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Three Essays on Output Quality and International Trade

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Dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics (XXV Cycle)

Tutor: Prof. Paolo Epifani

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Abstract

This dissertation has been written as part of the requirements to complete the Ph.D. programme in Economics at Bocconi University in Milan, Italy. It is comprised of three chapters.

This work investigates the determinants of trade in products of different qualities. Quality is an attribute of the product which is valued by the consumer. By upgrading the quality content of its output, a firm might be able to face competition from low-cost competitors. However, quality upgrading entails paying higher costs of production. Assessing the supply-side determinants of quality is then a crucial topic in the current International Trade literature.

The first chapter of this dissertation, co-authored with Francesca Bartoli, 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 derive testable predictions extending an endogenous quality-choice model. Our empirical investigation, based on a survey and balance sheet data from Italian firms, shows that exporting firms are less likely to upgrade output quality, when credit constrained. Moreover, firms exporting to distant markets cut quality upgrading more sharply when they are credit rationed. Overall, these findings suggest that, by impacting export quality upgrading, credit constraints may affect the intensive margin of trade.

The second chapter of this dissertation investigates a demand-side determinant of trade. We study how income inequality affects the demand for vertically differentiated products. Focusing on a variant of the heterogeneous-firms trade model, we introduce income inequality as a component of the total expenditure on manufactured products. Given our assumption on non-homothetic preferences, an increase of income inequality positively affects the market size for manufactured products. This effect ultimately leads to a reduction in the average quality of imported products. The empirical investigation, based on product-level data on trade flows among country-dyads, confirms that a higher income inequality is associated with a lower quality of imported products.

In the third chapter we focus on the relation between firm dynamics in the importing market and product unit values. Precisely, our aim is to assess whether being an incumbent in the importing market leads a firm to charge higher unit values with respect to entrants. Using firm-level data from Peru during the period 1993-2009, we find that incumbent firms charge higher unit values than entrants. Results also show that incumbents react to an exogenous increase in competition, due to a decrease in tariffs, lowering unit values. Tariff changes do not affect the pricing strategy of firms entering a product-country pair for the first time.

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To my grandmothers, Marisa and Rosa.

Chapter 1

Export Quality Upgrading Under Credit Constraints

Abstract

This chapter 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.

1.1 Introduction

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

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.[1] By upgrading output quality, producers can increase export revenues and reach distant markets (Hummels and Skiba, 2004; Martin, 2012; Mayneris and Martin, 2013). Therefore, financial constraints may strongly affect international trade by hampering firms' ability to upgrade export quality. Yet, to date, there is limited empirical evidence on the impact of credit constraints on output quality (Fan et al., 2013; Crinò and Ogliari, 2014).

This chapter seeks to assess the impact of credit constraints on output quality 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 component of the intensive margin of trade, our study investigates how financing constraints affect this margin of trade. Moreover, we take into account how distance to the export market and credit rationing jointly affect this choice. Our results show that exporting firms are less likely to upgrade output quality, when credit constrained. Moreover, 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 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 Manova (2013) and Fan et al. (2013). The optimal output-quality ratio depends on distance as well as credit availability. The model yields two predictions: (1) the lower the 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.[2] 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

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

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.[3] 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 also highly representative of the variable used in the theoretical framework: as credit availability is reduced, 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.[4] 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 a standard deviation increase in the external score is 24% 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 explicative variable, unobservables such as

[3] Panetta et al. (2009), find that this score is positively correlated with the median interest rates charged by banks to firms. Rodano et al. (2012) use it as an indicator for the likelihood of default.

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

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 whose score was negatively affected by the crisis are 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 increases 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, 2008; 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 an 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.[5] Minetti and Zhu (2011), using data on Italian manufacturing firms, confirm that credit constraints affect negatively firms' export participation and foreign sales.[6]

In order to investigate the impact of credit constraints on output quality, Fan et al. (2013) propose a theoretical framework in which heterogenous firms produce goods of

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

[6] 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.

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.[7] Crinò and Ogliari (2014) confirm the negative impact of financing constraints on average output quality at the product/country level.[8] Their study shows that heterogeneity in product quality is affected by the interplay of cross-industry 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 study 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 also 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 chapter 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 chapter.

1.2 Model

In this section we extend the 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 when it is credit constrained.

[7] 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.

[8] Crino and Ogliari (2014) 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).

1.2.1 The Consumer

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

$$q_i^k = \frac{\partial E^k}{\partial p_i^k}. \tag{1.1}$$

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 $Q_i^k = \frac{\partial E^k}{\partial P_i^k}$.

1.2.2 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 value of traded products, including the specific trade cost.[10] If we denote by p_i^{*k} the f.o.b price in the exporting country, i, the c.i.f price in the importing country, k, is equal to $p_i^k \equiv \tau_i^k(p_i^{*k} + T_i^k)$. Following the original model, output is produced employing a composite input in quantity x_{ij}^k. To produce one unit of a product with quality z_{ij}^k, a firm employs a quantity x_{ij}^k of variable input in the following Cobb-Douglas technology:

$$z_{ij}^k = \left(x_{ij}^k \varphi_{ij}\right)^\gamma. \tag{1.2}$$

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:

$$c_{ij}(z_{ij}^k, w_i) = w_i (z_{ij}^k)^{1/\gamma} / \varphi_{ij}. \tag{1.3}$$

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

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

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

adjusted terms, $\frac{F_{ij}^k}{z_{ij}^k} = f^k \frac{w_i\left(z_{ij}^k\right)}{z_{ij}^k}^{1/\gamma}$, where f^k is a constant.[11] 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 in order to sustain R&D expenditures and advertising. Higher the quality of the output, larger the cost that the firm needs to sunk,

$$TC_{ij} = c_{ij}(z_{ij}^k, w_i)q_{ij}^k + F_{ij}^k. \tag{1.4}$$

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

$$\pi_{ij}^k = [p_{ij}^{*k} - c_{ij}(z_{ij}^k, w_i)]\tau_i^k q_{ij}^k - F_{ij}^k. \tag{1.5}$$

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

$$\pi_{ij}^k = \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k}\right] Q_i^k - f^k \frac{w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}. \tag{1.6}$$

1.2.3 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.[12] Therefore when θ decreases, the firm has less credit available and it is more likely to be constrained. The budget constraint takes the following form,

$$\theta\left\{\left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k}\right] Q_i^k\right\} \geq f^k \frac{w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}. \tag{1.7}$$

The profit maximization problem reads now as follows:

$$\max_{P_{ij}^k, z_{ij}^k}\left\{\left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k}\right] Q_i^k - f^k \frac{w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}\right\} \tag{1.8}$$

subject to

[11] 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, $\frac{1}{\gamma}$.

[12] 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. (2013), 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.

$$\theta\left\{\left[P_{ij}^{k}-\tau_{i}^{k}\frac{\left(c_{ij}(z_{ij}^{k},w_{i})+T_{i}^{k}\right)}{z_{ij}^{k}}\right]Q_{i}^{k}\right\}\geq f^{k}\frac{w_{i}\left(z_{ij}^{k}\right)^{\frac{1}{\gamma}}}{z_{ij}^{k}}. \tag{1.9}$$

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,[13]

$$(z_{ij}^{*k})^{1/\gamma}=\frac{\tau_{i}^{k}T_{i}^{k}Q_{i}^{k}}{\left(\frac{1}{\gamma}-1\right)w_{i}\left(\tau_{i}^{k}\frac{1}{\varphi_{ij}}Q_{i}^{k}+\frac{1+\lambda}{1+\lambda\theta}f^{k}\right)}. \tag{1.10}$$

The optimal quality supplied to market k is increasing in the specific per-unit trade cost, T_i^k, in 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 marginal cost,

$$P_{ij}=\left(\frac{\sigma}{\sigma-1}\right)\tau_{i}^{k}\frac{\left(c_{ij}(z_{ij}^{k},w_{i})+T_{i}^{k}\right)}{z_{ij}^{k}}. \tag{1.11}$$

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:

$$z_{ij}^{k}=\left[\frac{\tau_{i}^{k}T_{i}^{k}Q_{i}^{k}}{\left[\frac{1}{\theta}f^{k}w_{i}-\left(\frac{1}{\sigma-1}\right)\tau_{i}^{k}\right]}\right]^{\gamma}. \tag{1.12}$$

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 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.[14] Our firm finances the total amount of the sunk cost obtaining a fraction, $\theta\epsilon[0,1]$, of its revenues in the domestic

[13] Refer to the appendix for all derivations.

[14] This assumption is consistent with Feenstra-Romalis (2014) and is convenient for our solution method.

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:

$$\max_{p^*_{ij}, z^i_{ij}} \left\{ \left[p^*_{ij} - \frac{\left(c_{ij}(z^i_{ij}, w_i) + 1\right)}{z^i_{ij}} \right] Q^i_i - f^i \frac{w_i \left(z^i_{ij}\right)^{\frac{1}{\gamma}}}{z^i_{ij}} \right\} \tag{1.13}$$

subject to

$$\theta \left\{ \left[p^*_{ij} - \frac{\left(c_{ij}(z^i_{ij}, w_i) + 1\right)}{z^i_{ij}} \right] Q^i_i \right\} \geq f^i \frac{w_i \left(z^i_{ij}\right)^{\frac{1}{\gamma}}}{z^i_{ij}}. \tag{1.14}$$

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

$$\left(\frac{z^k_{ij}}{z^i_{ij}} \right)^{\frac{1}{\gamma}} = \frac{Q^k_i}{Q^i_i} \frac{\tau^k_i T^k_i \left[f^i w_i \theta^{-1} - \left(\frac{1}{\sigma-1}\right) \right]}{\left[f^k w_i \theta^{-1} - \left(\frac{1}{\sigma-1}\right) \tau^k_i \right]}. \tag{1.15}$$

Proposition 1.2.1 *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 $f^k < \tau^k_i f^i$.*

Proof. *Refer to the appendix* ■

Proposition 1.2.2 *As T^k_i, the specific unitary cost to ship a product to the foreign market k, increases, the ratio between output quality supplied to the foreign and the domestic market augments when θ increases. Since T^k_i is increasing in distance between the domestic and the foreign market, credit constraints impact more on output quality upgrading by firms exporting to distant markets.*

Proof. *Refer to the appendix* ■

1.3 Data

The econometric analysis carried out in this chapter 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;[15] (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.[16] Along with information on firms' balance sheets, firms' credit scores from both UniCredit and CEBI are also at our disposal. Given our research question, we focus only on data regarding exporting manufacturing firms.

1.3.1 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. 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 variables usually found to be correlated with output quality per-se, such as labour productivity and firm size. 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 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 for the firm that might decide not to increase the quality content of its output. Our aim is then to find a firm-level proxy for credit rationing. Ideally, this proxy 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

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

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

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".[17]

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 can compute the ratio of total credit used over total credit available from banking institutions reporting this information to CEBI.[18]

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.[19] 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.[20] We also introduce a variable that is considered in the empirical trade literature as being positively correlated with output quality: productivity.[21] Specifically, we use labour productivity, the ratio between total value-added and the number of employees. 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, de-

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

[18] 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.

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

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

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

fined by firm's total liabilities over equity; (ii) liquidity ratio, obtained dividing current assets less current liabilities by total assets; (iii) cash flow, equal to net revenues over total equity; (iv) capital intensity, the ratio between total fixed assets and the number of employees. It is important to recall here that variables from (i) to (iii) have often been used in the literature as proxies for credit rationing.[22] 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 relative amount of credit used by the firm; the amount of external funds obtained by a firm is however a result of production technologies, investment decisions and business cycles, 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 and it is going to drive his/her decision on whether to finance a small firm.

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 the ones that have been producing for a long time are often found to be more productive and to supply high-quality products.[23] 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 economic development and credit-market fragmentation in Italy, 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.[24]

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 1.1 reports summary statistics on these variables for the group of exporting manufacturing firms in the year to which the survey refers, 2010.[25]

[22] See Greenaway et al. (2007) and Bernini et al. (2013).
[23] See Bernard et al. (2004) and Minetti and Zhu (2011).
[24] See Guiso et al. (2004), Minetti and Zhu (2011).
[25] Balance sheets data are from the end of 2010.

[Table 1.1 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.[26] The percentage of the labour force holding a University degree is slightly higher than 10%. The mean and the median external credit score are relatively low and equal to 4.38 and 4 respectively, 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, using annual survey data from the Bank of Italy, shows the increase in the share of rationed firms from the period 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.

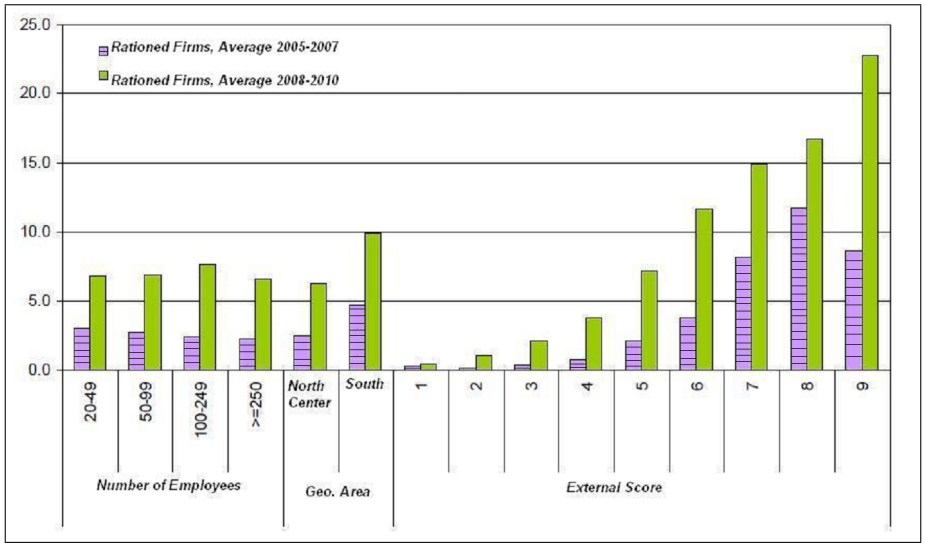

Figure 1.1. Increase in the Share of Rationed Firms.

