Düsseldorf Institute
for Competition Economics

DISCUSSION PAPER

No 191

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July 2015

HEINRICH HEINE
UNIVERSITÄT DÜSSELDORF

d|u|p düsseldorf university press

IMPRINT

DICE DISCUSSION PAPER

Published by

düsseldorf university press (dup) on behalf of
Heinrich-Heine-Universität Düsseldorf, Faculty of Economics,
Düsseldorf Institute for Competition Economics (DICE), Universitätsstraße 1,
40225 Düsseldorf, Germany
www.dice.hhu.de

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ISSN 2190-9938 (online) – ISBN 978-3-86304-190-8

Export Quality Upgrading Under Credit Constraints

Andrea Ciani* Francesca Bartoli†

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Abstract

This paper studies whether credit constraints affect the decision of small and medium size enterprises (SMEs) to upgrade the quality of their exported output with respect to the one sold domestically. We use a detailed firm-level data-set on Italian SMEs reporting information on output characteristics, credit rationing and international activities. Employing firm credit scores used by banks for their lending decisions, we assess how credit constraints affect export quality upgrading. First, we find that exporting firms are less likely to upgrade output quality, when their credit score worsens. A one standard deviation worsening in the credit score lowers the probability of quality upgrading by more than 35 percent. Second, firms exporting to distant markets cut quality upgrading more sharply when their score worsens. The negative impact of credit constraints is confirmed when taking into account firm heterogeneity in size and other relevant firm attributes. The main result is robust to endogeneity considerations of the credit score. Overall, our findings suggest that, by impacting export quality upgrading, credit constraints may 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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†Email: fra.bartoli@gmail.com. Research presented in this paper was carried out while Bartoli was part of the UniCredit Research Unit in Bologna, Italy. *We thank Carlo Altomonte, Italo Colantone, Paolo Epifani, Nicola Gennaioli, Amit Khandelwal, Florian Mayneris, Julien Martin, Tommaso Nannicini, Gianmarco Ottaviano, Nicolas Serrano-Velarde and seminar participants at Università Bocconi, Universitat Autònoma de Barcelona, Beijing Normal University, DICE Universität Düsseldorf, ISET, ETSG-2013, ITSG-2013, GTDW, RIEF-2014, SAEe Simposio 2014, RES PhD Meetings 2015 for their helpful comments. Ciani gratefully acknowledges Cariplo Foundation and Università L. Bocconi for funding. All errors are ours. The other, usual, disclaimers apply.*

1 Introduction

The negative impact of credit constraints on export has been assessed both theoretically and empirically (Chaney, 2005; Amiti and Weinstein, 2009; Minetti and Zhu, 2011; Manova, 2013; Muûls, 2015). In fact, exporting firms require external finance to face additional up-front costs associated with setting a distribution network in the destination market, product customization and advertising (Sutton, 2001; 2007). The literature reports, as well, that exporters produce higher quality goods and sell at higher prices than non-exporters (Hallak and Sivadasan, 2011).

The investment associated with quality upgrading (Verhoogen, 2008; Amiti and Khandelwal, 2013; Fieler et al., 2014) and technology upgrading (Bustos, 2011) is then a critical component of export up-front costs. By upgrading output quality, producers can increase revenues from exporting and reach distant markets (Hummels and Skiba, 2004; Martin, 2012; Mayneris and Martin, 2013).[1] Therefore, financial constraints may strongly affect international trade by hampering quality upgrading at the firm level. Yet, to date, there is limited empirical evidence on the impact of credit constraints on output quality (Fan et al., 2015; Crinò and Ogliari, 2015). Our aim is to study the impact of credit constraints on product quality upgrading by Small and Medium Enterprises (SMEs).

In 2014, SMEs represented the 80% of European exporting firms.[2] Given their characteristics, SMEs have bank credit as a main source of external finance, therefore, when the credit market is less liquid, SMEs may be severely affected. Evidence confirms that credit sources tend to dry up more rapidly for small firms than for large companies during economic downturns (ECB; 2013). As a consequence, the support to small and medium-sized enterprises (SMEs) is currently considered a main target for policies aimed to improving the performance of EU manufacturing firms.[3]

This paper seeks to assess the impact of financing constraints on output quality upgrading using a firm-level, time-varying, measure of credit constraints and studying how this affects a firm's decision to upgrade the quality of its exported output as opposed to the one sold domestically. Being output quality a determinant of the unit value at which a product is sold, our study sheds light on how financing constraints affect this component of the intensive margin of trade. Moreover, we take into account how distance to the export market and credit rationing jointly affect quality upgrading. Our results show that exporting firms are less likely to upgrade output quality when credit rationed. The impact of credit constraints is stronger on firms exporting to distant markets.

In order to guide our empirical investigation, we lay out a theoretical framework based on Feenstra and Romalis (2014). In this partial equilibrium model firms endogenously choose the ratio between exported and domestic output quality taking into consideration distance to the foreign market. We extend this framework by introducing credit availability, represented by the share of revenues the firm receives as credit to finance the total amount of the sunk cost for producing output with a determined quality content, similarly to Sutton (2001, 2007) and Fan et al. (2015). The optimal output-quality ratio depends on distance as well as credit availability. The model yields two predictions: (1) the lower the

[1] The determinants of output quality have been investigated using cross-country (Schott, 2004; Hummels and Klenow, 2005, Hallak, 2006) and firm-level data (Kugler and Verhoogen, 2012).

[2] In fact, while few exporters account for the majority of EU export revenues (Mayer and Ottaviano; 2007) the majority of EU exporting firms are actually SMEs and account for a small fraction of export revenues, see Cernat et al. (2014).

[3] See Canton et al. (2013).

credit availability, the more constrained the firm is, and the less likely it is to increase the ratio of exported to domestic output quality; (2) the more distant the export destination, the higher is the output-quality ratio and, hence, the larger is the impact of credit constraints on quality upgrading.

Model's predictions are tested on firm-level data. We use the VIIIth UniCredit Survey on Italian SMEs, ran in June-September 2011, to obtain information on firms' international activities, output characteristics, R&D practices, credit rationing, percentage of skilled labour, location and age.[4] Our main dependent variable is a dummy for firms declaring to produce output of higher quality for the foreign market with respect to the one sold at home, as of 2010. We merge balance sheet data for the period 2002-2010 to this data-set. Our proxy for credit rationing is a creditworthiness score assigned to the firm by an external rating agency. This score, varying from 1 to 9, higher for firms more likely to default, is an independent, annually updated, measure available to each institution operating in the Italian credit market. Banks check this score when deciding on whether to open or increase a firm's line of credit.[5] By determining financial constraints with a discrete variable rather than a dichotomous one we are able to measure the impact of a worsening in credit rationing for the firm. This proxy is linked the variable used in the theoretical framework: as credit availability shrinks, the cost of additional funds increases proportionally to the external score. We validate this measure by finding that it is a good predictor of firms that in survey declare to be strongly rationed.[6] Moreover, the credit score is highly correlated with indicators of a firm's economic and financial performance, such as labour productivity, liquidity ratio, cash flow and leverage ratio. We next turn to estimating the impact of credit constraints on export quality upgrading controlling for firm's balance sheet data, firm's location and proxies for economic development and credit supply in the province where the firm has the headquarter.

We find that credit constrained firms are less likely to upgrade export quality with respect to the quality of domestically sold output. A one standard-deviation worsening in the credit score reduces the probability of quality upgrading by more than 35 percent. We then test the prediction that firms exporting to distant markets have higher incentives to upgrade output quality and therefore are the most harmed by credit rationing. Results show that the impact of credit constraints on quality upgrading is stronger on firms selling their products outside Europe and particularly on those exporting to North America. The impact of an increase in the external score is 28 percentage points larger on manufacturing firms exporting outside Europe.

Endogeneity of the credit score might bias our estimates. First of all, even if a firm's score is determined by an external agency after analyzing its economic performance in the previous years, this measure might be influenced by the impact of the recent economic crisis. Credit supply and credit demand factors may jointly affect the external score, leading to a simultaneity bias. Furthermore, we do not have explicit information on how the external rating agency determines a firm's score, as it is computed using a proprietary algorithm. If the rating agency gives better (i.e. lower) scores to those firms that are capable of increasing the quality of exported output with respect to the one sold domestically, we face a classical reverse causality problem. Lastly, even if we control for a number of factors correlated with our main

[4] The survey was designed to be representative under different dimensions: type of industry, firm's location and size. We focus only on manufacturing firms.

[5] Panetta et al. (2009), find that this score is positively correlated with the median interest rates charged by banks to firms. Rodano et al. (2014) use it as an indicator for the likelihood of default.

[6] Minetti and Zhu (2011) use this dummy for firms declaring to be strongly rationed as their proxy for credit rationing.

explicative variable, unobservables such as managerial ability and firm's connections with bank managers might bias our estimates.

Our first strategy to tackle endogeneity treats the recent economic crisis as an exogenous shock to credit rationing. We use the variation in the score that is explained by the crisis as a proxy for credit rationing, after controlling for firm-level indicators of economic and financial performance. 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 that uses the average score in the years before the crisis and the number of banks lending funds to each firm as instrumental variables. We find a lower bound for the coefficient of interest: the marginal effect of an increase in the score remains negative but larger in magnitude.

We extend our analysis by studying how firm size interacts with credit constraints in determining quality upgrading. Results show that small firms, defined as those having less than 50 employees, are significantly hit by credit constraints while large firms are less harmed: the impact of an increase in the score doubles for small firms. Our findings are robust to controlling for revenues in the foreign market, for different proxies of a firm's output position in the product quality-ladder and considering alternative indicators of credit rationing, such as industry finance dependence.

