035)
Observations	400	400
Percent correctly predicted	85.00	
Log pseudolikelihood	-668.00	
Wald test of Exogeneity, Prob. > Chi2	0.08	
F Test of excluded instruments		101.63
Cragg-Donald Wald F statistic		173.56
Stock-Yogo weak ID test critical value, 10 percent		16.38
Endogeneity Test, Prob. > Chi2		0.09
	(1b)	(2b)
	High Quality Out, 2nd Stage	High Quality Out, 2SLS, 2nd Stage
External Score - Av.	-0.061**	-0.065**
	(0.031)	(0.030)
Ln Firm Size - Av.	0.030	0.030
	(0.026)	(0.028)
Ln Labour Productivity - Av.	0.042	0.040
	(0.036)	(0.035)
Observations	400	400
Percent correctly predicted	85.50	
Log pseudolikelihood	-673.24	
Wald test of Exogeneity, Prob. > Chi2	0.03	
F Test of excluded instruments		99.70
Cragg-Donald Wald F statistic		157.93
Stock-Yogo weak ID test critical value, 10 percent		16.38
Endogeneity Test, Prob. > Chi2		0.04
Firm Level Financial Controls	Y	Y
Other Firm Level Controls	Y	Y
Location Dummies	Y	Y
Province Level Controls	Y	Y

Notes: This table studies the impact of our proxy for credit constraint, "External Score - Av." on the probability that a firm declares to produce higher quality for the foreign market using an IV strategy. In part (a), our IV for "External Score - Av." is the average of the External Score during the period 2002-2006. In part (b), our IV for "External Score - Av." is the difference between the average of the External Score of the firm and the average Score in the Province where the firm is based, in the period 2002-2006. All specifications include industry level dummies. Average Marginal Effects are reported. Variables indicated with - Av. are averages taken for the period 2008-2010, (d) indicates a dummy variable. Both regressions include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 13: Exported Vs Domestic Quality, Determinants, IV-Probit, Coefficients

	(1)	(2)	(3)	(4)
	High Quality Out	High Quality Out	High Quality Out	High Quality Out
External Score - Av.	-0.257**	-0.254**	-0.273**	-0.059**
	(0.121)	(0.126)	(0.130)	(0.028)
Ln Firm Size - Av.	0.126	0.163	0.155	0.032
	(0.109)	(0.120)	(0.127)	(0.028)
Ln Labour Productivity - Av.	0.234	0.250	0.208	0.041
	(0.146)	(0.164)	(0.171)	(0.035)
Firm Level Financial Controls	Y	Y	Y	Y
Other Firm Level Controls	N	Y	Y	Y
Location Dummies	N	Y	Y	Y
Province Level Controls	N	N	Y	Y
Observations	400	400	400	400
Percent correctly predicted	85.00	85.25	85.25	
Log pseudolikelihood	-673.62	-662.60	-658.44	
Wald test of Exogeneity, Prob. > Chi2	0.041	0.034	0.034	
F Test of excluded instruments				64.15
Cragg-Donald Wald F statistic				98.80
Stock-Yogo weak ID test critical value, 10 percent				19.93
Endogeneity Test, Prob > Chi2				0.03
Hansen J Stat., Prob > Chi2				0.37

Notes: This table studies the impact of our proxy for credit constraint, "External Rate - Av." on the probability that a firm declares to produce higher quality for the foreign market using an IV strategy. Our IVs for "External Rate - Av." are the average External Score of the firm in the period 2002-2006, and the Number of Banks lending funds to the firm, as of 2010. All specifications include industry level dummies. Variables indicated - Av. are averages taken for the period 2008-2010, (d) indicates a dummy variable. All specifications include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 14: Strongly Rationed and Industry Fin. Dependence, Robustness Check 1

	(1a)	(2a)	(3a)
	High Quality Out	High Quality Out	High Quality Out
Strongly Rationed	-0.057	-0.039	0.116
	(0.050)	(0.050)	(0.097)
External Score - Av.		-0.037**	-0.040**
		(0.018)	(0.018)
Strongly Rationed (d) X External Score - Av.			-0.148**
			(0.049)
Ln Firm Size - Av.	0.054**	0.038	0.041*
	(0.023)	(0.024)	(0.024)
Ln Labour Productivity - Av.	0.048	0.043	0.038
	(0.031)	(0.033)	(0.034)
Observations	395	395	395
Percent Correctly Predicted	83.80	83.80	83.54
Log pseudolikelihood	-156.84	-154.69	-151.86
Pseudo R^2	0.095	0.107	0.124
	(1b)	(2b)	(3b)
	High Quality Out	High Quality Out	High Quality Out
Industry Fin. Dependence	0.073	0.064	0.064
	(0.051)	(0.053)	(0.051)
External Score - Av.		-0.035**	-0.034**
		(0.014)	(0.014)
Industry Fin. Dependence X External Score - Av.			0.077
			(0.055)
Ln Firm Size - Av.	0.064***	0.050**	0.050**
	(0.022)	(0.022)	(0.022)
Ln Labour Productivity - Av.	0.052	0.048	0.047
	(0.033)	(0.035)	(0.035)
Observations	415	415	415
Percent Correctly Predicted	85.06	85.06	85.06
Log pseudolikelihood	-156.76	-154.42	-154.27
Pseudo R^2	0.104	0.117	0.118
Firm Level Financial Controls	Y	Y	Y
Other Firm Level Controls	Y	Y	Y
Location Dummies	Y	Y	Y
Province Level Controls	Y	Y	Y