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

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

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 to default (score equal to 9) is extensive. The years of the current economic crisis have then witnessed a worsening in the access to credit for Italian firms.

1.3.2 Different Measures of Credit Constraint

To support our choice of the score as our 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 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 1.2 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 operate in a province that has experienced economic growth in 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 1.3 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 only 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 1.2, have an easier access to credit.

[Table 1.3 here]

A higher liquidity ratio and a higher cash-flow are also associated with a lower external score, while results for 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 of 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 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 firms reporting an external score from 5 to 9.

[Table 1.4 here]

Table 1.4 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, interestingly for our study, in the possibility to upgrade output quality for the foreign market.

1.4 Results: Upgrading Quality for the Foreign Market

In this section, we empirically test predictions of the framework presented in section 2. Using $Q_j = 1$ for firms exporting an output of higher quality with respect to the one sold domestically and C_j, to represent credit rationing at the firm-level. Given that we suppose that rationed firms are less likely to upgrade quality, we test the following empirical prediction: $\frac{\partial \Pr(Q_j=1)}{\partial C_j} < 0$.

We employ the following econometric model:

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta C_j + \gamma X_j + \chi T_p + \varepsilon_j > 0). \tag{1.4.1}$$

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 and 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.[27] If we assume that ϵ_j is i.i.d, normally distributed with mean 0 and variance 1, we have:

$$\Pr(Q_j = 1) = \Phi(\alpha + \varsigma_{ind} + \beta_1 C_j + \gamma_1 X_j + \chi_1 T_p). \tag{1.4.2}$$

where Φ indicates a normal distribution function. Table 1.5 reports our first set of results.

[Table 1.5 here]

We start by using our main explicative variable, the average external score in 2008-2010, and insert controls group by group in the following regressions. The average of

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

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 dynamic 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.[28]

Our first set of estimations shows that the marginal effect of our proxy for credit constraint always enters with a negative and significant coefficient.[29] Interestingly, the magnitude of the marginal effect for this variable remains quite stable across specifications.[30] 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.[31] Referring to Table 1.6, the reader can compare results obtained in specification (7) of Table 1.5 with those obtained estimating a linear probability model on the same specification, in (1) and (2) respectively. Estimated average marginal effects are very similar. Credit constrained firms are less likely to upgrade

[28] Ideally, both the level and the growth rate of provincial value added might affect output quality influencing demand for goods produced by the firm and for output quality.

[29] At the 5%.

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

[31] We obtain this number multiplying the average marginal effect of this variable, as obtained in specification (7) 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: 15%.

the quality of exported output, while bigger firms are more likely to pursue this strategy.

[Table 1.6 here]

In specification (3) we change our dependent variable to "Quality". This variable takes three different values: 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 output quality upgrading is equal to -0.026 and significant at the 5%. Table 1.7 reports cross-correlations between variables employed in these estimations.

[Table 1.7 here]

1.4.1 Export destination and credit constraints

Following the intuition of Alchian and Allen (1964), many authors investigated the relationship between export destination and quality of exported output.[32] These studies use product unit values as proxies for quality, finding that firms sell high quality goods to more distant markets. Our theoretical framework finds that firms exporting to more distant markets are more hit by 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,[33] Asia,[34] China-India, Oceania, European main markets for Italian exporters,[35] European secondary markets[36] and Est-European countries.[37] Given this information, we differentiate firms using a dummy equal to 1 for those firms exporting outside the European area (EU).[38] As confirmed in the theoretical framework, firms selling their products outside the European area should face higher per-unit transportation costs

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

[33] North Africa and the Middle East.

[34] Including countries in the Arabic peninsula.

[35] Germany, France, UK and Spain.

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

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

[38] 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.

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 (1.4.3) reports the econometric model estimated in Table 1.8.

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta C_j + \lambda OutEu_j + \delta OutEu_j * C_j + \gamma X_j + + \chi T_p + \varepsilon_j > 0) \quad (1.4.3)$$

[Table 1.8 here]

We test the following prediction: the probability of quality upgrading is 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 1.8, reporting coefficients and not average marginal effects, shows two interesting results. First, firms exporting outside the European area are the ones 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, exporting outside the EU reduces the probability of quality upgrading by more than 24% when the external score increases by a standard deviation. 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 under different dimensions 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 destination market. Specifications reported in Table 1.8 also confirm that more productive and large firms are capable to upgrade the quality of exported output. We report, in figure 1.2, the marginal impact of an increase in the average external score, on the X axis, on the probability of quality upgrading by exporters outside Europe, on the Y axis. An increase in the external score and therefore a worsening in credit rationing 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.

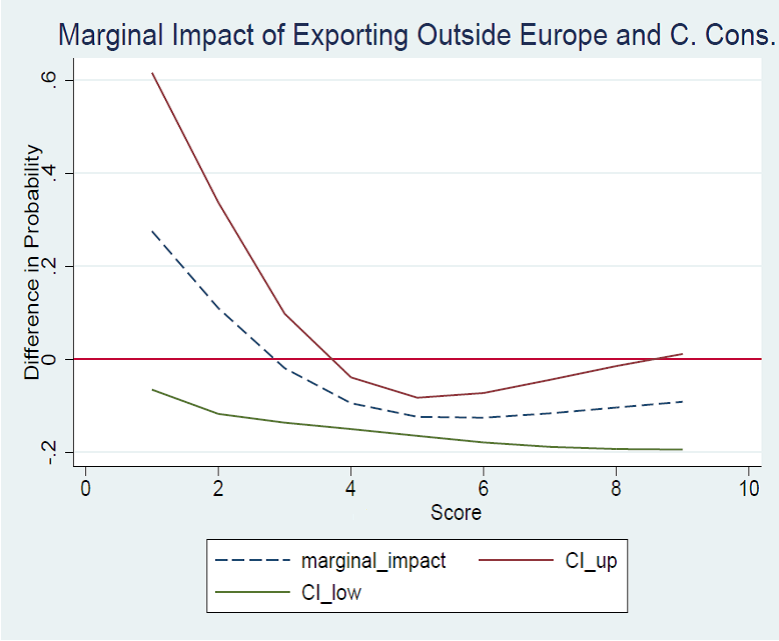

Figure 1.2. Score, Impact on Quality Upgrading for Firms Exporting Outside EU.

Considering all export destinations as equally impacting on quality upgrading might be a strong assumption. In order to further speculate on this, we employ a different estimation strategy. We now consider only 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 US are the first 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 1.9, confirm findings previously described.

[Table 1.9 here]

Among exporters in EU main markets, those exporting to North America are more impacted by a worsening in the external score. The coefficient for the dummy variable is positive and significant: in case the external score 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) increases significantly the impact of credit constraints on quality upgrading by firms also exporting to the largest EU markets for Italian exporters.

1.5 Addressing Endogeneity

Endogeneity of the main explicative variable might bias results 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.[39] 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 information 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 external-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 are more likely to obtain a better (i.e. lower) external score, we suppose that our estimates might 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' linkages with the banking sector, that might be negatively correlated with a firm's external score[40] and with exported-output quality upgrading leading us to find upward biased estimates.[41] The marginal effects at the means commented in the previous section would then be an upper bound of the unbiased marginal effect at the mean.

1.5.1 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

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

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

[41] In fact, entrepreneurs well connected with banking institutions might have less incentives to be innovate their products in order to succed in foreign markets and increase revenues.

spread across the globe[42] through a significant fall in the demand for durable goods.[43] 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.

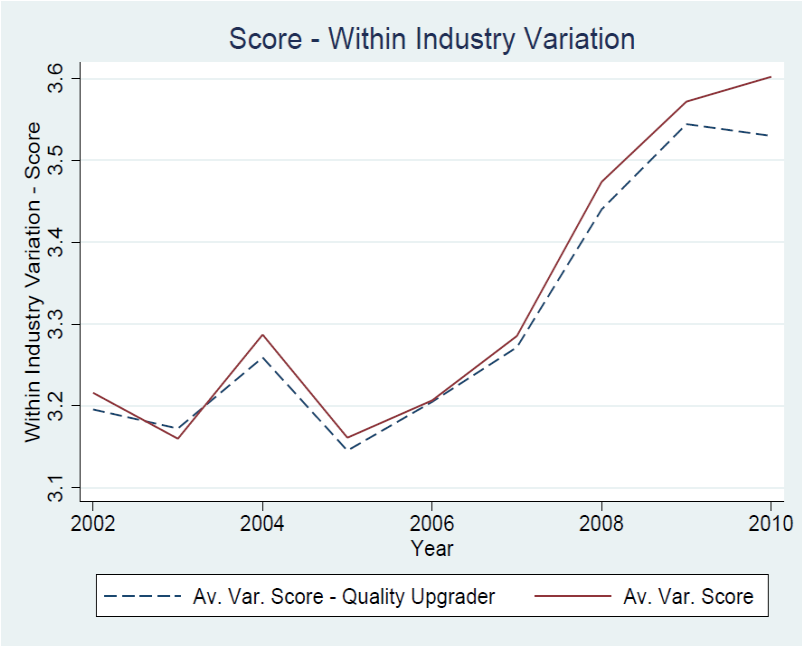

Figure 1.3. External Score, Within Industry Average Variation.

The recent economic crisis, coincides then with a higher polarization in the scores obtained by firms. 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:

$$C_{jt} = \alpha + \gamma_t + \rho_j + \lambda After2007 + \gamma X_{jt} + \varepsilon_{jt}. \tag{1.5.1}$$

Coefficients reported in column (1) of Table 1.10 confirm that the crisis impacted on firms by raising (i. e. worsening) their score. This variable reports a positive and significant coefficient.

[42] 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.

[43] We refer here to the debate on the Great Trade Collapse, as in Baldwin (2009). Bems et al. (2010) confirm that demand-side factors account for 70 percent of the trade collapse.

[Table 1.10 here]

Given that we find this positive correlation, we proceed to the following step and run specification (1.5.1) on two different sub-samples. We separately use observations before and after the crisis, with $After2007 = 0$ and $After2007 = 1$:

$$C_{jt} = \alpha + \gamma_t + \rho_j + \gamma X_{jt} + \varepsilon_{jt}. \tag{1.5.2}$$

After obtaining firm level time-varying residuals from (1.5.2), $\widehat{\varepsilon}_{jt}$, we regress $\widehat{\varepsilon}_{jt}$ on our dummy for the crisis period, $After2007$:

$$\widehat{\varepsilon}_{jt} = \alpha + \beta_j After2007 + \mu_{jt}. \tag{1.5.3}$$

Using coefficients, $\widehat{\beta}_j$, estimated in this last regression, a dummy equal to one for firms reporting a positive $\widehat{\beta}_j$ is generated, and named *Impact of Crisis*. These are the firms whose external score has been increased (i.e. worsened) by the recent economic crisis. It is now possible to employ this new exogenous measure to study the 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 average impact of the economic crisis on firm's credit access through the change in the external score. We run the following specification:

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta Crisis_j + \lambda LabP_j + \delta LabP_j * Crisis_j + \gamma X_j + + \chi T_p + \varepsilon_j > 0). \tag{1.5.4}$$

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 a 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. We compare, for a given level of labour productivity, firms that experienced a worsening in the external score due to the crisis with firms that did not. Results, as reported in specifications (2) to (5) of Table 1.10, show that more productive firms were negatively impacted by the crisis. The interaction term reports a negative coefficient, significant at the 5% in most of the specifications. More productive firms, the ones more likely to pursue quality upgrading, were more affected by the worsening in the credit score due to the crisis. Results are confirmed when controlling for the time-trend of economic and financial variables in our "first stage", represented in the econometric model (1.5.2). In Table 1.11 we report results for specifications similar to (1.5.4) but using the estimated $\widehat{\beta_j s}$, as proxies for the impact of the crisis on the credit score. Previous results are confirmed.

[Table 1.11 here]

Using the crisis as an exogenous shock for the credit score, we find that firms whose score was negatively affected by the crisis and that, consequently, experienced a reduction of credit availability are less-likely to upgrade the quality of exported output with respect to the one sold domestically.

1.5.2 Instrumental Variable Approach

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

$$\Pr(Q_j = 1) = prob(\alpha + \varsigma_{ind} + \beta C_j + \gamma X_j + \chi T_p + \varepsilon_j > 0) \tag{1.5.5}$$

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 :

$$C_j = \mu + \varsigma_{ind} + \eta Z_j + \gamma X_j + \chi T_p + \iota_j. \tag{1.5.6}$$

We can base our strategy 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 a firm declaring to be strongly rationed in 2001.[44] 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.

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 use 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 2011. 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. In Table 1.12, we report results obtained using our instrumental variable approach.