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

The second strand focuses on the impact of credit constraints on the probability that a firm becomes an exporter and on its output quality choice. Manova (2013) introduces credit market frictions in a heterogeneous-firms trade model. In this framework, firms differ in their credit needs because of the different technologies employed in the industries in which they operate. 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.[7] Minetti and Zhu (2011), on a sample of Italian manufacturing firms, confirm that credit constraints negatively affect firms' export participation and foreign sales.[8]

In order to investigate the impact of credit constraints on output quality, Fan et al. (2015) propose a theoretical framework in which heterogenous firms produce goods of a determined quality, conditional on their productivity draw. When credit constraints are binding, output quality and prices decrease since firms start buying inputs of lower cost/quality. Using Chinese data, they find that credit rationing, proxied by industry finance dependence, leads firms to reduce output quality.[9] Crinò and Ogliari (2015) confirm the negative impact of financing constraints on average output quality at the product/country level.[10] Their study shows that heterogeneity in product quality is affected by the interplay of cross-industry

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

[8] Muûls (2012) proposes a firm level analysis on data from Belgium to study the interaction between credit constraints and trading behavior. Using the Coface score as a proxy for credit constraints during the period 1999-2007, Muûls (2012) finds that credit constrained firms export and import less than non-constrained ones.

[9] Bernini et al. (2013) find a similar result using firm-level data from France on a limited number of products and employing firm's leverage as a proxy for credit rationing.

[10] Crino and Ogliari (2015) use finance dependence at the industry level as a proxy for credit constraints and estimate average product quality at the country level following Khandelwal (2010).

differences in financial vulnerability and cross-country differences in financial frictions.

Our study contributes to this literature by using a firm-level measure of credit rationing to determine how credit constraints affect the decision of small and medium size enterprises (SMEs) to upgrade the quality of their exported output with respect to the one sold domestically. This study is the first one, to the best of our knowledge, focusing on the interaction between distance to the destination market, output quality upgrading and credit constraints. We find that the impact of credit constraints is stronger on firms exporting to distant markets, the ones having higher incentives to upgrade output quality. To address endogeneity of our explicative variable we treat the recent economic crisis as an exogenous shock to firm's credit rationing and employ an instrumental variable approach. Our results lead us to assess and quantify the negative impact of credit constraints on output quality upgrading for the foreign market.

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 explicative 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 decides upon the ratio of output quality for the two markets, domestic and foreign, when it is credit constrained.

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.[11] 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:

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

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 trade cost.[12] If we

[11] 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).

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

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 in the following Cobb-Douglas technology:

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

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

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

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 sunk cost to start producing an output with quality z_{ij}^k for market k : $F_{ij}^k = f^k w_i (z_{ij}^k)^{1/\gamma}$. 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.[13] Notice that the effectiveness of the sunk cost depends on output quality and equals the one of the variable cost. This cost is sunk by firms exporting to k for expenditures in R&D, marketing, and innovation as in Sutton (2001, 2007). Higher the quality of the output, larger the cost that the firm must sunk,

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

We can then write a firm's profit in market k:

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

Rewriting it in quality-adjusted terms, using the definition of the sunk 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 obtain:

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

2.3 Credit Constraints

We 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, as credit to finance the sunk cost of producing a good with quality z_{ij}^k. The firm finances the full amount of the sunk cost.[14] Therefore when θ decreases, the firm

[13] The firm has to invest x_{ij}^k units of input in its technology in order 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, $\frac{1}{\gamma}$.

[14] It is possible to solve the model considering the possibility that the firm finances a fraction $d \epsilon [0,1]$ of the sunk 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.

has less credit available and it is more likely to be constrained. The budget constraint takes the following form,

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

The profit maximization problem reads now 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

$$\theta \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k \right)}{z_{ij}^k} \right] Q_i^k \right\} \geq f^k \frac{w_i \left(z_{ij}^k \right)^{\frac{1}{\gamma}}}{z_{ij}^k}. \tag{9}$$

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,[15]

$$(z_{ij}^{*k})^{1/\gamma} = \frac{\tau_i^k T_i^k Q_i^k}{\left(\frac{1}{\gamma} - 1 \right) w_i \left(\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k + \frac{1+\lambda}{1+\lambda\theta} f^k \right)}. \tag{10}$$

The 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,

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

There exist a cutoff level of credit access, θ, such that the budget constraint (9) is binding for $\theta^* < \theta$. Using θ as a proxy for a firm's credit 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:

$$z_{ij}^k = \left[\frac{\tau_i^k T_i^k Q_i^k}{\left[\frac{1}{\theta} f^k w_i - \left(\frac{1}{\sigma - 1} \right) \tau_i^k \right]} \right]^{\gamma}. \tag{12}$$

Given (12), if $\left[\frac{1}{\theta} f^k w_i - \left(\frac{1}{\sigma-1} \right) \tau_i^k \right] > 0$, it is possible to conclude 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

[15] Refer to the appendix for all derivations.

in T_i^k, the destination specific per-unit cost, $\frac{\partial z_{ij}^k}{\partial \theta \partial T_i^k} > 0$, provided that $\left[\frac{1}{\theta} f^k w_i - \left(\frac{1}{\sigma - 1}\right) \tau_i^k\right] < \frac{1}{(1-\gamma)}$.

Suppose now 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 profit in the two markets, i and j, independently. We solve the profit maximization problem for firm j in the domestic market i, assuming that it has to sunk a cost, $f^i \frac{w_i \left(z_{ij}^i\right)^{\frac{1}{\gamma}}}{z_{ij}}$, 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.[16] Our firm finances the total amount of the sunk 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 profit in the domestic market is maximized as follows:

$$\max_{p_{ij}^*, z_{ij}^i} \left\{ \left[p_{ij}^* - \frac{\left(c_{ij}(z_{ij}^i, w_i) + 1\right)}{z_{ij}^i} \right] Q_i^i - f^i \frac{w_i \left(z_{ij}^i\right)^{\frac{1}{\gamma}}}{z_{ij}^i} \right\} \tag{13}$$

subject to

$$\theta \left\{ \left[p_{ij}^* - \frac{\left(c_{ij}(z_{ij}^i, w_i) + 1\right)}{z_{ij}^i} \right] Q_i^i \right\} \geq f^i \frac{w_i \left(z_{ij}^i\right)^{\frac{1}{\gamma}}}{z_{ij}^i}. \tag{14}$$

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

$$\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}} = \frac{Q_i^k}{Q_i^i} \frac{\tau_i^k T_i^k \left[f^i w_i \theta^{-1} - \left(\frac{1}{\sigma - 1}\right)\right]}{\left[f^k w_i \theta^{-1} - \left(\frac{1}{\sigma - 1}\right) \tau_i^k\right]}. \tag{15}$$

Proposition 1 *When θ, the fraction of revenues that a firm obtains as credit in order to finance the sunk cost, decreases, the ratio between output quality supplied to the foreign and the domestic market decreases, if $f^k < \tau_i^k f^i$.*

Proof. *Refer to the appendix* ■

This first proposition states that as the amount of credit available is reduced, a firm is less likely to increase the quality content of exported products with respect to the quality of products sold in the domestic market. This result holds if the constant component of the sunk cost associated to export, f^k, is smaller than the product between the iceberg trade cost, τ_i^k, and the constant component of the sunk cost one needs to pay to start producing for the domestic market, f^i

Proposition 2 *As T_i^k, 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.*

[16] This assumption is consistent with Feenstra-Romalis (2014) and it eases our computation.

Since T_i^k 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 of credit availability should affect more this subgroup of exporting firms.

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-location level. The sample size of the survey consists of 7436 non-financial firms, among these 1057 are manufacturing. 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. We also have access to the annual balance sheets for all firms involved in the survey for the period 2002-2010.[18] Along with information on firms' balance sheets, firms' credit scores from both UniCredit and CEBI are at our disposal. Given our research question, we focus only on data from manufacturing firms.

3.1 Main Variables

High Quality Out. Our main 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 clearly stating 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, referring to the cost of inputs employed for producing the two products (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, such as labour productivity and firm size, usually found in the literature to be correlated with standard measures of output quality. When answering this question firms can also declare to export products of lower quality with respect to the one produced for the domestic market: we will use this information in some of the following specifications.

Measures of Credit Rationing. We need to find a proxy for credit constraints at the firm level, an observable variable representing the term θ used in our theoretical framework. As previously said, when θ

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

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

decreases the firm has less external funds available to finance its sunk cost of production; when this term decreases, accessing external funds becomes more costly to the firm that might decide not to increase the quality content of its output. Our aim is then to find a firm-level measure for credit rationing. Ideally, this measure should be a discrete variable since our objective is to measure how a worsening in the credit constraints affects the decision of the firm on output quality.

In the survey, firms are asked to define their credit availability, specifically 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, a firm is labelled as "weakly rationed".[19]

Referring to balance sheets data, it is possible to extract other valuable information on a firm's economic and financial status. For those firms in the sample that in 2011 were customers of UniCredit Group, we also can compute the ratio of credit used over total credit available from banking institutions reporting this information to CEBI.[20]

External Score. From the same source, we obtain a firm's external score, spanning from one, for firms in good financial/economic health, to nine, for firms with a high probability of default.[21] In our main specifications we will use this variable as a 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 market's interest rate. In the following section we will support this assumption relying on several econometric specification. The idea of using a firm's credit score as a measure for credit constraint is common in the Corporate Finance literature. In fact, Panetta et al. (2009), find that the score is positively correlated with the median interest rates charged by banks to Italian firms. The lowest external score, is on average associated with a loan interest rate of 4%, whereas the worst category pays an average loan interest rate of around 5%. The same authors also find that the external score is an accurate predictor of actual default-incidence among Italian firms.