Notes: This table studies the relation between the proxy for credit constraint, "External Score - Av." and the probability that a firm declares to produce higher quality for the foreign market. We check the robustness of previous results controlling for the "Strong Rationing" dummy in part (a) of the table, and for "Industry Finance Dependence" in part (b). Marginal effects are reported. Specifications in (a) include industry level dummies. The marginal effect for the interaction term reported in specification (3) of part (b) is obtained by computing the marginal impact of "Industry Finance Dependence" when the External Score is equal to 4, the discrete value closest to the mean of this variable in our sample. Variables indicated with - Av. are averages for the period 2008-2010. All regressions include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 15: Ebitda and Debt over Ebitda, Robustness Check 2

	(1)	(2)	(3)
	High Quality Out	High Quality Out	High Quality Out
External Score - Av.	-0.028*	-0.030**	-0.028*
	(0.014)	(0.014)	(0.014)
Ebitda - Av.	0.002**		0.002**
	(0.001)		(0.001)
Debt/Ebitda - Av.		-0.013	-0.012
		(0.031)	(0.036)
Ln Firm Size - Av.	0.005	0.048**	0.006
	(0.029)	(0.024)	(0.029)
Ln Labour Productivity - Av.	0.010	0.053	0.011
	(0.035)	(0.034)	(0.035)
Firm Level Financial Controls	Y	Y	Y
Other Firm Level Controls	Y	Y	Y
Location Dummies	Y	Y	Y
Province Level Controls	Y	Y	Y
Observations	428	428	428
Percent Correctly Predicted	85.05	84.81	85.05
Log pseudolikelihood	-160.15	-162.11	-160.12
Pseudo R^2	0.121	0.110	0.132

Notes: This table studies the relation between the proxy for credit constraints, "External Score - Av." and the probability that a firm declares to produce higher quality for the foreign market. We check the robustness of our previous results controlling for an alternative indicator a firm's performance, Ebitda, and for the ratio between Firm Debt and Ebitda. Average marginal effects are reported. All specifications include industry level dummies.Variables indicated with - Av. are averages for the period 2008-2010. All regressions include a constant term. Standard errors, reported in parentheses, are clustered at the province level, *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 16: Importance of Export Market, Robustness Check 3

	(1)	(2)	(3)	(4)
	High Quality Out	High Quality Out	High Quality Out	High Quality Out
External Score - Av.		-0.044**		-0.035**
		(0.019)		(0.016)
High Exp Turnover	0.067*	0.064*		
	(0.039)	(0.038)		
Rev. Exp./Tot. Rev.			0.106*	0.109*
			(0.058)	(0.061)
Ln Firm Size - Av.	0.026	0.007	0.057**	0.042*
	(0.021)	(0.024)	(0.024)	(0.024)
Ln Labour Productivity - Av.	0.019	0.008	0.050	0.041
	(0.035)	(0.038)	(0.035)	(0.037)
Firm Level Financial Controls	Y	Y	Y	Y
Other Firm Level Controls	Y	Y	Y	Y
Location Dummies	Y	Y	Y	Y
Province Level Controls	Y	Y	Y	Y
Observations	322	322	380	380
Percent Correctly Predicted	86.34	87.27	84.74	85.26
Log pseudolikelihood	-109.58	-106.42	-145.35	-143.34
Pseudo R^2	0.121	0.146	0.114	0.126

Notes: This table studies the relation between the proxy for credit constraints, "External Score - Av." and the probability that a firm declares to produce higher quality for the foreign market. We check the robustness of our previous results controlling for two proxies for firm's revenues in the foreign market. Average marginal effects are reported. All specifications include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010, (d) indicates a dummy variable. All regressions include a constant term. Standard errors, reported in parentheses, are clustered at the province level, *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 17: Firm Size, Robustness Check 4