[Table 1.12 here]

This table reports the first and the second stage coefficients of our specifications. We notice that, as expected, our instrument is not weak since the correlation with the endogenous variable is always high and significant at the 1%. Results confirm that more

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

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 1.12 reports coefficients and not marginal effects at the means, we then have to rely on Table 1.13 to assess how the magnitude of marginal effects changes when addressing endogeneity with IV.

[Table 1.13 here]

Results in specification (1) show that the omitted variable bias was influencing our 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 estimation on the same model proposed in specification (1). We use this specification to obtain a series of important statistical tests on our econometric specifications. 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 often rely on a very limited number of creditors. Therefore, a higher number of creditors could be a proxy for credit rationing. Therefore we expect that a higher number of creditors should be associated with higher average external score in 2008-2010. In Table 1.14 we propose results obtained when using both the number of banks and the average of the external score during 2002-2007 as instruments.

[Table 1.14 here]

In specifications (1) to (3) we report the second stage coefficients obtained when introducing our set of controls by groups. Specification (4) reports instead 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 1.13. 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 affect negatively a firm's decision to upgrade output quality. 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 find that the effect of a worsening in credit rationing is still negative but larger than the one suggested in our main estimations. Based on these results, a standard deviation increase in the external score lowers the probability of quality upgrading by more than 50 percent.[45]

1.6 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 measures 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 1.15 confirms that this is indeed the case.

[Table 1.15 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 equal to 0.067 and 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%.

[45] To obtain this number, we multiply the average marginal effect of the External Score, obtained in specification (1) of Table 1.14, by the ratio between its standard deviation and share of quality upgrading firms in the estimation sample.

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 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.[46] 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 and 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 1.4 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 observe how size affects quality upgrading. The graph shows that the predicted probability of quality upgrading increases as the firm becomes larger.

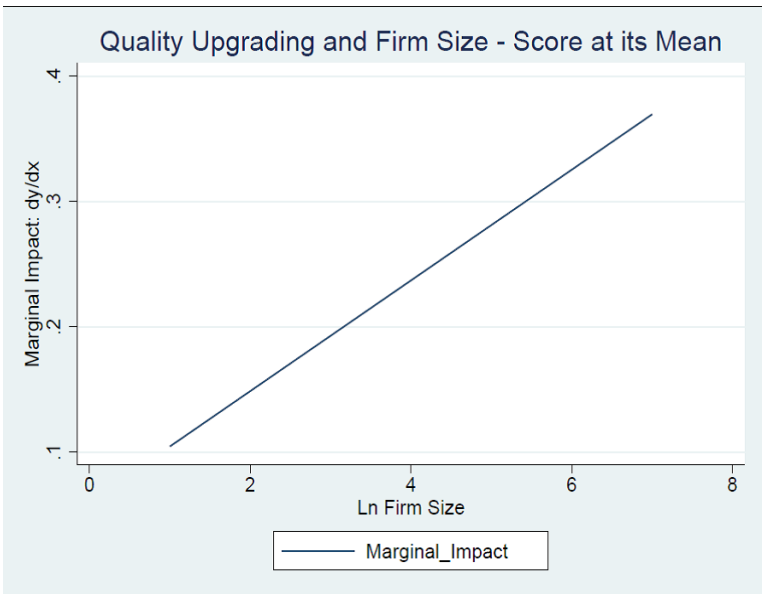

Figure 1.4. Firm Size, External Score and Probability of Quality Upgrading.

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.[47] Results,

[46] Estimates not reported, but available upon request.

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

as reported in Table 1.16, show that our interaction term reports a negative significant coefficient for firms having less than 50, 50-99 and 100-249 employees.

[Table 1.16 here]

To easily grasp these result, we propose the following graph reporting the change in the probability of quality upgrading for firms in the different size-groups.[48] 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 1.16. 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 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.

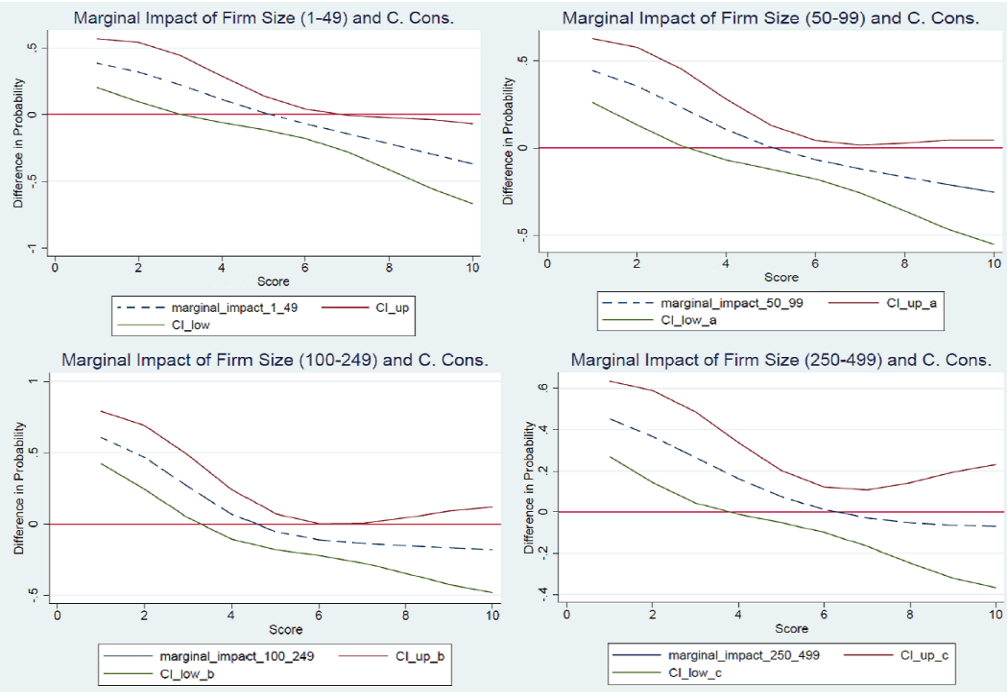

Figure 1.5. External Score and Probability of Quality Upgrading, Different Firm Size.

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.

[48] See Norton et al. (2004).

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 1.17 as an alternative proxy for credit constraint.

[Table 1.17 here]

The dummy variable enters our specification with a negative significant coefficient confirming our prior.[49] 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 significantly and negatively correlated with the dependent variable. The external score confirms to be highly correlated with the "strongly rationed" dummy when predicting the probability of quality upgrading. In specification (3a) we introduce a variable representing the interaction between the dummy variable and the external score so 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 taking into account 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 et al. (2013) followed by Fan et al. (2013) use an indicator of dependence on external finance at the industry level, based on US data, as a proxy for credit constraints.[50] 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 1.18 show that industry finance dependence reports non-significant coefficients 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,

[49] At the 10%.

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

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, this reports a negative and significant coefficient. In specification (3b) we introduce a variable representing 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 coefficient, while our main explicative variable still enter with the usual negative and significant coefficient.

Quality within the firm. In our main specifications we control for two variables that the literature usually considers to be predictor of output quality: labour productivity and firm size.[51] 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 1.18 we insert a dummy for firms that declare to have devoted a part of their revenues to R&D.

[Table 1.18 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 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 if a firm has adopted, in the last-three years, an innovation that was new to the firm's main export 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.[52] Results show that firms reporting a high value-added are more likely to pursue quality upgrading.

[51] See Veerhogen (2008), Minetti and Zhu (2011), Manova (2012).

[52] See Crinò and Epifani (2012) and Flach (2013).

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 always 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.

1.7 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. Moreover, we observe that using external finance dependence at the industry level as an alternative proxy for credit constraints does not affects our results. 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.

1.8 Appendix: Solving the Profit Maximization Problem in the Feenstra-Romalis 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:

$$\begin{aligned} \underset{P_{ij}, z_{ij}^k}{MaxL} &= \left\{ \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k} \right] Q_i^k - f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k} \right\} + \\ &+ \lambda \left\{ \theta \left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k} \right] Q_i^k - f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k} \right\}. \end{aligned} \tag{1.8.1}$$

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

$$\begin{aligned} & (1+\lambda\theta)\tau_i^k \left[\frac{\partial c_{ij}(z_{ij}^k, w_i)}{\partial z_{ij}^k} \left(z_{ij}^k\right)^{-1} - \left(z_{ij}^k\right)^{-2} \left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right) \right] Q_i^k \\ = \; & -(1+\lambda) z_{ij}^{-1} f_{ij}^k w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}-1} \left(\frac{1}{\gamma} - 1 \right), \end{aligned} \tag{1.8.2}$$

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

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

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

$$\begin{aligned} & (1+\lambda\theta)\tau_i^k \left[\frac{w_i (z_{ij}^k)^{1/\gamma-1}}{\gamma\varphi_{ij}} - \left(z_{ij}^k\right)^{-1} \left(\frac{w_i (z_{ij}^k)^{1/\gamma}}{\varphi_{ij}} + T_i^k \right) \right] Q_i^k \\ = \; & -(1+\lambda) \left(z_{ij}^k\right)^{-1} f_{ij}^k w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}-1} \left(\frac{1}{\gamma} - 1 \right). \end{aligned} \tag{1.8.3}$$

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,

$$(z_{ij}^k)^{1/\gamma} = \frac{\tau_i^k T_i^k Q_i^k}{\left(\frac{1}{\gamma}-1\right) w_i \left[\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k + \frac{(1+\lambda)}{(1+\lambda\theta)} f^k\right]}. \tag{1.8.4}$$

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

$$E^k = U^k \left[\int_i \left(p_i^k / z_{ij}^k\right)^{1-\sigma} di\right]^{\frac{1}{1-\sigma}}. \tag{1.8.5}$$

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

$$E^k = U^k \left[\int_i \left(P_i^k\right)^{1-\sigma} di\right]^{\frac{1}{1-\sigma}}, \tag{1.8.6}$$

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

$$\begin{aligned} \underset{P_{ij}, z_{ij}^k}{MaxL} \quad = \quad & \left\{\left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k}\right] Q_i^k(P_{ij}) - f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}\right\} + \\ & +\lambda \left\{\theta \left\{\left[P_{ij}^k - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k}\right] Q_i^k(P_{ij})\right\} - f^k \frac{w_i \left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}\right\}. \end{aligned} \tag{1.8.7}$$

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

$$\left[Q_i^k(P_{ij}) + \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}} P_{ij} - \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k} \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}}\right](1+\lambda\theta) = 0, \tag{1.8.8}$$

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

$$\left[Q_i^k(P_{ij}) + \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}} P_{ij} = \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k} \frac{\partial Q_i^k(P_{ij})}{\partial P_{ij}}\right] \tag{1.8.9}$$

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:

$$1 - \sigma = (-\sigma)\tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k P_{ij}}. \tag{1.8.10}$$

That is equal to,

$$P_{ij} = \left(\frac{\sigma}{\sigma-1}\right) \tau_i^k \frac{\left(c_{ij}(z_{ij}^k, w_i) + T_i^k\right)}{z_{ij}^k}. \tag{1.8.11}$$

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

$$\frac{(p_i^{*k}+T_i^k)}{z_{ij}^k} = \left(\frac{\sigma}{\sigma-1}\right)\frac{\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right)}{z_{ij}^k}, \tag{1.8.12}$$

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 per-unit trade cost,

$$\left(p_i^{*k}+T_i^k\right) = \left(\frac{\sigma}{\sigma-1}\right)\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right). \tag{1.8.13}$$

Using (1.8.11) 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:

$$\theta\tau_i^k\left\{\left[\left(\frac{1}{\sigma-1}\right)\frac{\left(c_{ij}(z_{ij}^k,w_i)+T_i^k\right)}{z_{ij}^k}\right]Q_i^k\right\} \geq f^k\frac{w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}}{z_{ij}^k}, \tag{1.8.14}$$

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,

$$\theta\tau_i^k\left\{\left[\left(\frac{1}{\sigma-1}\right)\left(\frac{w_i(z_{ij}^k)^{1/\gamma}}{\varphi_{ij}}+T_i^k\right)\right]Q_i^k\right\} \geq f^k w_i\left(z_{ij}^k\right)^{\frac{1}{\gamma}}, \tag{1.8.15}$$

substituting (1.8.4), $(z_{ij}^k)^{1/\gamma} = \frac{\tau_i^k T_i^k Q_i^k}{\left[\frac{1}{\gamma}-1\right]w_i\left[\tau_i^k\frac{1}{\varphi_{ij}}Q_i^k+\frac{(1+\lambda)}{(1+\lambda\theta)}f^k\right]}$, in (1.8.15), the budget constraint becomes:

$$\begin{aligned}&\theta\tau_i^k\left\{\left[\left(\frac{1}{\sigma-1}\right)\tau_i^k T_i^k Q_i^k + T_i^k\left[\frac{1}{\gamma}-1\right]w_i\left(\tau_i^k\frac{1}{\varphi_{ij}}Q_i^k+\frac{(1+\lambda)}{(1+\lambda\theta)}f^k\right)\right]Q_i^k\right\}\\ \geq\ & f^k w_i\tau_i^k T_i^k Q_i^k. \end{aligned}\tag{1.8.16}$$

Dividing (1.8.16) by τ_i^k and $T_i^k Q_i^k$:

$$\begin{aligned}&\left\{\left[\left(\frac{1}{\sigma-1}\right)\tau_i^k+\left(\frac{1}{\gamma}-1\right)w_i\left(\tau_i^k\frac{1}{\varphi_{ij}}Q_i^k+\frac{(1+\lambda)}{(1+\lambda\theta)}f^k\right)\right]\right\}\\ \geq\ & \frac{1}{\theta}f^k w_i.\end{aligned}\tag{1.8.17}$$