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, have large funds to invest in quality differentiation.[22] We also introduce a variable that is found in the empirical trade literature to be positively correlated with output quality: 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

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

[20] We obtain two different measure: 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.

[21] This is the score classification 1 = High Safety, 2 = Safety, 3 = High Solvency, 4 = Solvency 5= Vulnerability, 6= High Vulnerability, 7=Risk, 8=High Risk, 9=Very High Risk.

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

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

over total equity; (iv) capital intensity, the ratio between total fixed assets and the number of employees. It is important to recall here that variables from (i) to (iii) have often been used in the literature as proxies for credit rationing.[24] In our study these measures are used as controls since we expect our main explicative variable, the firm's external score, to be highly representative for a firm's credit rationing. In fact, a firm's leverage ratio would give information on the amount of credit received by the firm with respect to the resources generated internally; the amount of external funds obtained by a firm is however a result of production technologies, investment decisions and business cycles, as such it gives only a partial information on how difficult and costly accessing external finance might be . The external score is instead an information that is known by all banking institutions across Italy. It is probably the first information checked by a Bank's local-branch manager when asked to increase the upper limit or to open a new line of credit for a firm and it is going to drive his/her decision on whether to finance a SME.

Other Survey Data. We consider a number of 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, whether it is part of a business group, a corporation or a consortium and if it is located in the Center, the South or the North of Italy. Firms employing a skilled labour force and those producing for a long time are often found to be more productive and to supply high-quality products.[25] 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 characteristics 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 composition of its labour force and its access to credit.[26]

Province Level Variables. We merge information on the economic activity at the province level to this rich database. We consider data on provincial value-added from 1998 to 2008, both in levels and growth rates, as obtained from ISTAT. In order to have 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.

Table 1 reports summary statistics on these variables for the group of exporting manufacturing firms in the year to which the survey refers, 2010.[27]

[Table 1 here]

It is interesting to notice that almost 12% of firms declare to export products of higher quality with respect to ones sold in the domestic market. The mean size of firms in our sample is equal to 76 employees, but observing that the median is lower, 49, we can claim that the majority of firms in the sample is significantly smaller. On average, exporting manufacturing firms are operating since 32 years and are mainly located in the North of Italy.[28] 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

[24] See Greenaway et al. (2007) and Bernini et al. (2013).
[25] See Bernard et al. (2004) and Minetti and Zhu (2011).
[26] See Guiso et al. (2004).
[27] Balance sheets data are from the end of 2010.
[28] The 74.2% is located in the North, the 15.5% in the Center and the 10.1% in the South.

and equal to 4.38 and 4 respectively, underlying that the majority of interviewed firms were classified as not likely to default by the external rating agency in 2010. However, the 13.3% of firms declares, in the survey, to be strongly rationed while the 26% is weakly rationed. We can compare these numbers with Minetti and Zhu (2011), using data from a similar survey on Italian SMEs ran in 2001. In their data only the 4.4% of exporting firms is strongly rationed and the 18.5% weakly rationed. The sizeable increase in these percentages from 2001 to 2011 is most-likely due to the recent economic crisis and 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 the 2005-2007 to 2008-2010. Rationed firms are 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 firms.

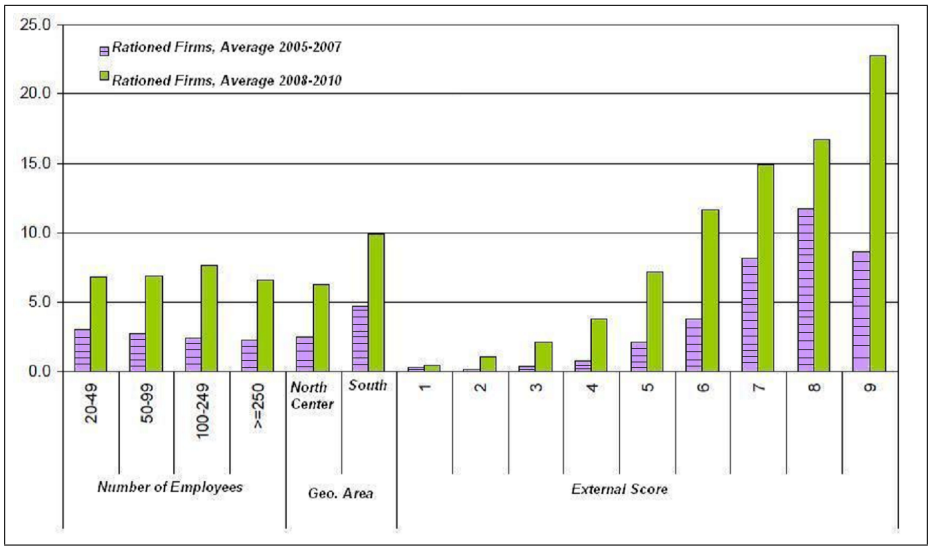

Figure 1. Increase in the Share of Rationed Firms.

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 each score category. Moreover, 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 conclude that the years of the current economic crisis have witnessed a worsening of credit availability for Italian firms.

3.2 Different Measures of Credit Constraint

To support our choice of the score as the main explicative variable and proxy for credit constraint, we first study the relationship between the dummy indicating whether a firm is strongly credit rationed in 2010, and four variables that could be used as proxies for credit constraints. The four candidate explicative 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 in the period 2008-2010 and the average of credit use in the short-term. 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 the following paragraph refers to customers of UniCredit.

As previously said, our ideal measure for credit constraint would be a firm level measure that is correlated with what declared by the firm in the survey but also measures how intensively the reduction of credit impacts on exported output quality upgrading. Two firms both declaring in the survey to be credit rationed might be differently affected. 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 explicative 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 the period 2010-2011.

[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 a specification 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 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 of a firm's economic and financial performance and our candidate explicative variable. Table 3 reports OLS estimates obtained using the external score as a dependent variable. In specification (1) to (4) we exploit within-time and firm variation using firm and time fixed-effects, while in specification (5) we use data from 2010 and introduce industry fixed-effects. Results show that, among 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 liquidity ratio and a higher cash-flow are also associated with a lower external 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 for credit availability and, being strongly correlated with indicators of a firm's economic and financial status, is also a valid proxy for a firm's creditworthiness.

We showed that our proxy for credit constraints is a good prediction for a firm declaring to be strongly rationed and that it is correlated with measures 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. In the following table we split our sample of manufacturing firms in two different groups, non-vulnerable (N. V.) firms are those reporting an average external score lower than or equal to 4 while vulnerable exporting firms are those reporting an external score from 5 to 9.

[Table 4 here]

Table 4 shows group means, standard deviations and T-tests for difference in means for our variables of interest in the two groups. Vulnerable firms are significantly less likely to upgrade output quality for the foreign market. Moreover, among the group of vulnerable firms the 42.5% and the 27.5% are weakly and strongly rationed, respectively. These percentages are significantly smaller for non-vulnerable firms: almost the 4% and the 15% of non-vulnerable firms declare to be strongly and weakly rationed, respectively. Vulnerable firms are also 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 the ability to upgrade output quality for the foreign market.

4 Results: Upgrading Quality for the Foreign Market

In this section we empirically test predictions obtained in the framework presented in section 2. We set $Q_j = 1$ for firms exporting an output of higher quality with respect to the one sold domestically and use 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 employ this 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 main explicative variable, C_j, credit rationing at the firm-level, proxied by the average of the external score for the period 2008-2010. Higher the external 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 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 the level of economic development in the province where the firm has the headquarter, such as provincial value-added growth, the average of provincial valued-added, and for 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 world demand for goods.[29] If we assume that ϵ_j is i.i.d, normally distributed with mean 0 and variance 1, we have:

[29] Using the ateco two-digit classification our firms belong to 25 different industries.

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

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

[Table 5 here]

We start by using our main explicative variable, the average external score in 2008-2010, and insert control variables group by group in the following regressions. The average of the external score reports in specification (1) a negative coefficient equal to -0.025 and 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: the sign of this coefficient is positive and significant in all of our specifications. 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 consider the percentage of skilled labour force in the firm and for a dummy equal to one for firms declaring to have innovated their products in the last year before the survey, from specification (6) onwards. These two variables report small and non-significant coefficients. In specification (6) 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. Specification (7) introduces our full 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 is in line with the intuition 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 requested in the export market. In specification (8) we consider the level of provincial value-added, results do not change and the coefficient of this variable is not significant.[30]

Our 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 specifications.[31] Relying on the coefficient obtained in specification (7), we observe that a one-standard deviation increase in the average external score reduces the probability of quality upgrading by more than 35 percentage points.[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. The average marginal effects are very similar. Credit constrained firms are less likely to upgrade the quality of exported output, while larger firms are more likely to pursue this strategy.

[30] 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/lower quality.

[31] It varies from -0.019 to -0.030.

[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%.

[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 in the domestic market, equal to 1 if the firm states that output quality 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 explicative 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 significant at the 10%. Table 7 reports cross-correlations for the variables employed in these specifications.