	(1)	(2)	(3)	(4)	(5)	(6)
	High Quality Out	High Quality Out	High Quality Out	High Quality Out	High Quality Out	High Quality Out
External Score - Av.	0.233	0.265*	0.222	0.258*	0.261*	0.261
	(0.156)	(0.159)	(0.150)	(0.141)	(0.142)	(0.165)
1-49 Empl. (d)	1.777*	2.015**	2.018**	2.209**	2.219**	2.433**
	(0.935)	(0.963)	(0.948)	(0.913)	(0.930)	(1.087)
1-49 Empl. (d) X External Score - Av.	-0.361**	-0.387**	-0.391**	-0.421***	-0.419***	-0.450**
	(0.165)	(0.166)	(0.165)	(0.158)	(0.159)	(0.190)
50-99 Empl. (d)	1.841*	2.102**	2.058**	2.214**	2.294**	2.439**
	(0.980)	(1.013)	(0.993)	(0.971)	(0.993)	(1.124)
50-99 Empl. (d) X External Score - Av.	-0.346*	-0.373**	-0.373**	-0.392**	-0.404**	-0.421**
	(0.177)	(0.177)	(0.174)	(0.168)	(0.171)	(0.195)
100-249 Empl. (d)	2.440**	2.692**	2.640**	2.950***	2.967***	3.244***
	(1.059)	(1.112)	(1.104)	(1.060)	(1.082)	(1.190)
100-249 Empl. (d) X External Score - Av.	-0.501**	-0.525***	-0.526**	-0.581***	-0.582***	-0.633***
	(0.199)	(0.202)	(0.204)	(0.199)	(0.202)	(0.218)
250-499 Empl. (d)	0.655	1.213	1.087	1.682	1.581	1.555
	(1.442)	(1.610)	(1.633)	(1.679)	(1.668)	(1.593)
250-499 Empl. (d) X External Score - Av.	-0.061	-0.142	-0.125	-0.182	-0.162	-0.105
	(0.290)	(0.314)	(0.321)	(0.336)	(0.336)	(0.308)
Ln Labour Productivity - Av.		0.087	0.153	0.141	0.151	0.124
		(0.078)	(0.102)	(0.116)	(0.119)	(0.126)
Firm Level Financial Controls	N	N	Y	Y	Y	Y
Other Firm Level Controls	N	N	N	Y	Y	Y
Location Dummies	N	N	N	N	Y	Y
Province Level Controls	N	N	N	N	N	Y
Observations	420	420	420	420	420	420
Percent correctly predicted	84.29	84.29	84.52	85.24	85.00	84.76
Log pseudolikelihood	-165.18	-164.88	-164.39	-160.43	-160.15	-155.42
Pseudo R^2	0.070	0.071	0.074	0.096	0.098	0.125

Notes: This table studies the relation between the proxy for credit constraint, "External Score - Av." and the probability that a firm declares to produce higher quality for the foreign market. We control for firm-size proxied by the different firm-size dummies, and interact these variables with firm's External Score. Coefficients are reported and all specifications include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010. All probit regressions include a constant term and cluster standard errors, reported in parentheses, at the province level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 18: Proxies for a Firm's Average Output Quality, Robustness Check 5

	(1)	(2)	(3)	(4)
	High Quality Out	High Quality Out	High Quality Out	High Quality Out
External Score - Av.	-0.029**	-0.039*	-0.045**	-0.039**
	(0.014)	(0.020)	(0.021)	(0.016)
R. and D. (d)	-0.044			
	(0.037)			
R. and D. Expenditure		-0.003*		
		(0.001)		
Innovation for the main market (d)			0.114*	
			(0.058)	
Innovation within the firm (d)			0.085	
			(0.063)	
Firm Value Added				0.009**
				(0.004)
Ln Firm Size - Av.	0.053**	0.099**	0.089**	-0.005
	(0.023)	(0.045)	(0.043)	(0.032)
Ln Labour Productivity - Av.	0.054	0.017	0.021	0.002
	(0.034)	(0.049)	(0.048)	(0.039)
Firm Level Financial Controls	Y	Y	Y	Y
Other Firm Level Controls	Y	Y	Y	Y
Location Dummies	Y	Y	Y	Y
Province Level Controls	Y	Y	Y	Y
Observations	428	184	184	405
Percent Correctly Predicted	84.58	85.87	84.24	84.94
Log pseudolikelihood	-161.59	-63.51	-63.63	-151.76
Pseudo R^2	0.113	0.172	0.171	0.124

Notes: This table studies the relation between the proxy for credit constraints, "External Score - Av." and the probability that a firm declares to produce higher quality for the foreign market. We check the robustness of our previous results controlling for several indirect proxies of firm's output-quality. Average marginal effects are reported. All specifications include industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010, (d) indicates a dummy variable. All regressions include a constant term. Standard errors, reported in parentheses, clustered at the province level, *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.