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

$$\left(\frac{1}{\sigma-1}\right)\tau_i^k+\left(\frac{1}{\gamma}-1\right)\tau_i^k\frac{1}{\varphi_{ij}}Q_i^k f^k w_i+\frac{(1+\lambda)}{(1+\lambda\theta)}f^k w_i\left(\frac{1}{\gamma}-1\right) = \frac{1}{\theta}f^k w_i, \tag{1.8.18}$$

$$\lambda(\theta) = \frac{\left[f^k w_i \left(\frac{1}{\theta} - \left(\frac{1}{\gamma} - 1\right)\right) - \left(\frac{1}{\sigma-1}\right)\tau_i^k - \left(\frac{1}{\gamma} - 1\right)\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k w_i\right]}{\left[f^k w_i \left(\frac{1}{\gamma} - 1\right) - f^k w_i + \theta\left[\left(\frac{1}{\sigma-1}\right)\tau_i^k + \left(\frac{1}{\gamma} - 1\right)\tau_i^k \frac{1}{\varphi_{ij}} Q_i^k w_i\right]\right]}. \tag{1.8.19}$$

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 $\frac{1+\lambda}{1+\lambda\theta}$,

$$\lambda = \frac{\left[f^k w_i \left(\frac{1}{\theta} - \left(\frac{1}{\gamma} - 1\right)\right) - \Psi\right]}{\left[f^k w_i \left(\frac{1}{\gamma} - 1\right) - f^k w_i + \theta\Psi\right]}, \tag{1.8.20}$$

$$\lambda\theta = \frac{\left[f^k w_i \left(1 - \theta\left(\frac{1}{\gamma} - 1\right)\right) - \theta\Psi\right]}{\left[f^k w_i \left(\frac{1}{\gamma} - 1\right) - f^k w_i + \theta\Psi\right]}, \tag{1.8.21}$$

$$\frac{1+\lambda}{1+\lambda\theta} = \frac{\left(\frac{1}{\theta}\right) - \frac{\Psi}{f^k w_i}}{\left(\frac{1}{\gamma} - 1\right)}. \tag{1.8.22}$$

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 (1.8.22) 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:

$$z_{ij}^k = \left[\frac{\tau_i^k T_i^k Q_i^k}{f^k w_i \theta^{-1} - \frac{1}{\sigma-1}\tau_i^k}\right]^\gamma. \tag{1.8.23}$$

Taking the partial derivative of (1.8.23) with respect to θ

$$\frac{\partial z_{ij}^k}{\partial\theta} = \gamma\left[\frac{\tau_i^k T_i^k Q_i^k}{f^k w_i \theta^{-1} - \frac{1}{\sigma-1}\tau_i^k}\right]^{\gamma-1} \frac{\tau_i^k T_i^k Q_i^k f^k w_i \theta^{-2}}{\left(f^k w_i \theta^{-1} - \frac{1}{\sigma-1}\tau_i^k\right)^2} > 0. \tag{1.8.24}$$

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 unit-cost paid to export products from i to k, in fact:

$$\frac{\partial z_{ij}^k}{\partial\theta\partial T_i^k} = \left\{(\gamma-1)\gamma\left(\frac{\Lambda}{\tau_i^k T_i^k Q_i^k}\right)\left(\frac{\left(\tau_i^k Q_i^k\right)^2 T_i^k f^k w_i \theta^{-2}}{\Lambda^2}\right)\right\} + \gamma\frac{\tau_i^k Q_i^k f^k w_i \theta^{-2}}{\Lambda^2}, \tag{1.8.25}$$

$$\frac{\partial z_{ij}^k}{\partial\theta\partial T_i^k} = \gamma\frac{\tau_i^k Q_i^k f^k w_i \theta^{-2}}{\Lambda}\left[(\gamma-1)+\frac{1}{\Lambda}\right]. \tag{1.8.26}$$

The first term of the equation presented above is positive. While the second-one is positive if $\Lambda \equiv \left[f^k w_i \theta^{-1} - \frac{1}{\sigma-1}\tau_i^k\right] < \frac{1}{(1-\gamma)}$.[53] In this case it is possible to conclude that

$$\frac{\partial z_{ij}^k}{\partial\theta\partial T_i^k} > 0. \tag{1.8.27}$$

The impact of θ on z_{ij}^k is increasing in T_i^k, the specific per-unit cost paid to ship to market k that is proportional to distance.

In order to obtain optimal output quality for the domestic market, we solve this maximization problem:

$$\max_{p_{ij}^*, z_{ij}^i}\left\{\left[p_{ij}^* - \frac{\left(c_{ij}(z_{ij}^i, w_i)+1\right)}{z_{ij}^i}\right]Q_i^i - f^i\frac{w_i\left(z_{ij}^i\right)^{\frac{1}{\gamma}}}{z_{ij}^i}\right\} \tag{1.8.28}$$

subject to

$$\theta\left\{\left[p_{ij}^* - \frac{\left(c_{ij}(z_{ij}^i, w_i)+1\right)}{z_{ij}^i}\right]Q_i^i\right\} \geq f^i\frac{w_i\left(z_{ij}^i\right)^{\frac{1}{\gamma}}}{z_{ij}^i}. \tag{1.8.29}$$

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:

$$z_{ij}^i = \left[\frac{Q_i^i}{\left[\frac{1}{\theta}f^i w_i - \left(\frac{1}{\sigma-1}\right)\right]}\right]^{\gamma}. \tag{1.8.30}$$

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:

$$\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}} = \frac{Q_i^k}{Q_i^i}\frac{\tau_i^k T_i^k\left[f^i w_i\theta^{-1} - \left(\frac{1}{\sigma-1}\right)\right]}{\left[f^k w_i\theta^{-1} - \left(\frac{1}{\sigma-1}\right)\tau_i^k\right]}. \tag{1.8.31}$$

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

$$\frac{\partial\left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}}}{\partial\theta} = \left(\frac{\tau_i^k T_i^k Q_i^k}{Q_i^i}\right)\frac{\theta^{-2}w_i\frac{1}{\sigma-1}\left(f^i\tau_i^k - f^k\right)}{\left(f^k w_i\theta^{-1} - \frac{1}{\sigma-1}\tau_i^k\right)^2}. \tag{1.8.32}$$

[53] 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 (1.8.32) with respect to T_i^k, we obtain:

$$\frac{\partial \left(\frac{z_{ij}^k}{z_{ij}^i}\right)^{\frac{1}{\gamma}}}{\partial\theta\partial T_i^k} = \left(\frac{\tau_i^k Q_i^k}{Q_i^i}\right) \frac{\theta^{-2} w_i \frac{1}{\sigma-1}\left(f^i \tau_i^k - f^k\right)}{\left(f^k w_i \theta^{-1} - \frac{1}{\sigma-1}\tau_i^k\right)^2}. \tag{1.8.33}$$

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 per-unit trade cost proportional to distance to the foreign market. Greater the distance, higher the impact of credit availability, θ, on the output-quality ratio.

1.9 Tables

Table 1.1: 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 1.2: Strongly Rationed Firms in 2010 - Exporters, Probit

	(1)	(2)	(3)	(4)	(5)
	Strong Rationing	Strong Rationing	Strong Rationing	Strong Rationing	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 1.3: 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 1.4: Summary statistics for Vulnerable (V) and Non-Vulnerable (N.V) 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 1.5: Quality Upgrading, Determinants, Probit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High Quality Out	High Quality Out	High Quality Out	High Quality Out	High Quality Out	High Quality Out	High Quality Out	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 1.6: Quality Upgrading, 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 1.7: Cross Correlations Variables employed in the Main Estimation

Variables	Quality Up.	Ext. Sc.	Firm Size	Lab. Prod.	Cap. Int.	Cash Flow	Lev. Ratio.	Lab. Skill	Age	Corp.	Cons.	B. Group	Center	South	Prov. VA	Gr. Val. Add.	N. Branch.
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 1.8: Quality Upgrading and Exporting Outside EU, 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 1.9: Quality Upgrading and Exporting to North America, 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 1.10: Productivity and External Score, Impact of Crisis, Dummy

	Ext. Score	High Q. Out	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)							
Ln Labour Productivity - Av.		0.076	0.451**	0.582***	0.570***	0.592***	0.586***	0.553***
		(0.092)	(0.176)	(0.184)	(0.187)	(0.197)	(0.204)	(0.208)
Impact of Crisis, (d)		0.055	2.709***	2.540**	2.391**	2.552**	2.485**	2.499**
		(0.168)	(1.025)	(1.061)	(1.073)	(1.148)	(1.134)	(1.169)
Impact of Crisis, (d) X Labour Productivity			-0.616**	-0.569**	-0.523**	-0.557**	-0.541**	-0.537*
			(0.239)	(0.250)	(0.251)	(0.275)	(0.271)	(0.280)
Ln Firm Size - Av.				0.210*	0.202*	0.241*	0.245*	0.244*
				(0.116)	(0.115)	(0.130)	(0.129)	(0.126)
Firm Level Financial Controls	N	N	N	N	Y	Y	Y	Y
Other Firm Level Controls	N	N	N	N	N	Y	Y	Y
Location Dummies	N	N	N	N	N	N	Y	Y
Province Level Controls	N	N	N	N	N	N	N	Y
Observations	9188	403	403	403	403	403	403	403
R^2 or Pseudo R^2	0.848	0.041	0.059	0.069	0.074	0.097	0.098	0.116

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 dummy for a positive impact 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 1.11: Productivity and External Score, Impact of Crisis, Coefficient

	High Q. Out	High Q. Out	High Q. Out	High Q. Out	High Q. Out	High Q. Out
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	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	403	403	403	403	403	403
Pseudo R^2	0.061	0.072	0.076	0.099	0.100	0.120

Notes: From specification (1) onwards we use a firm-level proxy for a positive impact 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 1.12: Quality Upgrading, Determinants, IV, Coefficients of First and Second Stage

	(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 1.13: Quality Upgrading, Determinants, IV, Coefficients of the Second Stage

	(1)	(2)
	High Q. Out, 2nd St.	High Q. Out, 2SLS, 2nd St.
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 1.14: Quality Upgrading, Determinants, IV, Coefficients of the Second Stage

	(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 1.15: Quality Upgrading, Check 1

	(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 1.16: Quality Upgrading, Check 2

	(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 1.17: Quality Upgrading, Check 3

	(1a)	(2a)	(3a)
	High Quality Out	High Quality Out	High Quality Out
Strongly Rationed (d)	-0.417*	-0.330	1.784
	(0.249)	(0.259)	(1.225)
External Score - Av.		-0.171**	-0.153*
		(0.083)	(0.081)
Strongly Rationed (d) X External Score - Av.			-0.421**
			(0.214)
Ln Firm Size - Av.	0.314***	0.244**	0.241**
	(0.108)	(0.111)	(0.116)
Ln Labour Productivity - Av.	0.223	0.199	0.176
	(0.150)	(0.161)	(0.164)
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	0.396	0.358	0.840
	(0.250)	(0.261)	(0.866)
External Score - Av.		-0.156**	-0.162**
		(0.067)	(0.068)
Industry Fin. Dependence X External Score - Av.			-0.121
			(0.179)
Ln Firm Size - Av.	0.307***	0.247**	0.246**
	(0.111)	(0.113)	(0.113)
Ln Labour Productivity - Av.	0.261*	0.246	0.238
	(0.157)	(0.167)	(0.170)
Observations	407	407	407
Percent Correctly Predicted	84.52	85.26	85.50
Log pseudolikelihood	-151.64	-149.67	-149.42
Pseudo R^2	0.109	0.120	0.122
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 our previous results controlling for the "Strong Rationing" dummy in part (a) of the table, and for Industry Finance Dependence in part (b). Coefficients are reported. Specifications in (a) 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 1.18: Quality Upgrading, Check 4

	(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.

Chapter 2

Income Inequality and Quality of Imported Products

Abstract

This chapter investigates the relation between income inequality in the importing country and the quality of imported product in a simple variant of the heterogenous firms model allowing firms to produce vertically and horizontally differentiated goods. In this framework, firms producing goods of higher quality are the most competitive. A higher income inequality in the importing country, increasing the market size for manufactured products, reduces the quality cutoff for imported varieties. The empirical investigation, using two different proxies for quality and controlling for selection, confirms that higher income inequality is associated with a lower quality of imported products.

2.1 Introduction

The investigation on the linkages between the characteristics of trading countries and the quality of traded products has recently attracted a number of researchers. This ramping interest has primarily been driven by the availability of very detailed data on trade flows originating from customs records. The debate has focused on the determinants of product quality from the perspective of the exporting (Fajgelbaum et al., 2011; Latzer and Mayneris, 2014) and the importing country (Hallak, 2006; Crinò and Epifani, 2012; Bekkers et al., 2012), and on how to measure product quality (Hallak and Schott, 2011; Khandelwal, 2010).