[Table 7 here]

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 product unit values as proxies for output quality, find that firms sell high quality products in more distant markets. Our theoretical framework suggests that firms exporting to more distant markets should suffer more from a worsening in credit constraints when deciding on export quality upgrading: $\frac{\partial\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}}}{\partial\theta\partial T_i^k} > 0$.

In the survey, 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[37] and Est-European countries.[38] Given this information, we differentiate firms using 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 impact of credit constraints on these firms by interacting this dummy variable with our main explicative variable: the average external score obtained by the firm during the period 2008-2010. Equation (4.3) reports the econometric model estimated in Table 8.

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

[Table 8 here]

[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 export in European main markets, European secondary markets and Est-European countries. We refer to EU as a geographical area and not as a political-economic entity in this case. Moreover, we do not consider observations from firms whose most distant export market is in the Medieterranean.

We test the following prediction: the probability of quality upgrading should be decreasing in the term interacting the proxy for credit rationing and export destination, $\frac{\partial \Pr(Q_j=1)}{\partial(C_j * OutEu_j)} < 0$. Table 8, reporting coefficients and not average marginal effects, shows two interesting results. First, firms exporting outside the European area are more likely to upgrade exported output quality. Moreover, these firms are the ones whose probability of quality upgrading is more affected by credit constraints. In fact, 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, firms exporting inside Europe are less likely to upgrade quality since these markets are more similar to the domestic one, therefore they are 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 per-unit trade costs on the final price of their products in the export market. Coefficients reported in Table 8 also confirm that more productive and large firms are capable to upgrade the quality of exported output. Using the last specification reported in Table 8, Figure 2, reports the marginal impact of an increase in the average external score (X axis) on the probability of quality upgrading by exporters outside Europe (Y axis).[41] An increase in the external score has a negative impact on the probability of quality upgrading. This impact is negative and significant for exporters outside the EU with an average external score higher than 4 and remains negative and of a similar magnitude for higher values of the score.

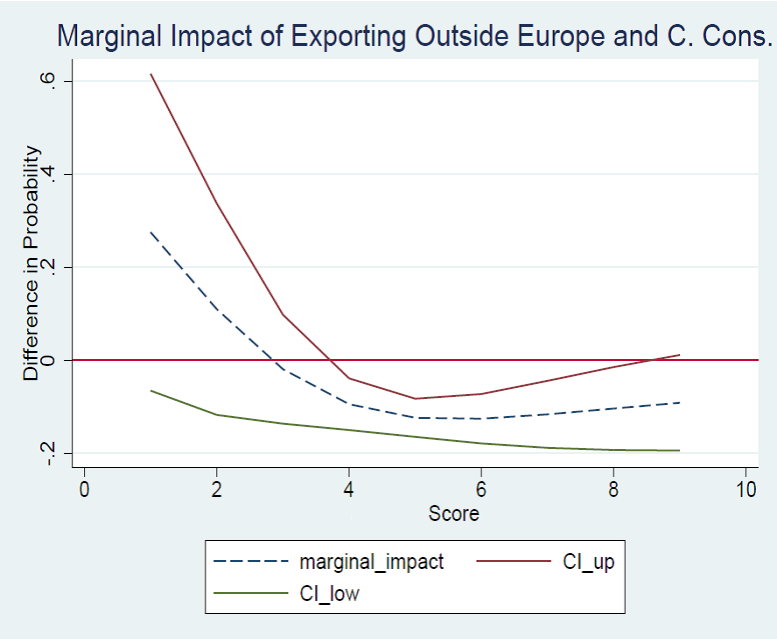

Figure 2. Score, Impact on Quality Upgrading for Firms Exporting Outside EU.

Considering all export destinations as equally impacting on quality upgrading might be a strong assumption. In order to further investigate on this, we now employ an alternative estimation strategy.

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

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

We focus on the sub-sample of firms exporting to the main European destination markets for Italian exporters: France, Germany, UK and Spain. Within these firms, we select the ones exporting also to North America. The United States are, by far, the largest market for Italian manufacturing firms outside the EU: 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. Results, as reported in Table 9, confirm findings previously described.

[Table 9 here]

Among exporters to EU main destinations, firms exporting 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 positively impact on quality upgrading. This result strongly reinforces conclusions drawn on previous results. We find here that adding a distant foreign market (i.e. North America) significantly increases the impact of credit constraints on quality upgrading by firms already exporting to the largest EU markets for Italian exporters. Figure 3 reports the marginal impact of an increase in the credit score (X axis) on the probability of quality upgrading by exporters to North America (Y axis). A worsening in credit rationing significantly reduces the probability of quality upgrading. The impact is negative and significant for exporters to North America reporting an average external score between 5 and 7.

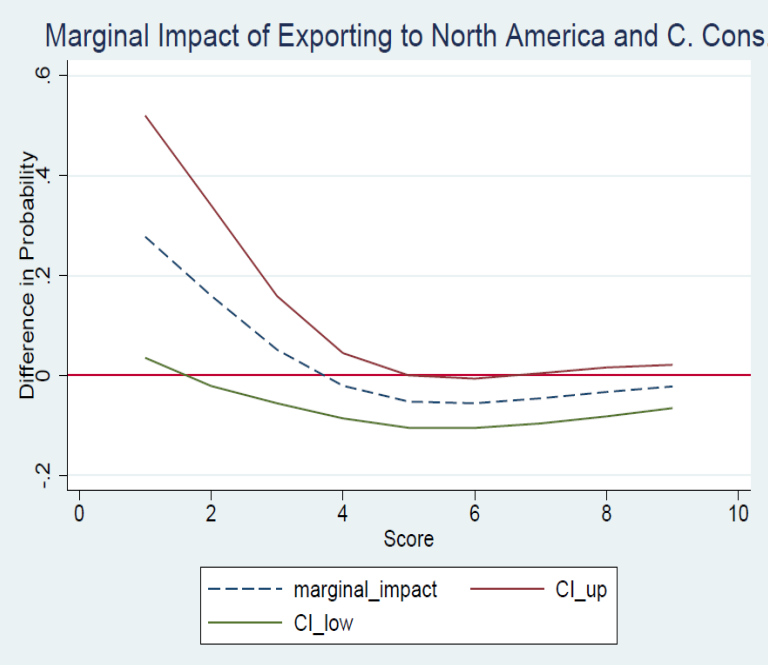

Figure 3. Score, Impact on Quality Upgrading for Firms Exporting To North America.

5 Addressing Endogeneity

Endogeneity of the main explicative variable might bias the findings we have just discussed. First of all, even if a firm's score is determined by the external agency after analyzing its economic performance, it might suffer 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 crisis, Italian credit institutions decreased the amount of loans and strongly reduced the number of loans to risky creditors.[42] This factor might have influenced the external rating agency when determining firms' external scores during the crisis. If firms receive worse scores because of the credit-supply effect of the crisis, our results are biased.

We tackle this issue assessing the supply-side impact 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 our main specification to study the impact of the economic crisis on exported output quality upgrading.

Furthermore, we do not have 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, we suppose that our estimates could be downward biased. Based on this reasoning, if we would find a proper instrument for our explicative 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 explicative variable, there might be unobservables, such as managers' connections with the banking sector, that might be negatively correlated with a firm's external score[43] and with exported-output quality upgrading, leading us to find upward biased estimates.[44] The marginal effect at the mean 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 idea is to consider the great recession as an external shock to credit access for Italian firms. The recession started at the end of 2007 with a financial crisis in the US and then spread across the globe[45] through a significant fall in the demand for durable goods.[46] This shock impacted on the economic and financial performance of Italian firms both reducing revenues and worsening credit availability. In the following graph we report the average of within-industry variation of 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 the score's variation significantly increased during the crisis for both groups of firms.

[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.

[44] Firms producing high quality products both for the domestic and the foreign market might have strong connections with credit institutions.

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

[46] We refer to the debate on the Great Trade Collapse, as in Baldwin (2009).

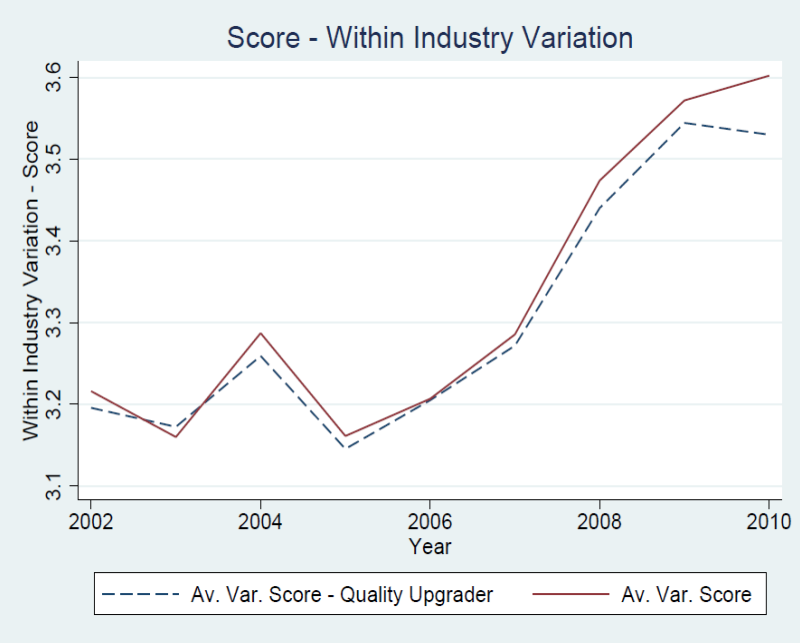

Figure 4. External Score, Within Industry Average Variation.