This chapter studies the relation between product quality and income inequality in the importing country. The quality heterogenous-firms trade model (QHFT), proposed by Baldwin and Harrigan (2011), is extended to introduce income inequality as a determinant of the demand for vertically and horizontally differentiated manufactured goods. In

this framework, firms are heterogenous with respect to marginal cost and supply products of different quality to the importing market. We allow for the presence of non-homothetic preferences: rich individuals consume more manufactured goods than poor individuals. This result derives from the income share devoted to manufactured products being increasing in individual income; the opposite holds for non-differentiated products, such as necessities. An increase of income inequality, modelled as a wealth transfer from the poor to the rich individuals in the economy, positively affects the demand for manufactured products in the importing country. As a consequence, the size of importing market increases, more firms start exporting to this market, including the less productive, leading to a reduction in the quality of imported products. Following Arkolakis (2010), we assume that firms need to pay a specific fixed cost in order to export to a destination market. Given the assumed advertisement technology, this cost is increasing in average income of the importing country. Therefore, we find a positive relation between average income in the importing country and quality of imported products: the richer is the importing country the higher is the quality of imported products. Differently from other theoretical frameworks proposed in the field, this relation does not derive from assuming non-homothetic preferences for quality but from the destination-country characteristics affecting the fixed cost of exporting.[1]

The relevance of these theoretical implications is verified in the empirical section of this chapter, where we employ CEPII-BACI data on HS-6 products traded between country dyads and World-Bank's data on country characteristics for the years 2002, 2004 and 2006. Our main proxy for product quality is the unit value of a HS-6 product traded between a country-dyad; we consider three different variables representing income inequality: the Interdecile Ratio, the Interquintile Ratio and the Gini Index.

Results confirm that a higher income inequality in the importing country is associated with a lower quality of imported products. Results obtained when using the Interquintile Ratio as a proxy for income inequality show that a 1% increase in income inequality lowers the unit value of imported products by 0.106%. Moreover, we find that average PPP income in the importing country and unit values are positively correlated. The positive relation between distance and quality, found by Hummels and Skiba (2004) and Martin (2012), is also confirmed. Given that our results might be biased by the selection of varieties into importing markets, we employ the two-stage Heckman estimator proposed by Harrigan et al. (2011). Accounting for the selection bias does not affect our results. We then introduce a different proxy for product quality in the importing market. Following Khandelwal (2010), quality is now estimated considering both the market share of a product and its unit value in the destination market. The negative relation between

[1] Compare with Fajgelbaum et al. (2011), Crinò and Epifani (2012), Flach and Janeba (2013) that assume non-homothetic preferences for quality in order to obtain proportionality between quality of imported products and average income in the importing country.

income inequality and product quality is confirmed when using this different proxy: a 1% increase in the Interquintile Ratio lowers the quality of imported products by 1.48%. This last result strongly reinforces conclusions drawn on our main estimations. We then assess the robustness of our results by using different specifications. Our findings are robust to: controlling for different proxies of human capital in the importing country, considering only large trade flows, controlling for sectoral demand elasticity in the importing country, the length of the quality ladder at the sectoral level, and using f.o.b. unit values as a proxy for product quality.

This work contributes to the existing literature under several dimensions. We propose a simple variant of the QHFT model that is capable to show how income inequality in the importing country affects exporting firms' marginal cost cutoff and, consequently, the quality of imported products. Moreover, in the empirical analysis, a new data-set on trade flows among an heterogenous group of countries is assembled and employed to test the main predictions of the model. The presence of a selection bias when dealing with trade data is largely disregarded in the literature on trade and quality: we account for it. This work is also the first studying the relation between income inequality and product quality measured as is Khandelwal (2010).

Our study is related to several researches proposed in the recent years to investigate the linkages between trading partners' characteristics and the quality of traded products. Crinò and Epifani (2012), in order explain the fact that more productive, high-quality, firms export less to poor countries, propose a model based on non-homothetic preferences for quality in which rich individuals prefer to consume goods of higher quality. As a consequence, the market for high-quality products is smaller in low-income destinations. Fajgelbaum, Grossman and Helpman (2011) propose a discrete choice framework in which consumers differing in income and tastes derive utility from consuming an homogenous good and from the quality of the chosen variety. The assumed distribution of preferences enables Fajgelbaum et al. (2011) to develop a nested logit demand system based on a non-homothetic aggregate demand function. This demand system is such that the fraction of consumers buying goods of higher quality increases with income, confirming the Linder's hypothesis.[2] This model is then employed to study the patterns of trade between countries that differ in size and income distribution. Fajgelbaum et al. (2011) provide a number of theoretical predictions: first, among countries of similar size, richer countries export goods of higher average quality. Moreover, when a country exports products of a given quality to two different markets of similar size it ships a greater volume to the country whose income ranking is more similar to its own.[3] Latzer and Mayneris (2014) theoretically

[2] This hypothesis, first proposed by Staffan Burenstam Linder in 1961, states that firms produce goods suited to the specific tastes of their local consumers.

[3] This result is confirmed empirically by Choi, Hummels and Xiang (2009) finding that country pairs with similar income distributions have similar import prices' distributions.

and empirically investigate the relation between income distribution in the exporting country and the quality of exported products, confirming the implications of the Linder's hypothesis as Fajgelbaum et al. (2011). In their framework, non-homothetic preferences give a role to income inequality within a country at shaping the quality composition of production and exports. Using a database on EU-25 member countries, they conclude that income inequality has an heterogenous impact on the quality content of exported output, affecting positively the quality of exports only in richer countries.

Turning to papers studying the relation between importing country's characteristics and unit values of imported products. Hallak (2006) reports on a positive relation between importer's per-capita income and unit values of imported products. Hummels and Lugovskyy (2009) focus on the linkages between market size and product prices. In their model, the marginal utility of new varieties reduces as market size increases, their empirical results confirm that large markets report lower unit values and higher own-price elasticity of demand, while richer countries are characterized by higher product prices.

Bekkers et al. (2012) is the paper most related to this one for what concerns the research question and the empirical results. Focusing on the relation between unit values of imported products, inequality and income per-capita, Bekkers et al. (2012) test predictions deriving from three different theoretical frameworks: demand for quality, hierarchic demand and ideal varieties. These models all confirm the existence of a positive relation between importing country's income per-capita and unit values of imported goods but have different predictions regarding the relation between unit values and income inequality. In fact, while the demand for quality and the ideal-varieties framework predict a positive relation between income inequality and unit values, the hierarchic demand model implies a negative relation. Bekkers et al. (2012) test these implications, using data on HS-6 products, in order to discriminate among the three different frameworks. Results show that while richer countries import goods of higher unit value, the more unequal ones tend to import goods with a lower unit value.[4] Flach and Janeba (2013) provide firm-level evidence on the linkages between income inequality and export prices. Using data on unit values from Brazilian exporting firms in the year 2000, they find a positive correlation between f.o.b. unit values and income inequality, controlling for income per capita. However, these results hold only for differentiated products, and for varieties in which vertical differentiation is more important. Flach and Janeba (2013) underline that their conclusions, based on firm-level data, might differ from the ones obtained in Bekkers et al. (2012), because of the presence of markups at the firm-level that are averaged-out when using product-level data. The effect of income inequality on prices might, in fact, be reinforced when considering markups.

We add to this last strand of the literature by introducing a new theoretical framework

[4] The authors use the Atkinson index as a measure of income inequality both in the theoretical and in the empirical analysis.

which gives a different explanation for the role of income inequality as a determinant of the demand for vertically differentiated products. Moreover, our empirical investigation takes into consideration the role of selection into the importing markets and employs an alternative proxy for product quality.

The remainder of this chapter is organized as follows. Section 2 reports several motivating facts confirming the relevance of the chosen modelling strategy. Section 3 proposes a theoretical framework based on the QHFT model. In Section 4 we implement the empirical investigation. Section 5 reports on robustness checks. Section 6 concludes the chapter.

2.2 Motivating Facts

Before introducing our theoretical framework, we describe some empirical regularities found in the data at our disposal. A first step is to observe if and how income inequality is related to the amount of resources devoted to the consumption of goods by households, both across countries and in single countries over time. If, among the other variables usually employed in the literature as proxies for economic size,[5] income inequality is a determinant of total expenditure on consumption goods it might, consequently, influence the demand for goods of different quality.[6]

We obtain data on expenditure for consumption goods, average income, population and a measure of income inequality, the Gini Index, for a sample of 46 countries over the period 1960-2006, from the World Bank data-set.[7] We regress expenditure on consumption goods, deflated by the price index, on average income, population and the Gini Index. The Gini Index reports a positive significant coefficient, either considering data for a single year, in order to use cross-sectional variation, or exploiting the panel dimension, as in Table 2.1.

[Table 2.1 here]

Total expenditure on consumption goods is computed summing expenditures all type of goods without differentiating between consumption on manufactured products and

[5] In the empirical international trade literature GDP and Population are the variables usually employed as proxies for market size.

[6] The indicator "Household final consumption expenditure" defined as the market value of all goods and services including durable products, purchased by the household, is used as a proxy for household expenditure on consumption goods. The expenditure on manufactured goods which we have in mind in the theoretical framework would then be a fraction of this variable. This variable is available on the World Bank Databank and it is a realiable measure of the size of an importing market.

[7] A list of Countries included in this database is reported in Figure 2.1. This group of countries is rather heterogeneous since, following the World Bank classification, it includes, developing economies, middle-income countries and high-income countries.

necessities. In the following table we use the value of manufactured products over total merchandise imports and the value of food products over total merchandise imports as two proxies for market size in the importing country, while, average income, population, Gini Index and the price index are the explicative variables. It is possible to observe that the two measures of market size are differently related to our explicative variables.

[Table 2.2 here]

Focusing our attention on the proxy for income inequality: the Gini coefficient is positively and significantly correlated with the share of manufactured products over total imports, while it is not significantly correlated with the share of food products over total imports. Average income and population are positively and significantly correlated with the share of manufactured products over total imports and negatively correlated with the share of food products over total imports. Rich, populated and unequal economies import more manufactured products and less necessities.

Continuing this descriptive analysis, we regress the share of manufactured products over total imports on GDP per capita, population and the price index for the same group of countries in 2002. Residuals are then regressed on the Gini Index. Figure 2.1 shows that, after controlling for these explicative variables, the value of imported manufactured products over total imports is positively correlated with income inequality. Therefore, income inequality seems to be a plausible proxy for market size when size is measured using total imports of manufactured goods, .

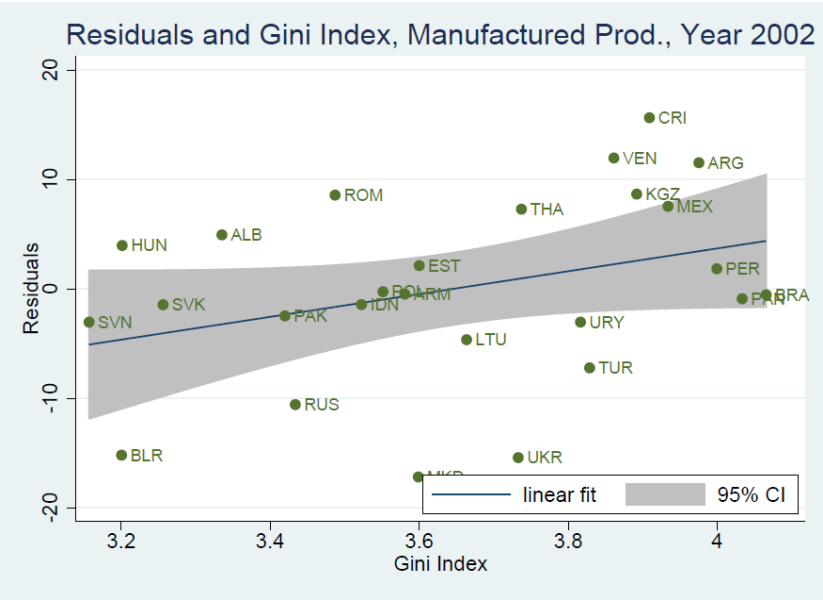

Figure 2.1. Residuals and Gini Index, Manufactured Products.

As we have seen in Table 2.2, the share of food products on total imports is not correlated with income inequality across time and countries. We further investigate on this

result by regressing this variable on GDP per capita, population and the price index for the same group of countries in the same year. Residuals are then fitted on the Gini Index. Figure 2.2 confirms that residuals are not positively correlated with income inequality: countries with a high level of income inequality do not import more necessities. These results are confirmed by Francois and Kaplan (1996) finding that in developing countries the share of imports from rich countries increases with income inequality. Given that manufactured products account for the majority of imports from developed countries this result suggests that income inequality increases the demand for manufactured products.

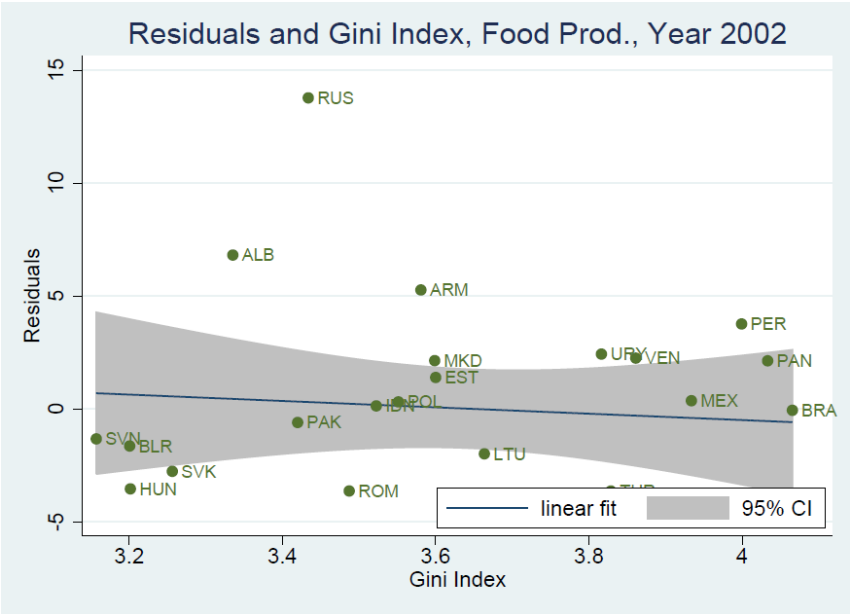

Figure 2.2. Residuals and Gini Index, Food Products.

The second channel devoting our attention is the relation between the quality of imported products and importing countries' market size. Baldwin and Harrigan (2011) find that market size and the quality of imported products are negatively correlated. We investigate on this by using unit values of HS-6 manufactured products traded among country-dyads, in the years 2002, 2004 and 2006, as our proxy for product quality.[8] While our proxy for market size will be the household expenditure on consumption goods. In order to obtain a proxy for average quality of imports, we compute the average unit value of goods imported by each country in our sample as the unit value of products weighted by the corresponding imported quantity. For each HS-6 manufactured product imported by country z in year t, we obtain an index of quality as a weighted sum of imported products' unit values. Figure 2.3 shows that, in 2002, the average unit value of imported products is negatively correlated with market size, measured by household final expenditure on

[8] Available from the BACI dataset in the CEPII website. The unit-value is equal to the total monetary amount (thousands of dollars) divided by total quantity (tons) traded between a country dyad in a specific year for a single HS-6 product.

consumption. A larger importing market is associated with a lower average quality of imported products.

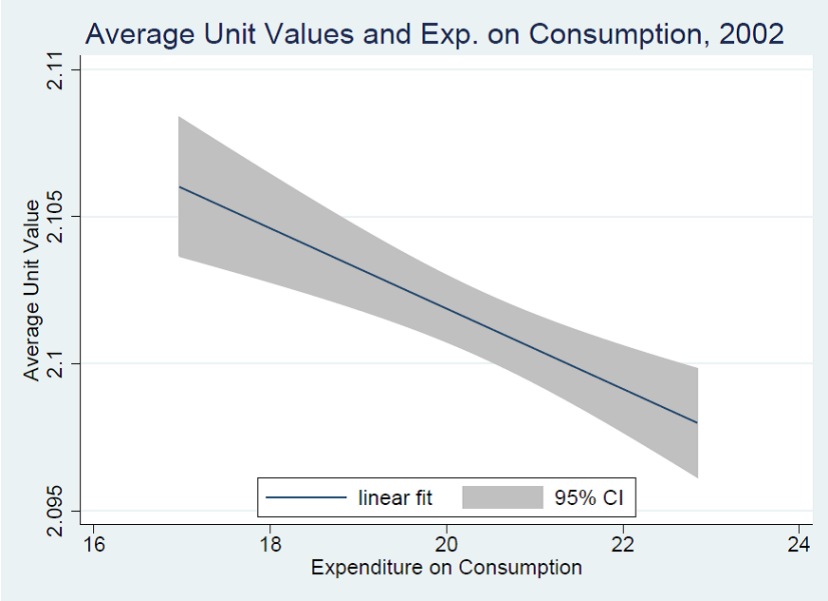

Figure 2.3. Average Unit Values and Expenditure on Consumption.

It might be the case that this negative correlation arises only using when this particular proxy for market size. We now employ another variable as a proxy market size: the share of manufactured products over total imports. Figure 2.4 reports the fitted line obtained once regressing our proxy for average quality of imports, the average unit value of manufactured products imported in each country, on the share of manufactured products over total imports in the same country. This graph confirms results described above: there is a negative correlation between average quality of imported products and importing countries' market size. The larger the importing market the lower the average quality of imported products.

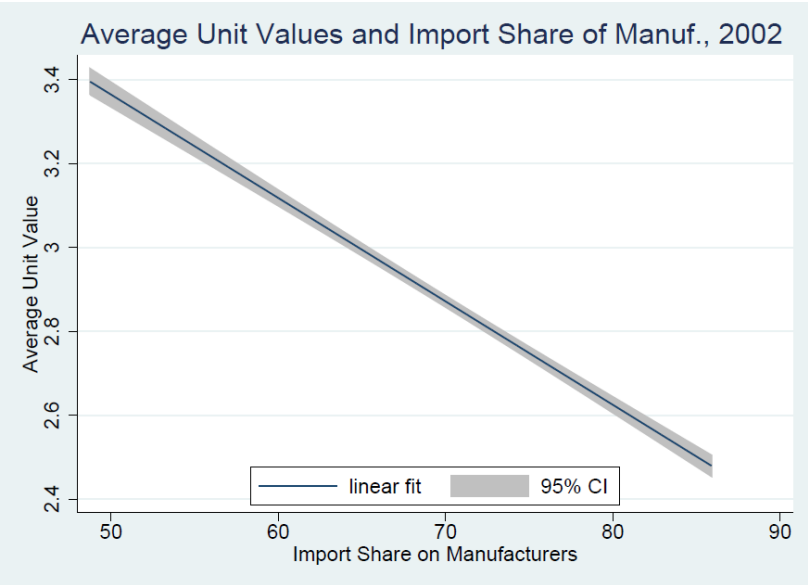

Figure 2.4. Average Unit Values and Import Share of Manufactured Goods.

Since we have previously shown that market size and income inequality are positively correlated, as a consequence, a higher level of income inequality should be negatively correlated with the quality of imported products through an increase in the size of the market for manufactured products. In the following section we propose a theoretical framework that tries to rationalize this mechanism.

2.3 Theoretical framework

This section proposes a framework capable to rationalize the evidence on the relation between income inequality in the importing country, z, and the quality of products exported by firms based in country d to country z, q_j. This framework extends the quality-heterogeneous firms trade model proposed by Baldwin and Harrigan (2011) by introducing non-homothetic preferences for manufactured products.

2.3.1 The Consumer

A representative individual, i, in the importing country, z, maximizes the following utility function:

$$U_{i,z} = M_{i,z}^{\Phi_{M,i}(I_i)} N_{i,z}^{\left(1-\Phi_{M,i}(I_i)\right)} \tag{2.1}$$

Where, $M_{i,z} = \left(\int_{j\epsilon\Omega} (q_j c_j)^{\frac{\sigma-1}{\sigma}} dj\right)^{\frac{\sigma}{\sigma-1}}$, represents the utility derived from consuming manufactured goods, while I_i is the income of individual i.[9] Manufactured goods are vertically and horizontally differentiated, every variety j has a quality q_j and is consumed in quantity c_j. Each individual increases utility obtained from consuming manufactured goods either buying a product of higher quality or consuming more units of that product. The term N represents the amount of necessities consumed by i; necessities are nor vertically, neither horizontally differentiated. Each individual allocates a share of her income, $\Phi_{M,i}(I_i)$ to the consumption of manufactured products, while the remaining share, $(1 - \Phi_{M,i}(I_i))$ is devoted to necessities.[10] Maximizing utility with respect to the budget constraint, individual i's demand for product j is equal to:

$$c_{j,z} = \frac{(p_j)^{-\sigma} \left(\frac{1}{q_j}\right)^{1-\sigma} \Phi_{M,i}(I_i) I_i}{P_z^{1-\sigma}}. \tag{2.2}$$

[9] With $\sigma > 1$.

[10] For tractability we assume that the price of necessities, p_N, is equal to 1, therefore $N_{i,z} = (1 - \phi_{Mi}(I_i, P))I_i$.

Here $P_z = \left[\int_{j\epsilon\Omega} \left(\frac{p_j}{q_j}\right)^{1-\sigma} dj\right]^{\frac{1}{1-\sigma}}$, is the price index aggregating quality-adjusted prices $\frac{p_j}{q_j}$, for every variety j.

Non-Homotheticity and Income Inequality

We assume that the income share devoted to the consumption of manufactured goods is increasing in income, i.e. $\frac{\partial \Phi_{M,i}(I_i)}{\partial I_i} > 0$. This peculiarity introduces non-homotheticity in the upper tier of the utility function: individual's demand for necessities and manufactured goods reacts differently to an increase in income. In fact, as the income of individual i rises, her demand for manufactured goods increases more than her demand for necessities, $\frac{\partial\left(\frac{M}{N}\right)}{\partial I_i} > 0$: the income expansion path is convex in M. Given that preferences, as defined by the utility function in (2.1), are non-homothetic, the total demand for manufactured goods and necessities depends on how income is distributed in the importing country, z. As in Latzer and Mayneris (2012), we divide the population in two groups of different numerosity: a fraction γ of the population is poor, p, while the remaining part, $(1-\gamma)$ is rich, r.[11] A rich individual in country z, earns income $I_{r,z}$ while a poor one earns $I_{p,z}$. If $\widetilde{I}_z$ is the average income in country z, we have $I_{p,z} = \eta_z \widetilde{I}_z$ and $I_{r,z} = \left[\frac{1-\gamma\eta_z}{1-\gamma}\right] \widetilde{I}_z$.

When $\eta_z \epsilon [0,1]$ is closer to 1 income inequality is reduced since the income of a poor individual is closer to the average income in z.[12] In this framework, inequality increases when we transfer income from poor to rich individuals. The income share, $\Phi_{M,i}(I_i)$, devoted to manufactured goods is also a function of income inequality, in fact, $\Phi_{M,r}(\left[\frac{1-\gamma\eta_z}{1-\gamma}\right] \widetilde{I}_z)$. An increase in income inequality (i.e. a reduction of η_z), reduces a poor's income and increases a rich's income by the same amount. Consequently, the income share devoted by rich individuals to manufactured products increases without affecting average income $\widetilde{I}_z$. Since $\frac{\partial\left(\frac{M}{N}\right)}{\partial I_i} > 0$, the total expenditure on manufactured products, $E_{tot,z} = [\gamma \Phi_{M,r,z}(I_{r,z}) I_{r,z} + (1-\gamma)\Phi_{M,p,z}(I_{p,z}) I_{p,z}]$, increases when inequality raises, provided that the increase in the expenditure for manufactured goods by rich individuals more than compensates the contemporaneous expenditure drop by poor individuals. This is the case if the following inequality holds:[13]

$$\left[\frac{\partial \Phi_{M,r,z}\left(I_{r,z}\right)}{\partial \eta_z} \frac{\gamma\left(1-\gamma\eta_z\right)}{\left(1-\gamma\right)^2} + \Phi_{M,r,z}\left(\frac{\gamma}{1-\gamma}\right)^2\right] > \left[\frac{\partial \Phi_{M,p,z}\left(I_{p,z}\right)}{\partial \eta_z}\left(\eta_z\right) + \Phi_{M,p,z}\right]. \tag{2.3}$$

This proposition summarizes implications discussed above:

[11] The treshold splitting country z's population in these two groups is *exogenously* determined. Moreover, the two groups are homogeneous within themselves.

[12] Given this definition of income, average income does not vary after a change of income inequality.

[13] Refer to the appendix for the derivation of this inequality.

Proposition 2.3.1 *A decrease in η_z (i.e. an increase in income inequality) leads to an increase in Rich individuals' expenditure manufactured goods (ΔM_r) that more than compensates the reduction in Poors' expenditure (ΔM_p) : $\Delta M_r + \Delta M_p > 0$. Consequently, total expenditure on manufactured goods, $E_{tot,z}$, increases following an increase in income inequality.*

2.3.2 The Firm

Quality, q_j, is chosen by a representative firm producing variety j. We assume that a higher quality is produced at a higher marginal cost, $q_j = \left(a_j^{1+\theta}\right)$, with $\theta > -1$, where a_j is a firm's marginal cost.[14] This relation implies that firms producing high-quality goods employ more costly inputs, as found in the recent literature.[15] In this framework, more productive firms are the ones having a higher marginal cost and producing goods of higher quality, as in Baldwin and Harrigan (2011).

Following Arkolakis (2010) we assume that each exporting firm decides the fraction of consumers it wants to reach in country z, n_z, using advertisements. In order to do that, the firm employs labour in the importing market, l_z and in domestic market l_d to produce advertisements through the production function: $S{=}l_z^{\kappa} l_d^{1-\kappa}$. Under decreasing returns to scale of advertising with respect to country z's population, L_z, the amount of advertising that is necessary for a firm willing to reach a fraction n_z of consumers in z, is $f(n_z,\ L_z){=}\frac{L_z^{\alpha}(1-(1-n_z)^{1-\beta})}{\psi(1-\beta)}$, where $\alpha, \beta \epsilon [0;1]$ and $\frac{1}{\psi}$ is the labour requirement for each advertisement.[16] Therefore, if the cost of labor in z and d is, respectively, w_z and w_d, the fixed cost for a firm j exporting to z is equal to: $w_z^{\kappa} w_d^{1-\kappa} \frac{L_z^{\alpha}(1-(1-n_z)^{1-\beta})}{\psi(1-\beta)}$.

2.3.3 Trade

We now derive the zero cutoff profit condition for firms exporting to country z. Using this partial equilibrium condition we derive implications on the relation between unit values of exported goods and importing country's characteristics, focusing on the role of income inequality.

Given the advertising technology employed by the firm to export in country z, a fraction n_z of its population L_z is going to buy its output, therefore total demand in country z is:

[14] If we think of this relationship as deriving from a Cobb-Douglas production function similar to the one used in Feenstra and Romalis (2014), then a plausible candidate might be, $q_j = (\frac{L_i}{a_j})^{\frac{1}{\theta+1}}$, where $a_j = \frac{1}{\varphi_j}$, φ_j is the firm's productivity draw in Feenstra and Romalis with $\frac{1}{\theta+1} < 1$ leading to $\theta > 0$, i.e. dimishing returns to quality.