The recent economic crisis, coincides then with a polarization in the scores reported by the SMEs in our sample. To further investigate on this issue, we empirically assess whether the firm's external score was influenced by the crisis. In the following specification we identify the correlation between a dummy for the crisis' years, *After 2007*, and our explicative variable, the external score, controlling for time fixed effects, γ_t, firm fixed effects, ρ_j, and for time-varying indicators for a firm's economic and financial performance, X_{jt}. 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 10 confirm that the crisis impacted on firms by raising (i. e. worsening) their score. This variable reports a positive and significant coefficient.

[Table 10 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, with $After2007 = 0$ and $After2007 = 1$ and estimate:

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

After obtaining firm level time-varying residuals from (5.2), $\widehat{\varepsilon}_{jt}$, 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 coefficients, $\widehat{\beta_j}$, estimated in this last regression, we create the variable *Crisis*. It is now possible to employ this exogenous variable to identify the causal impact of credit rationing on quality upgrading.

Our identification strategy relies on assuming that, after controlling for firm specific and time varying components, we are able to capture the exogenous impact of the economic crisis on firm's credit access through the exogenous variation in the external score. We run the following specification to compare, at a given level of labour productivity, firms reporting different variations in the external score due to the recent economic crisis conditioning on the set of controls previously employed:

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

The variable representing the impact of the crisis on a firm's external score, $Crisis_j$, is interacted with labour productivity, $LabP_j$. We employ this quasi-DID strategy in order to study whether firms, conditional on their economic performance, were affected by credit rationing due to the exogenous impact of the crisis when deciding to upgrade the quality of their products. Employing coefficients obtained in specification (6) of Table 10, we report the marginal effects of $Crisis_j$ at different levels of labour productivity in Table 11.[47] Results show that more productive firms are negatively impacted by credit rationing 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", presented in (5.2)

[Table 11 here]

Considering the crisis as an exogenous shock for 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 credit availability are less-likely to upgrade the quality of exported output with respect to the one sold domestically. Credit rationing reduces the probability of quality upgrading for the foreign market.

5.2 Instrumental Variable Approach

We continue our analysis implementing an instrumental variable approach. We suppose that our main model,

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

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

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

We can rely on other researches that have dealt with endogeneity of the main explicative variable while working on data-sets and research questions similar to ours. Minetti and Zhu (2011) employ province-level variables representing credit supply at the local level as instruments for strong rationing.[48] Secchi et al. (2012) use the lagged value of the firm's external score as an instrument in order to assess the impact of credit constraints on firm's exporting performance and on unit values of traded products.

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

[48] They follow Guiso et al. (2004).

In the following specifications we use the average external score obtained by firms in the period 2002-2006 as an instrument for our main explicative 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. Moreover, we expect our instrument to be related to our dependent variable only through the instrumented one: the lagged external score affects quality upgrading only through its impact on the average external score in the period 2008-2010 once controlling for our complete vector of covariates. In Table 12, we report results obtained using our instrumental variable approach.

[Table 12 here]

This table reports the first and the second stage coefficients of our specifications. We find that our instrument is not weak given that it reports a high and significant correlation with the endogenous variable. Results confirm that more 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 to upgrade output quality, as well. Table 12 reports coefficients and not marginal effects at the means, we then have to rely on Table 13 to assess how the magnitude of marginal effects changes when addressing endogeneity with IV.

[Table 13 here]

Results in specification (1) show that the omitted variable bias was affecting previous results. In fact, the marginal effect for the instrumented variable is now greater in magnitude and equal to -0.048, a value that almost doubles the one obtained without instrumenting. The significance of the estimated regressor is however lower: 10%. In the second specification we report coefficients obtained running a two stage least squares model on the same econometric model . We use this specification to obtain a series of important statistical tests on our estimations. 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 and the endogeneity test confirms that results obtained when instrumenting are statistically different to the ones obtained without instrumenting. We complete our investigation introducing another instrument for the average external score in the period 2008-2010. From our survey we have data on the number of banks from which the firm obtains external finance in year 2010. Obtaining funds from a large number of banks in a crisis period might be a signal of a reduction in credit availability from the principal financier, and this is particularly true for SMEs that normally rely on a very limited number of creditors. Therefore, a higher number of creditors could be a proxy for credit rationing. We expect that a higher number of creditors should be associated with higher average external score in 2008-2010. In Table 14 we propose results obtained when using both the number of banks and the average of the external score during 2002-2007 as instruments.

[Table 14 here]

In specifications (1) to (3) we report second stage coefficients obtained when introducing our set of controls by groups. Specification (4) reports average marginal effects estimated when using a two stage

least squares model. The coefficient for our variable of interest is still negative but larger in magnitude with respect to the one obtained in the previous table, the marginal effect at the mean is now equal to: -0.059. Tests report results comparable to the ones obtained for specification reported in Table 13. For this last estimation, we also report the Hansen-J statistic of the over-identification test. Since we reject its null-hypothesis, we can conclude that our instruments are valid.

Results reported in this section confirm that credit constraints 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 exogenously negatively affected by the crisis is less likely to upgrade output quality for the foreign market. Moreover, using IV, we estimate that the effect of a worsening in credit rationing is still negative but larger than the one reported in our main findings. Based on these results, a standard deviation increase in the external score lowers the probability of quality upgrading by more than 50 percent.[49]

6 Robustness Checks

Export Revenues. As reported in equation (15) of our theoretical framework, the ratio between the quality of exported output and the quality of output sold domestically depends, among other variables, on $\frac{Q_i^k}{Q_i^i}$, the ratio between quality-adjusted demand in the destination, k and in the domestic market, i. A higher 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 a ratio between revenues in the export market and total revenues. Following implications discussed above, we expect to find a positive impact of these variables on the probability of producing an output of higher quality for the export market. Table 15 confirms that this is indeed the case.

[Table 15 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 results. Firms reporting higher revenues in the export market with respect to the ones obtained domestically 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, when interacted with our proxy for credit constraint, impacts on export quality upgrading. Firm size is clearly a crucial issue when a bank decides on whether to lend funds: large firms might be perceived as safer debtors

[49] To obtain this number, we multiply the average marginal effect of the External Score, obtained in specification (1) of Table 14, by the ratio between its standard deviation and share of quality upgrading firms in the estimation sample.

since they hold more collateralizable assets. Large firms might also have stronger connections with credit institutions simply because they require their services more often and in larger amounts than 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 for different credit scores.[50] We estimate a probit model in which our dependent variable is regressed on the usual set of controls and on a term interacting firm size with the external score. This specification enables us to plot the marginal impact 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. Doing so, we are able to determine how size affects quality upgrading. The graph shows that the predicted probability of quality upgrading increases as the firm becomes larger.

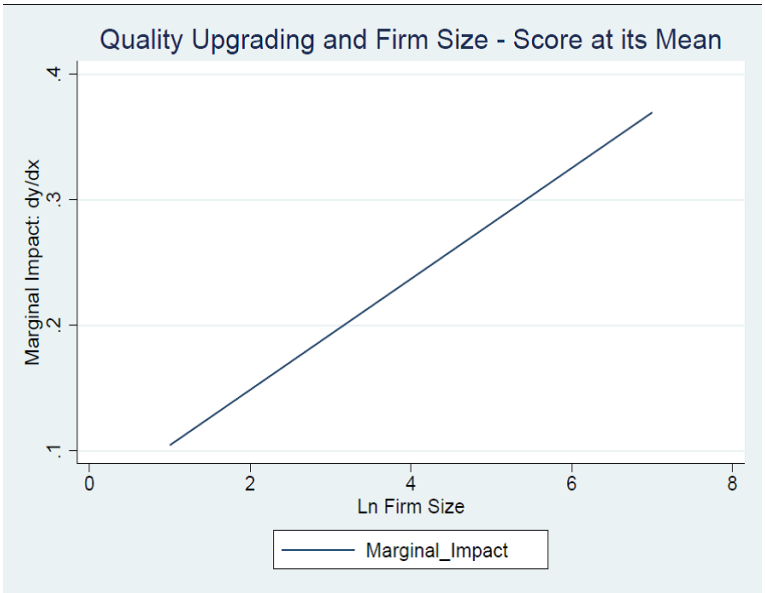

Figure 5. Firm Size, External Score and Probability of Quality Upgrading.

In the following table we report results obtained when interacting our proxy for credit constraints, the external average score, 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.[51] Results, as reported in Table 16, show that our interaction term reports a negative significant coefficient for firms having less than 50, 50-99 and 100-249 employees.

[Table 16 here]

To easily grasp results, we propose the following graphs reporting the change in the probability of quality upgrading for firms in the different size-groups.[52] On the X axis we report the external score and on the Y axis the difference in probability. Marginal effects are computed using average marginal impacts at the means estimated in specification 6 of Table 16. 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

[50] Estimates not reported, available upon request.
[51] The residual category is the group of firms having 500 to 1387 employees, representing the 2% of firms in our sample.
[52] See Norton et al. (2004) and Karaca-Mandic et al (2012).

upgrade exported 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 external score. The graph for firms having 250 to 499 employees shows that we cannot properly draw conclusions on the relation between quality upgrading and our interaction term for this group of firms since the confidence bounds lie above and below the zero line. Comparing the marginal effects at the means, we observe that the impact of a standard deviation increase in the external score on quality upgrading is twice as large for firms having less than 50 employees with respect to larger firms.