[15] Kugler and Verhoogen (2012), using data on Colombian firms, find that firms producing high quality output employ more costly inputs, having a higher marginal cost.

[16] For the theory behind this function refer to Arkolakis (2010).

$$c_{z,tot} = \frac{n_z L_z \left(p_j\right)^{-\sigma} \left(\frac{1}{q_j}\right)^{1-\sigma} E_{tot,z}}{P_z^{1-\sigma}}. \tag{2.4}$$

A firm maximizes its profit choosing n_z and p_j given the production function $q_j = \left(a_j^{1+\theta}\right)$. Moreover, $\tau_{d,z}>1$ is the iceberg cost for sending one unit of product from country d to country z and $\frac{a_j}{q_j}$ is the quality-adjusted marginal cost.

The firm's profit function reads as follows:

$$\begin{aligned}\pi_z(p_j, n_z; a_j) \quad = \quad & \left[\frac{n_z L_z^{1-\sigma}\left(\frac{p_j}{q_j}\right)^{1-\sigma} E_{tot,z}}{P_z^{1-\sigma}\sigma}\right] - \left[\frac{n_z L_z \left(p_j\right)^{-\sigma}\left(\frac{1}{q_j}\right)^{1-\sigma} E_{tot,z}\tau_{d,z}}{P_z^{1-\sigma}\sigma}\right]\left(\frac{a_j}{q_j}\right) - \\ & - \left[w_z^{\kappa} w_d^{1-\kappa} \frac{L_z^{\alpha}(1-(1-n_z)^{1-\beta})}{\psi(1-\beta)}\right].\end{aligned}$$

Following Arkolakis (2010), we maximize profit with respect to p_j, we find that price is a mark-up over marginal cost: $p_j = \frac{\sigma}{\sigma-1}\tau_{d,z}a_j$. The first order condition with respect to n_z, the fraction of consumers reached in country z, gives instead the following equality:

$$\frac{E_{tot,z}}{P_z^{1-\sigma}}\left(\frac{p_j}{q_j}\right)^{1-\sigma}\frac{1}{\sigma} = w_z^{\kappa} w_d^{1-\kappa}\frac{L_z^{\alpha-1}(1-n_z)^{-\beta})}{\psi(1-\beta)}. \tag{2.5}$$

Using $p_j = \frac{\sigma}{\sigma-1}\tau_{d,z}a_j$, $q_j = \left(a_j^{1+\theta}\right)$ and setting $n_z = 0$, we find the marginal cost cutoff for firms exporting to country z:

$$a_{z,j}^* = \left[\frac{\sigma P^{1-\sigma}\left[\frac{\tau_{d,z}\sigma}{\sigma-1}\right]^{\sigma-1} w_z^{\kappa} w_d^{1-\kappa} L_z^{\alpha-1}}{E_{tot,z}\psi}\right]^{\frac{1}{\theta(\sigma-1)}}. \tag{2.6}$$

Recalling that $E_{tot,z} = \left[\gamma\Phi_{M,r,z}(I_{r,z})I_{r,z} + (1-\gamma)\Phi_{M,p,z}(I_{p,z})I_{p,z}\right]$, equation (2.6) reads as follows,

$$a_{z,j}^* = \left[\frac{\sigma P^{1-\sigma}\left[\frac{\tau_{d,z}\sigma}{\sigma-1}\right]^{\sigma-1} w_z^{\kappa} w_d^{1-\kappa} L_z^{\alpha-1}}{\left[\gamma\Phi_{M,r,z}(I_{r,z})I_{r,z} + (1-\gamma)\Phi_{M,p,z}(I_{p,z})I_{p,z}\right]\psi}\right]^{\frac{1}{\theta(\sigma-1)}}.$$

Moreover, given that $I_{p,z} = \eta_z \widetilde{I}_z$ and $I_{r,z} = \left[\frac{1-\gamma\eta_z}{1-\gamma}\right]\widetilde{I}_z$. We obtain:

$$a_{z,j}^* = \left[\frac{\sigma P^{1-\sigma}\left[\frac{\tau_{d,z}\sigma}{\sigma-1}\right]^{\sigma-1} w_z^{\kappa} w_d^{1-\kappa} L_z^{\alpha-1}}{\left[\gamma\Phi_{M,r,z}\left[\frac{1-\gamma\eta_z}{1-\gamma}\right] + (1-\gamma)\Phi_{M,p,z}\eta_z\right]\widetilde{I}_z\psi}\right]^{\frac{1}{\theta(\sigma-1)}}. \tag{2.7}$$

that, using $q_j = \left(a_j^{1+\theta}\right)$, becomes:

$$q_{z,j}^* = \left[\frac{\sigma P^{1-\sigma}\left[\frac{\tau_{d,z}\sigma}{\sigma-1}\right]^{\sigma-1} w_z^{\kappa} w_d^{1-\kappa} L_z^{\alpha-1}}{\left[\gamma\Phi_{M,r,z}\left[\frac{1-\gamma\eta_z}{1-\gamma}\right] + (1-\gamma)\Phi_{M,p,z}\eta_z\right]\widetilde{I}_z\psi}\right]^{\frac{1}{(1+\theta)\theta(\sigma-1)}}. \tag{2.8}$$

Equation (2.8) gives us some interesting partial-equilibrium implications. As income inequality in the importing country raises (η_z decreases), for a given average income $\widetilde{I}_z$, $E_{tot,z}$ increases and the optimal quality cutoff is reduced. In fact, after a decrease in η_z, $\widetilde{I}_z$ does not vary, while the income of poor individuals is reduced and the income of rich individuals raises by the same amount. Since $\Phi_{M,r,z}$, the income share devoted by rich individuals to manufactured goods, is increasing in income, this more than compensates the decrease in demand for manufactured goods from poor individuals, provided that (2.3) holds. This increase in total demand for manufactured goods in country z reduces the marginal cost and the quality cutoff. In fact, for the group of exporting firms, an increase in foreign country's inequality is an increase in total demand that lowers market competition. Less competitive firms enter the market, leading to a reduction in the quality cutoff.

Proposition 2.3.2 *A decrease in η_z (an increase in income inequality) leads to a reduction in the quality of imported products through an increase in the total expenditure for manufactured products.*

Trade liberalization, a decrease in $\tau_{d,z}$, reducing the marginal cost cutoff, increases the number of firms capable to sustain competition and to produce for the foreign market while it decreases the price charged to consumers together with quality. An increase in trade costs leads then to an increase in the marginal cost cutoff implying that goods of higher quality have to be produced to export in distant markets. This result entails that only sufficiently high quality/high-price producers find it worthwhile to export to distant markets, confirming the Alchian-Allen effect (1964).[17] Moreover, when L_z, the population in country z, increases, the marginal cost cutoff is reduced and we can interpret this result as an effect of the increase in market size.

The cost of labor in the importing country, w_z, is correlated with average income, $w_z = \left[f(\widetilde{I}_z)\right]$, therefore an increase of w_z is positively correlated with an increase in average income $\widetilde{I}_z$ and impacts positively on the quality cutoff.[18] Interestingly, average income enters also the denominator of (2.8), suggesting a negative correlation of this term with output quality.[19] Inserting country's z labor cost in firm j's fixed cost function gives us an alternative explanation for the well-known result that the quality of exported

[17] In this paper we assume that the iceberg trade-cost is proportional to distance, as in Baldwin and Harrigan (2011). Following Hummels and Skiba (2004) and Martin (2012), inserting a per-unit specific trade cost as a proxy for distance would be a more compelling assumption. In this case, however, this would complicate our theoretical framework without adding new insights on the mechanisms under analysis.

[18] f is a monotone, strictly increasing, function.

[19] In the empirical analysis we take into account for the presence of an interaction between average income and income inequality, as reported in the denominator of equation (8).

products is increasing in the average income of the importing country. It is important to stress that this result does not derive from assuming non-homothetic preferences for quality as in Flach and Janeba (2013), Crinò and Epifani (2011) and in Hallak (2006). In our framework non-homothetic preferences operate only by increasing the size of the market for manufactured goods. Moreover, given our definition of income inequality, an increase in average income does not influence income inequality and vice-versa. Considering these partial equilibrium implications, we now investigate the relation between income inequality in the importing country and the quality of imported products.

2.4 Empirical Analysis

2.4.1 Data

In the following empirical analysis we employ data from an heterogenous sample of 46 countries. In order to test predictions discussed in the previous section we measure product quality using the unit value of products traded between country dyads, as in Schott (2004). The BACI database, available from the CEPII, reports the total value (in thousands of US dollars) and quantity (in tons) traded for HS-6 products.[20] We obtain unit values by computing the ratio between total value and quantity of HS-6 products traded among country dyads in a specific year.

We use data for the years 2002, 2004 and 2006, therefore our estimations will be ran on repeated, unbalanced, cross-sections. We employ data for a two-years span to obtain a larger variation in our proxies for income inequality. Data are trimmed so not to have results driven by outliers. We drop trade-records with unit value lower than 0.1 times and higher than 10 times the median unit value observed for a single product category. We consider only trade in manufactured differentiated products according to the Rauch (1999) conservative classification.[21] To this data-set we merge data on population, distance, common official language, common legal origin, landlocked countries, participation to the GATT and other regional trade agreements, as obtained from the CEPII database. Data on average PPP income,[22] Gini Index, Interquintile Ratio,[23] Interdecile Income Ratio,[24] the share of population enrolled in tertiary education and the share of labour force with

[20] Refer to Gaulier and Zignago (2010) for a description of this database.

[21] HS6 product codes are converted to 5 digits SITC codes and to 4 digits SITC codes, the level of classification chosen by Rauch (1999), to distinguish among differentiated (n), homogenous (w) and reference priced goods (r).

[22] GNI per capita, PPP at current international $.

[23] The ratio between the income share earned by the top 20% of the income distribution and the income share earned by the bottom 20%.

[24] The ratio between the income share earned by the top 20% of the income distribution and the income share earned by the bottom 20%.

secondary education is available from the World Bank data-set.

The following table shows descriptive statistics for the main variables of interest in the year 2004: unit value, quantity (tons), monetary value (thousands of US$), inter-decile income ratio, interquintile income ratio, Gini Index, distance (kilometers), average income (in PPP $), population (millions of people), the percentage of students enrolled in tertiary education and the percentage of labour force with secondary education. The mean distance between country-dyads in our sample is 3016 kilometers, while the mean population is 53 millions.[25]. Focusing on the characteristics of countries included in our sample, we notice that the mean of the average PPP income is equal to 9803 PPP dollars per year, ranging from a minimum of 610 for Malawi to a maximum of 22010 for Slovenia, with a standard deviation of 4263 dollars. The mean Gini Index is 37.85, spanning from 26.22 to 58.49.

[Table 2.3 here]

As the following figure shows, the sample of countries under analysis is rather heterogeneous in terms of income inequality and average PPP income. We observe countries with an average income higher than the mean both among the less unequal and the more unequal countries in the sample. Nevertheless, countries with an average income lower than the median are represented over the all interval of the variable representing income inequality, the Gini Index.

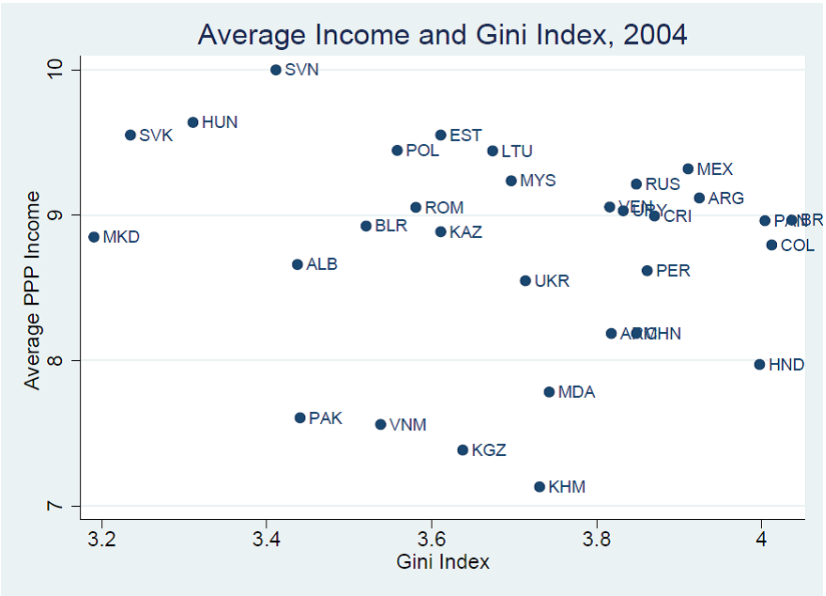

Figure 2.5. Average Income and Gini Index.

[25] China is present in our dataset only for the year 2002.