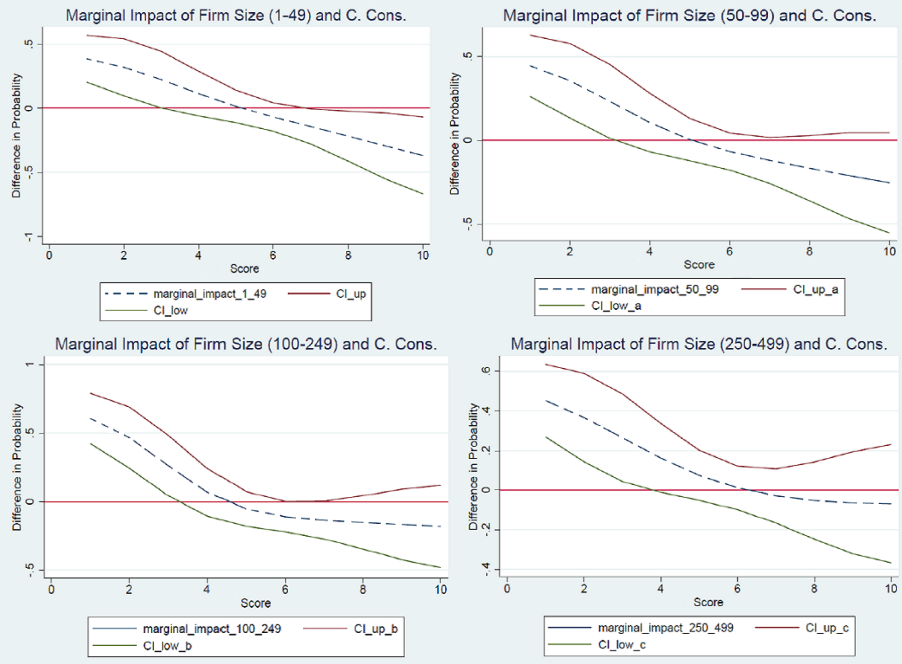

Figure 6. External Score and Probability of Quality Upgrading, Different Firm Size.

Strongly Rationed Exporters. As shown in the previous section, our main explicative variable is a good predictor for a firm declaring to be strongly rationed in the survey. However, the dummy variable for strongly rationed firms is a reliable measure of credit constraint since it is an information provided directly by the firm on its impossibility to obtain the desired amount of credit in the year preceding the survey. This variable directly identifies those firms that demanded credit and did not obtain it in year 2010. We introduce this variable in specification (1a) of Table 17 as an alternative proxy for credit constraint.

[Table 17 here]

As expected, this dummy variable enters our specification with a negative significant marginal effect.[53] We continue by introducing, in specification (2a), our main explicative variable, average external score, together with this dummy variable. Interestingly, when we consider both variables, only the average external score remains significant and negatively correlated with the dependent variable. The external score confirms to be highly correlated with the "Strongly Rationed" dummy when predicting the probability

[53] At the 10%.

of quality upgrading. In specification (3a) we introduce a variable representing the interaction between the dummy variable and the external score in order to study the joint impact of these two variables. 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. We expect firms declaring in the survey to be strongly rationed and obtaining a higher score to be affected. Results confirm that strongly rationed firms reporting a high external score are less likely to upgrade quality.

External Finance Dependence. Manova (2013) followed by Fan et al. (2015) use an indicator of dependence on external finance at the industry level, based on US data, as a proxy for credit constraints.[54] The rationale behind this choice being that a firm operating in a specific industry needs on average a certain amount of external funds given by 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 finance dependence.

Specifications in part (b) of Table 18 show that industry finance dependence reports non-significant marginal effects when clustering standard errors at the province level. The positive sign, in 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 need and be able to quality differentiate across markets more often than producers of tobacco. This measure, however, is unlikely to give any information on how costly or difficult obtaining external funds might be for a single firm. In fact, when we introduce our explicative variable, average external score, it reports the usual negative and significant marginal effect. In specification (3b) we introduce the interaction between external finance dependence and the external score to study the joint effect of these two variables. The interaction term reports a negative non-significant marginal impact while our main explicative variable still enters with the usual negative and significant coefficient.

Quality within the firm. In our main specifications we control for two variables usually considered by the literature to be predictors of output quality: labour productivity and firm size.[55] In various estimations we also control for the percentage of university graduates in the firm's labour force, supposing that higher 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 practices 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.

[Table 18 here]

The coefficient for this variable enters this specification with a negative non-significant coefficient, while the coefficient for our variable of interest does not change magnitude, sign and significance. We

[54] This industry level indicator of finance dependence has been proposed by Rajan and Zingales (1998).

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

continue our investigation introducing other proxies for firm's output quality. In specification (2) we control for R&D expenditure 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 and are less likely to upgrade quality for the foreign market. In specification (3) we insert two dummies equal to one when a firm has adopted, in the last-three years, an innovation that was new to the firm's main destination market or that was new only for the firm itself. We expect firms that introduced innovations for the export market to be more likely to upgrade output quality. In fact, the coefficient for this variable enters our specification with a positive and significant magnitude. The marginal effect at the means for innovation for the main market is equal to 0.114 and it is significant at the 10%. In specification (4), following researches claiming that firms producing output of higher quality are also capable to have better economic performances compared to other firms operating in the same sector, we control for a firm's value-added in 2010.[56] Results show that firms reporting a high value-added are more likely to pursue quality upgrading.

Our main explicative variable enters each of these specifications with the usual negative and significant coefficient. The estimated marginal effect varies form -0.029 to -0.045 and it is significant at the 5% in these specifications. Therefore, controlling for proxies of a firm's output position in the product quality-ladder does not impact on the negative relation between our proxy for credit constraints and quality upgrading: when the external score worsens a firm is less likely to upgrade output quality.

7 Conclusion

We investigated the linkages between the choice to upgrade output quality for the foreign market and credit rationing 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 impact of credit rationing on quality upgrading is stronger on those firms that have higher incentives to pursue it, i.e. the ones exporting to distant markets.

Results are confirmed when accounting for firm size: small firms are the ones more affected by credit constraints when taking the decision to upgrade output quality. We employ two different strategies in order to address the endogeneity of our explicative variable, estimates confirm our findings.

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

[56] See Crinò and Epifani (2012) and Flach (2014).

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8 Appendix: Solving the Profit Maximization Problem 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:

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

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

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

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

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

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), our budget constraint becomes:

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

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

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

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

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

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

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

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

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

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

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:

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

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

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

Taking the partial derivative of (23a) with respect to θ

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

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

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

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

The first term of the equation presented above is positive. While the second-one is positive if $\Lambda \equiv \left[f^k w_i\theta^{-1} - \frac{1}{\sigma-1}\tau_i^k\right] < \frac{1}{(1-\gamma)}$.[57] 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 for the domestic market, we solve this 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 those previously shown, it is possible to find a solution for optimal output-quality supplied to the domestic market when the budget constraint is binding:

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

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:

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

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

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

[57] Recall that $0 < \gamma < 1$.

This term is positive when $f^k < \tau_i^k f^i$. An increase in 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 obtain:

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

This term is positive provided that $f^k < \tau_i^k f^i$. The impact of an increase in θ on the output-quality ratio is increasing in T_i^k, the term proportional to distance to the foreign market. Greater the distance, higher 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	601
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)	.0264	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 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. 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 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 calculated as value added per employee. Fix assets/employment measures capital intensity. Cash flow is calculated 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 equity. Liquidity ratio is defined as firm's current assets minus current liabilities over total assets. The number of years since the foundation defines 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 Score, 2010		0.028*			0.015
		(0.015)			(0.023)
Short Term Credit Use			0.128		0.045
			(0.168)		(0.294)
Total Credit Use				0.121	-0.138
				(0.207)	(0.358)
Number of Creditors	0.015	0.016	0.018*	0.019*	0.014
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
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 Switcher (d)	0.064	0.066	0.079	0.079	0.061
	(0.126)	(0.124)	(0.123)	(0.123)	(0.125)
Ln Firm Size - Av.	-0.045	-0.076*	-0.086	-0.091*	-0.043
	(0.053)	(0.045)	(0.053)	(0.051)	(0.054)
Ln Labour Productivity - Av.	-0.020	-0.017	-0.018	-0.019	-0.018
	(0.047)	(0.046)	(0.049)	(0.050)	(0.047)
Ln Cash Flow - Av.	-0.447***	-0.478***	-0.532***	-0.542***	-0.431**
	(0.161)	(0.140)	(0.158)	(0.162)	(0.168)
Leverage Ratio - Av.	0.008***	0.008**	0.007**	0.007**	0.009**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Liquidity Ratio - Av.	0.303	-0.039	-0.102	-0.128	0.301
	(0.297)	(0.189)	(0.219)	(0.214)	(0.278)
Ln Capital Intensity - Av.	-0.063	-0.106*	-0.120*	-0.124*	-0.061
	(0.077)	(0.062)	(0.069)	(0.071)	(0.077)
Ln Firm Age	-0.051	-0.054	-0.054	-0.053	-0.053
	(0.036)	(0.036)	(0.036)	(0.037)	(0.037)
Center (d)	-0.030	-0.034	-0.029	-0.025	-0.036
	(0.060)	(0.052)	(0.056)	(0.056)	(0.058)
South (d)	-0.170	-0.145	-0.153	-0.149	-0.167
	(0.105)	(0.112)	(0.112)	(0.116)	(0.109)
Provincial Value Added Growth, 98-08	-0.132***	-0.127***	-0.126***	-0.126***	-0.132***
	(0.036)	(0.039)	(0.037)	(0.036)	(0.037)
N. Branches per 1000 inhab.	-0.004*	-0.004*	-0.003	-0.003	-0.004
	(0.002)	(0.002)	(0.002)	(0.003)	(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	-49.82	-50.37	-50.53	-48.77
Pseudo R^2	0.413	0.403	0.396	0.394	0.415

Notes: This table studies the impact of our four candidates proxies for credit rationing, the first four regressors reported in the table, 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
Ln Firm Size	-0.009	-0.378***	-0.051	-0.074	-0.258***	-0.304***
	(0.078)	(0.098)	(0.076)	(0.077)	(0.086)	(0.084)
Ln Cash Flow	-0.881***				-0.430***	-0.237*
	(0.084)				(0.063)	(0.134)
Ln Labour Productivity		-0.918***			-0.710***	-0.860***
		(0.120)			(0.086)	(0.124)
Ln Liquidity Ratio			-0.450***		-0.412***	-0.529***
			(0.017)		(0.018)	(0.028)
Ln Leverage Ratio				0.001	0.000	0.043***
				(0.001)	(0.001)	(0.011)
Firm F. E.	Y	Y	Y	Y	Y	N
Year F.E.	Y	Y	Y	Y	Y	N
Industry F.E.	N	N	N	N	N	Y
Observations	4093	4093	4093	4093	4093	467
R^2	0.824	0.830	0.856	0.810	0.875	0.596

Notes: This table studies the relation between Firm Size, Cash Flow, Labour Productivity, Leverage Ratio, Liquidity Ratio and the External Score obtained by a firm during the period 2002-2010, from (1) to (5), and in year 2010 only, (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: Summary statistics 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	0.0979**
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	-0.0573
South (d)	0.093	0.291	0.115	0.32	-0.0212
Firm Size	67.152	58.743	67.751	80.259	-0.944
Ln Labour Productivity	4.236	0.487	3.97	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	11.24	-3.302***
Liquidity Ratio	0.28	0.19	0.05	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	500				

Notes: This table reports descriptive statistics on 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 impact of the proxy for credit constraint, "External Score - Av." on 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)
Ln Capital Intensity - Av.	-0.011	-0.004	-0.009
	(0.021)	(0.022)	(0.018)
Ln Cash Flow - Av.	-0.033	-0.028	-0.029
	(0.023)	(0.022)	(0.020)
Leverage Ratio - Av.	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Liquidity Ratio - Av.	-0.123	-0.072	-0.106
	(0.134)	(0.128)	(0.116)
Innovation (d)	-0.024	-0.023	-0.020
	(0.032)	(0.036)	(0.028)
Labour Skill	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)
Firm Age	0.011	0.006	0.009
	(0.020)	(0.021)	(0.017)
Corporation (d)	-0.008	-0.002	-0.007
	(0.035)	(0.040)	(0.030)
Consortium (d)	-0.103	-0.074	-0.089
	(0.102)	(0.083)	(0.088)
Business Group (d)	-0.094**	-0.082**	-0.081**
	(0.041)	(0.036)	(0.035)
Center (d)	-0.022	-0.024	-0.019
	(0.036)	(0.033)	(0.031)
South (d)	-0.019	-0.037	-0.016
	(0.056)	(0.060)	(0.048)
Provincial Value Added Growth, 98-08	-0.066***	-0.060***	-0.057***
	(0.018)	(0.016)	(0.016)
N. Branches per 1000 inhab.	-0.002	-0.002**	-0.002
	(0.001)	(0.001)	(0.001)
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 impact of the proxy for credit constraint, "External Score - Av.", on 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 export an output of lower quality with respect to the one sold domestically, Zi,j>Zk,j , using an Ordered Probit model. 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: Cross-correlation table, Variables of Main Estimation

Variables	Quality Up.	External Score	Firm Size	Labour Productivity	Cap. Int.	Cash Flow	Lev. Ratio.	Lab. Skill	Firm Age	Corp.	Cons.	B. Group	Center	South	Prov. VA Growth	Value Add.	N. Branches
Quality Upgrader	1.000																
External Score - Av.	-0.075	1.000															
	(0.000)																
Ln Firm Size - Av.	0.048	-0.067	1.000														
	(0.000)	(0.000)															
Ln Labour Productivity - Av.	0.008	-0.078	-0.838	1.000													
	(0.454)	(0.000)	(0.000)														
Ln Capital Intensity - Av.	-0.005	0.134	-0.617	0.714	1.000												
	(0.654)	(0.000)	(0.000)	(0.000)													
Ln Cash Flow - Av.	-0.018	-0.159	-0.177	0.096	-0.287	1.000											
	(0.107)	(0.000)	(0.000)	(0.000)	(0.000)												
Leverage Ratio - Av.	-0.020	0.122	-0.024	0.018	0.035	-0.000	1.000										
	(0.079)	(0.000)	(0.016)	(0.076)	(0.000)	(0.978)											
Labour Skill	0.043	-0.014	0.032	0.025	-0.029	-0.045	-0.014	1.000									
	(0.000)	(0.161)	(0.002)	(0.017)	(0.005)	(0.000)	(0.183)										
Ln Firm Age	-0.006	-0.142	0.138	-0.062	0.000	-0.103	-0.037	0.045	1.000								
	(0.608)	(0.000)	(0.000)	(0.000)	(0.980)	(0.000)	(0.000)	(0.000)									
Corporation	-0.059	0.018	0.007	-0.022	-0.034	0.023	-0.006	-0.004	-0.040	1.000							
	(0.000)	(0.068)	(0.501)	(0.028)	(0.001)	(0.022)	(0.517)	(0.650)	(0.000)								
Consortium	-0.027	0.025	0.029	-0.052	0.023	-0.054	0.111	-0.023	0.098	-0.251	1.000						
	(0.011)	(0.011)	(0.003)	(0.000)	(0.021)	(0.000)	(0.000)	(0.017)	(0.000)	(0.000)							
Business Group	-0.041	0.019	0.197	-0.109	-0.031	-0.058	0.054	0.113	-0.006	0.009	0.010	1.000					
	(0.000)	(0.055)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.532)	(0.334)	(0.287)						
Center	-0.040	0.037	0.024	-0.043	-0.046	-0.003	-0.030	-0.026	-0.054	0.023	0.025	0.031	1.000				
	(0.000)	(0.000)	(0.016)	(0.000)	(0.000)	(0.751)	(0.003)	(0.006)	(0.000)	(0.014)	(0.008)	(0.001)					
South	0.047	0.052	-0.028	-0.000	0.154	-0.117	-0.026	0.024	-0.100	-0.006	0.030	-0.094	-0.159	1.000			
	(0.000)	(0.000)	(0.004)	(0.993)	(0.000)	(0.000)	(0.010)	(0.012)	(0.000)	(0.510)	(0.001)	(0.000)	(0.000)				
Provincial Value Added Growth	-0.019	0.037	0.038	-0.073	0.009	-0.063	-0.019	-0.009	0.008	-0.022	0.010	-0.035	0.206	0.129	1.000		
	(0.082)	(0.000)	(0.000)	(0.000)	(0.386)	(0.000)	(0.061)	(0.388)	(0.401)	(0.023)	(0.282)	(0.000)	(0.000)	(0.000)			
Provincial Value Added	-0.000	-0.067	0.013	0.029	-0.104	0.105	0.017	0.021	0.076	0.002	0.001	0.105	-0.103	-0.759	-0.436	1.000	
	(0.995)	(0.000)	(0.185)	(0.004)	(0.000)	(0.000)	(0.084)	(0.036)	(0.000)	(0.811)	(0.911)	(0.000)	(0.000)	(0.000)	(0.000)		
N. Bank branches per 1000 inhab.	-0.019	-0.057	-0.040	0.068	0.007	0.046	0.004	-0.022	0.034	-0.006	0.047	0.086	-0.088	-0.608	-0.208	0.622	1.000
	(0.099)	(0.000)	(0.000)	(0.000)	(0.532)	(0.000)	(0.731)	(0.035)	(0.001)	(0.535)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Notes: This table reports correlations coefficients for variables used in our estimations. P-values reported in parentheses.

Table 8: 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 impact of the proxy for credit constraint, "External Score - Av." interacted with the dummy variable "Outside EU" on 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. Coefficients are reported. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 9: 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
Pseudo R^2	0.140	0.160	0.169	0.188
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 impact of the proxy for credit constraint, "External Score - Av." interacted with the dummy variable "North - America" on 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. Coefficients are reported. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 10: Productivity and External Score, Impact of Crisis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	External Score	High Q. Out	High Q.Out	High Q.Out	High Q. Out	High Q. Out	High Q. Out
After 2007	0.146***						
	(0.030)						
Ln Firm Size	-0.460***						
	(0.091)						
Ln Labour Productivity	-0.295***						
	(0.078)						
Ln Cash Flow	-0.562***						
	(0.045)						
Ln Capital Intensity	-0.196***						
	(0.049)						
Leverage Ratio	0.000						
	(0.000)						
Liquidity Ratio	-4.663***						
	(0.170)						
Impact of Crisis		1.351**	1.342**	1.426***	1.606***	1.556***	1.681***
		(0.531)	(0.538)	(0.550)	(0.586)	(0.575)	(0.585)
Labour Productivity - Av.		0.154	0.312**	0.310**	0.307*	0.316*	0.283
		(0.112)	(0.143)	(0.149)	(0.166)	(0.171)	(0.178)
Impact of Crisis X Labour Productivity		-0.312***	-0.303**	-0.315***	-0.349***	-0.338***	-0.365***
		(0.118)	(0.118)	(0.121)	(0.129)	(0.126)	(0.129)
Firm Size - Av.			0.214*	0.214**	0.249**	0.253**	0.248**
			(0.110)	(0.109)	(0.122)	(0.122)	(0.120)
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	9188	403	403	403	403	403	403
R^2 or Pseudo R^2	0.848	0.061	0.072	0.076	0.099	0.100	0.120

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 of the crisis on the external score as a proxy for credit rationing. In these specifications we cluster stardard errors, reported in parentheses, at the province level and introduce industry level dummies. Variables indicated with - Av. are averages for the period 2008-2010, (d) indicates a dummy variable. Coefficients are reported. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively

Table 11: Productivity and Impact of Crisis, Marginal Effects

	(1)
Ln Labour Productivity	
1.0	0.119
	(0.082)
1.5	0.114
	(0.071)
2	0.107*
	(0.060)
2.5	0.099**
	(0.048)
3	0.087**
	(0.037)
3.5	0.070**
	(0.028)
4	0.045**
	(0.022)
4.5	0.010
	(0.022)
5	-0.035
	(0.031)
5.5	-0.088*
	(0.046)
6	-0.142**
	(0.061)
Observations	403

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 Table 10. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 12: Exported Vs Domestic Quality, Determinants, IV, 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*		-0.250*	
	(0.122)		(0.125)		(0.131)	
Ln Firm Size - Av.	0.138	-0.350***	0.175	-0.381***	0.166	-0.376***
	(0.112)	(0.071)	(0.121)	(0.069)	(0.127)	(0.070)
Ln Labour Productivity - Av.	0.243*	-0.419***	0.256	-0.406***	0.212	-0.406***
	(0.147)	(0.096)	(0.165)	(0.101)	(0.172)	(0.101)
Ln Cash Flow - Av.	-0.220**	-0.392**	-0.186	-0.395**	-0.241*	-0.402**
	(0.109)	(0.158)	(0.114)	(0.161)	(0.124)	(0.164)
Ln Capital Intensity - Av.	-0.135	-0.104	-0.136	-0.133*	-0.119	-0.121
	(0.098)	(0.078)	(0.108)	(0.080)	(0.113)	(0.080)
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***	-1.390	-3.974***
	(0.931)	(0.431)	(0.958)	(0.443)	(1.000)	(0.444)
Labour Skill			-0.000	0.001	0.000	0.000
			(0.004)	(0.003)	(0.004)	(0.002)
Innovation			-0.031	0.074	-0.007	0.094
			(0.143)	(0.089)	(0.146)	(0.087)
Firm Age			0.167	0.095	0.168	0.092
			(0.120)	(0.075)	(0.122)	(0.075)
Corporation			-0.003	0.034	0.022	0.038
			(0.156)	(0.106)	(0.165)	(0.104)
Business Group			-0.549**	0.211**	-0.536***	0.223**
			(0.213)	(0.103)	(0.204)	(0.107)
Consortium			-0.556	0.025	-0.480	0.044
			(0.512)	(0.231)	(0.501)	(0.246)
Center			-0.203	0.177	-0.087	0.180
			(0.212)	(0.113)	(0.199)	(0.117)
South			0.159	0.150	0.033	0.045
			(0.207)	(0.136)	(0.261)	(0.172)
Provincial Value Added Growth, 98-08					-0.311***	-0.049
					(0.080)	(0.057)
N. Branches per 1000 inhab.					-0.008	-0.004
					(0.006)	(0.004)
External Score - Av. 02-06		0.485***		0.484***		0.480***
		(0.045)		(0.046)		(0.046)
Observations	428		428		428	
Percent correctly predicted	84.50		84.50		84.98	
Log pseudolikelihood	-681.90		-672.07		-674.41	
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 during 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 13: Exported Vs Domestic Quality, Determinants, IV

	(1)	(2)
	High Quality Out, 2nd Stage	High Quality Out, 2SLS, 2nd Stage
External Score - Av.	-0.048*	-0.052*
	(0.027)	(0.028)
Ln Firm Size - Av.	0.032	0.033
	(0.023)	(0.028)
Ln Labour Productivity - Av.	0.040	0.041
	(0.032)	(0.034)
Firm Level Financial Controls	Y	Y
Other Firm Level Controls	Y	Y
Location Dummies	Y	Y
Province Level Controls	Y	Y
Observations	428	428
Percent correctly predicted	84.98	
Log pseudolikelihood	-674.41	
Wald test of Exogeneity, Prob. > Chi2	0.08	
F Test of excluded instruments		100.22
Cragg-Donald Wald F statistic		174.15
Stock-Yogo weak ID test critical value, 10 percent		16.38
Endogeneity Test, Prob. > Chi2		0.09

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 during the period 2002-2006. Both 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 14: Exported Vs Domestic Quality, Determinants, IV, Coefficients

	(1)	(2)	(3)	(4)
	High Quality Out	High Quality Out	High Quality Out	High Quality Out
External Score - Av.	-0.257**	-0.254**	-0.275**	-0.059**
	(0.121)	(0.126)	(0.131)	(0.027)
Ln Firm Size - Av.	0.126	0.163	0.155	0.030
	(0.109)	(0.120)	(0.126)	(0.027)
Ln Labour Productivity - Av.	0.234	0.250	0.208	0.040
	(0.146)	(0.164)	(0.171)	(0.034)
Ln Cash Flow - Av.	-0.234**	-0.203*	-0.259**	-0.054**
	(0.112)	(0.120)	(0.130)	(0.026)
Ln Capital Intensity - Av.	-0.145	-0.149	-0.131	-0.023
	(0.097)	(0.111)	(0.116)	(0.023)
Leverage Ratio - Av.	-0.000	0.001	0.001	0.000
	(0.002)	(0.002)	(0.002)	(0.000)
Liquidity Ratio - Av.	-1.490	-1.449	-1.583	-0.320
	(0.925)	(0.973)	(1.010)	(0.205)
Labour Skill		-0.000	0.000	0.000
		(0.004)	(0.004)	(0.001)
Innovation		-0.023	0.003	-0.008
		(0.142)	(0.145)	(0.032)
Firm Age		0.169	0.167	0.028
		(0.120)	(0.122)	(0.027)
Corporation		0.006	0.031	0.011
		(0.155)	(0.163)	(0.038)
Business Group		-0.534**	-0.516**	-0.089***
		(0.211)	(0.201)	(0.033)
Consortium		-0.532	-0.451	-0.068
		(0.512)	(0.499)	(0.082)
Center		-0.206	-0.091	-0.020
		(0.209)	(0.195)	(0.037)
South		0.162	0.028	-0.016
		(0.207)	(0.260)	(0.056)
Provincial Value Added Growth, 98-08			-0.307***	-0.061***
			(0.078)	(0.016)
N. Branches per 1000 inhab.			-0.009	-0.002**
			(0.006)	(0.001)
Observations	428	428	428	428
Percent correctly predicted	84.25	84.50	84.51	
Log pseudolikelihood	-673.62	-662.60	-660.08	
Wald test of Exogeneity, Prob. > Chi2	0.041	0.034	0.035	
F Test of excluded instruments				62.63
Cragg-Donald Wald F statistic				98.74
Stock-Yogo weak ID test critical value, 10 percent				19.93
Endogeneity Test, Prob > Chi2				0.03
Hansen J Stat., Prob > Chi2				0.35

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 of the External Rate during 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 15: Exported Vs Domestic Quality, Robustness Check I

	(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 impact of the proxy for credit constraints, "External Score - Av." on 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 16: Exported Vs Domestic Quality, Robustness Check II

	(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)	(0.160)	(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	0.097	0.125

Notes: This table studies the impact of the proxy for credit constraint, "External Score - Av." on 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 this variable 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 17: Exported Vs Domestic Quality, Robustness Check III

	(1a)	(2a)	(3a)
	High Quality Out	High Quality Out	High Quality Out
Strongly Rationed	-0.090*	-0.070	0.054
	(0.054)	(0.055)	(0.111)
External Score - Av.		-0.036**	-0.039**
		(0.018)	(0.018)
Strongly Rationed (d) X External Score - Av.			-0.119**
			(0.061)
Ln Firm Size - Av.	0.068***	0.052**	0.051**
	(0.023)	(0.023)	(0.024)
Ln Labour Productivity - Av.	0.048	0.042	0.037
	(0.033)	(0.034)	(0.035)
Observations	385	385	385
Percent Correctly Predicted	83.90	84.42	84.16
Log pseudolikelihood	-150.65	-148.56	-147.21
Pseudo R^2	0.105	0.117	0.125
	(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.			0.067
			(0.053)
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	85.05
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 impact of the proxy for credit constraint, "External Score - Av." on 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 18: Exported Vs Domestic Quality, Robustness Check IV

	(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 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	429	184	405	429
Percent Correctly Predicted	84.15	85.33	85.19	84.62
Log pseudolikelihood	-163.71	-62.16	-152.40	-161.93
Pseudo R^2	0.113	0.190	0.121	0.121

Notes: This table studies the impact of the proxy for credit constraints, "External Score - Av." on the probability that a firm declares to produce higher quality for the foreign market. We check the robustness of our previous results controlling for various 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.

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ISSN 2190-9938 (online)
ISBN 978-3-86304-190-8