2.4.2 Empirical Specification

We employ the following empirical specification to determine the relation between the quality of imported products and importing countries' characteristics:

$$\ln(uv)_{p,d,z,t} = \alpha_{p,d,t} + \beta \ln(X_{z,t}) + \chi \ln(B_{z,d}) + \delta \ln(\varkappa_{z,p,t}) + \iota \ln(\omega_{z,t}) + \varepsilon_{p,d,z,t}. \quad (2.4.1)$$

Where $\ln(uv)_{p,d,z,t}$ is the unit value of a product, p, imported by country z from country d at time t, while $\alpha_{p,d,t}$ is a product, exporter and time fixed effect. Import values have been refined by the CEPII using both c.i.f and f.o.b. values so to reduce the measurement error due to the location where these values are measured. The term, $\omega_{z,t}$, represents income inequality. We employ three different proxies for income inequality: the Gini Index, the Interquintile Ratio, and the Interdecile Ratio. Using the terms employed in the framework proposed above, $\omega_{z,t} = 1 - \eta_{z,t}$. In all of the following specifications we cluster standard errors at the importer-year level. Variation within exporting countries, products and years will be used to determine the relation between importing countries' characteristics and the unit value of imported products. Following our theoretical framework, if income inequality acts as component of market size it should be negatively correlated with unit values. The vector $X_{z,t}$ several importing country characteristics, such as population, average income,[26] the share of students enrolled in tertiary education, a dummy for landlocked country and two dummies for the participation in the GATT agreement or in other regional trade agreements. Following our theoretical framework, we expect population to be negatively associated with unit values while average income should be positively correlated. The share of students enrolled in tertiary education is a proxy for human capital in the importing country and should be positively correlated with the quality of imported products. The landlocked and the GATT dummies are proxies for trade costs accounting for the variation in unit values due to market location. $B_{z,d}$ is a vector of bilateral variables such as distance[27] between two trading partners, a dummy for common official-language and a dummy equal to one if two countries have a common legal origin. These last two variables are introduced in order to control for factors other than distance that might increase the cost of trading among two partners. Following our theoretical framework and results reported in the literature, we should find a positive correlation between distance and unit values. The other dummy variables, being correlated with the fixed cost of exporting, should instead report negative coefficients. Similarities between

[26] We use per-capita PPP gross national income, instead of per-capita PPP gross domestic product. Per-capita income rather than per capita GDP is considered to be a more reliable measure for the income devoted to consumption.

[27] Geodesic distances are calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations.

countries and common participation in trade agreements should decrease the costs of exporting that affect unit values.

The term $\varkappa_{z,p,t}$ represents an index for relative comparative disadvantage computed for every product-country pair, *z-p*, at time *t*. The term $\varkappa_{z,p,t}$ is in fact obtained dividing the total value of imports for a particular product in year *t*, $IM_{z,p,t}$, by the amount of imports of all other products by the same country, in the same year, $IM_{z,t}$, and then dividing this ratio by a similar ratio computed for all countries in our sample, $(IM_{p,t}/IM_t)^{all}$.

$$\varkappa_{z,p,t} = \frac{IM_{z,p,t}/IM_{z,t}}{(IM_{p,t}/IM_t)^{all}}$$

Higher $\varkappa_{z,p,t}$, less productive are supposed to be firms in the importing country at producing that particular product. In fact, this index measures the competitiveness of a country's manufacturing sector at producing a particular HS-6 product. The lower this index, the higher the quality of imported products, since high-quality firms are the most productive. A country with a relatively low $\varkappa_{z,p,t}$ has, in fact, a fringe of competitive domestic firms producing that good, therefore, in order to find their own niche in this market, foreign firms have to supply goods of high quality to this destination.

2.4.3 Results

In Tables 2.4, 2.5 and 2.6 we report results obtained estimating specification (2.4.1) using the three proxies for income inequality at our disposal. In the first estimation of each table we introduce only the proxy for income inequality and then add the other covariates in the following specifications. We will first comment results on the covariates and then focus on our variable of interest: income inequality. Results, as reported in Tables 2.4, 2.5 and 2.6, show that average PPP income is positively and significantly correlated with the unit value of traded products.[28] This result is consistent with our theoretical framework, reporting a fixed cost of exporting proportional to average income in the importing country. The current literature (Crinò and Epifani, 2012; Hallak, 2006) also confirms this finding. However, non-homothetic preferences for quality are usually assumed to rationalize this result, while we introduce non-homothetic preferences for manufactured products. Moreover, population, a variable usually considered as a component of market size, reports a negative significant coefficient. As an importing market gets larger, in terms of population, the unit value of imported products becomes lower.[29]

Distance between the importing and the exporting country enters all specifications with a positive significant coefficient. The more distant a market is, the higher is the quality of products exported to this market. This result confirms that only producers of

[28] The coefficient for this variable is significant at the 1% in all specifications.

[29] Results do not change if we consider GDP as a proxy for market size instead of population.

high quality goods can profitably export to more distant markets, confirming the Alchian-Allen effect (1964) as in Martin (2012), Flach and Janeba (2013) and Hummels and Skiba (2004). The measure of competitive disadvantage reports a negative coefficient, significant at the 1%. Higher the relative imports of a country in a particular product category, lower is the unit value of products this country imports from abroad. On the contrary, more competitive a country is at producing a particular product, lower is this index and higher must be the unit value of imported products. Imported products, in this case, have to be of higher quality in order to compete in a market where domestic producers supply high-quality goods. The dummy for country dyads sharing a common official language enters the three tables with a negative significant coefficient.[30] If two countries speak the same language this reduces the unit values of traded goods since the variable costs of exporting are reduced. The dummy for a country being landlocked enters all specifications with a negative, significant coefficient. If a country is landlocked this reduces trading costs, either fixed or variable, and therefore less productive, low-quality, firms have incentive to start exporting to this country.

Table 2.4, reporting results obtained using the Interdecile Ratio as a proxy for income inequality, shows that the coefficient of this variable is negative and significant at the 1%. The higher is income inequality, the lower is the unit value of imported manufactured products.

[Table 2.4 here]

Using the coefficient estimated in specification (7) of this table, a 1% increase in the Interdecile Ratio lowers unit values of imported products by 0.076 percent. Table 2.5 reports estimates obtained when using the Interquintile Ratio as a measure for income inequality. The Interquintile Ratio enters all specifications reported in Table 2.5 with a negative, significant, coefficient. The magnitude of this coefficient is similar to the one for the Interdecile Ratio, reported in the previous table. Using the coefficient estimated in specification (7) of this table, a 1% increase in the Interquintile Ratio lowers unit values of imported products by 0.103 percent.

[Table 2.5 here]

In Table 2.6 we employ the Gini Index as a proxy for income inequality. This variable enters our specifications with a negative significant sign. The magnitude of the coefficient for this variable is larger than the ones for the Interquintile and the Interdecile Ratio. This happens since the Gini Index is a measure of income inequality that takes into consideration the difference between a perfectly proportional income distribution and the observed income distribution while the other two measures capture the difference between

[30] at the 1%.

the two opposite tails of income distribution. The negative correlation between income inequality and unit values of imported products is confirmed in all specifications. Using the coefficient estimated in specification (7) of this table, a 1% increase in the Gini Index lowers unit values of imported products by 0.242 percent.

[Table 2.6 here]

In the following tables we consider the presence of an interaction between income inequality and average income. In fact, our framework suggests that this term should be negatively correlated with the unit value of imported products. We investigate on this, first by interacting average income with the Interquintile Ratio, in Table 2.7, and then with the Gini Index, in Table 2.8.[31]

[Table 2.7 here]
[Table 2.8 here]

Results show that the interaction term reports a negative coefficient. However, this coefficient is significant in two out of seven specifications in Table 2.7, and in only one specification in Table 2.8. The other covariates report coefficients with signs and magnitudes similar to those commented above. The two variables included in the interaction term report coefficients with similar signs and magnitudes, as well. Therefore, we can conclude that introducing the interaction term does not affect our results: we find a negative correlation between income inequality and unit values of imported products.

2.4.4 Selection into Importing Markets

After having documented the role of country characteristics using a linear regression framework, it is important to extend this empirical analysis by considering the presence of a selection bias in our estimations. This bias arises from the intrinsic nature of trade data: we observe an entry in our data-set only if a positive amount of product is shipped from an exporting to an importing country in a specific year. Certain country pairs might not trade any product among themselves simply because they are too distant or because the exporting country simply does not produce that particular product. International agreements and product characteristics might also have a role for the selection bias. The two-stage Heckman estimation strategy proposed by Harrigan et al. (2011) is now implemented in order to control for selection. Suppose that imported quantities are explained by the following reduced form equation:

$$\ln(q_{p,d,z,t}) = Max[0; \delta W_z + u_{p,d,z,t}], \tag{2.4.2}$$

[31] Similar results are obtained when interacting the interdecile ratio with average income.

where W_z is the vector of bilateral and country characteristics used in specification (2.4.1) and $q_{p,d,z,t}$ is the quantity of product p imported by country z from country d at time t. The error term $u_{p,d,z,t}$ is correlated with the error of the pricing equation, $\varepsilon_{p,d,z,t}$, leading to a selection bias in specification (2.4.1). This bias would be eliminated by obtaining a consistent estimate of $u_{p,d,z,t}$ and using it as an additional control in specification (2.4.1).

$\Pr(q_{p,d,z,t})$ is the probability of entry that we estimate using a reduced form Probit model,[32]

$$\Pr(q_{p,d,z,t} > 0) = \Phi(\delta W_z) \tag{2.4.3}$$

To estimate equation (2.4.3) we need to generate all possible combination of product-importing-exporting country pairs in order to consider all trade zeros. Specification (2.4.3) is estimated to obtain the inverse Mills ratios, $\widehat{\lambda}_{p,d,z,t}$. We then run a linear regression in which imported quantity is the dependent variable while the inverse Mills ratios and the variables of vector W_z, including our proxies for income inequality are the explicative variables. Here we introduce $\alpha_{p,d,t}$, a product, exporter and time fixed effect:

$$\ln(q_{p,d,z,t}) = \alpha_{p,d,t} + \theta W_z + \theta \widehat{\lambda}_{p,d,z,t} + u_{p,d,z,t}. \tag{2.4.4}$$

We then obtain consistent estimates for the residuals, $\widehat{u}_{p,d,z,t}$, that are used in order to control for selection in the equation regressing unit value of imported products on bilateral and importing country characteristics, included in W_z:[33]

$$\ln(uv)_{p,d,z,t} = \alpha_{p,d,t} + \theta W_z + \widehat{u}_{p,d,z,t} + \varepsilon_{p,d,z,t} \tag{2.4.5}$$

Notice that, similarly to the estimations proposed above, since we are using product, exporter and time fixed effects, we identify parameters by exploiting variation within exporter-product, across importers. Results from specifications proposed in the previous section can then be compared with the ones obtained estimating (2.4.5). As confirmed in the following table, controlling for selection does not qualitatively affect our results. Income inequality in the importing country is negatively associated with the unit value of imported products. The magnitude of the coefficients is however smaller than the one reported in the last specification of Tables, 2.4, 2.5 and 2.6, suggesting the presence of a downward bias in the results previously described. The other explicative variables report coefficients similar in magnitude and significance to the ones previously observed. The coefficient for average income reports a positive and significant coefficient.[34] Distance enters

[32] Harrigan et al. (2011) use the Heckman estimator to estimate (2.4.2) since it enables them to avoid assuming that $u_{p,d,z,t}$ is normally distributed. This would be a restrictive assumption. The normality of the error term is assumed for specification (2.4.3) but not for specification (2.4.4).

[33] Following Harrigan et al. (2011), we assume that $q_{p,d,z,t}$ is an independet source of variation allowing us to identify coefficients in specification (5).

[34] Differently from what obtained by Harrigan et al. (2011) who use GDP per worker.

with a positive and significant coefficient while the coefficient for competitive disadvantage is negative and significant, as expected. Selection parameters enter with negative, significant coefficients in all of the three specifications, underlying the significant impact of the selection bias.

[Table 2.9 here]

2.4.5 Khandelwal procedure

Khandelwal (2010) proposes a different procedure to obtain a proxy for the quality of products imported by each country. We refer to this methodology in order to obtain an alternative proxy for the quality of varieties imported by countries in our data-set and then test our prediction using this new proxy. This procedure is based on regressing the market share of imported products on the price (unit value) at which these products are sold in each market. The exact procedure reads as follows. The market share in the importing country is explained by the following specification:

$$\ln(s_{z,p,t}) - \ln(s_{0z,p,t}) = \lambda_p + \lambda_t + \beta_1 \ln p_{z,p,t} + \beta_2(ns_{z,p,t}) + \beta_3 \ln pop_{d,p,t} + \lambda_{z,p,t} \quad (2.4.6)$$

Where $s_{z,p,t} = \frac{q_{p,t}}{MKT_t}$ is the market's share of variety p in the importing country z, at time t; $q_{p,t}$ represents the amount of product imported in country z at time t and $MKT_t = \sum_p \frac{q_{p,t}}{1-s_{0t}}$, is a measure of market size. The term s_{0t} is the market share of a domestic product, competitor of variety p, that is set equal to 1 minus import penetration in each industry-importing country pair. Import penetration is obtained dividing imports over imports plus exports in each industry-importing country pair. Moreover, $ns_{z,p,t} = \frac{q_{p,t}}{\sum_p q_{p,t}}$, the nest share, is the ratio between the imported quantity of variety p on the total quantity of varieties imported by country z at time t; $pop_{d,p,t}$ is exporting country's population, a measure for hidden varieties supplied by the exporting country.

The procedure is based on running regressions for each industry-importing country pair. Industries are defined at the SITC rev.2 classification. We match HS-6 products with SITC rev.2 industries, and run regressions as specified in equation (2.4.6) for each industry in each importing country. In order to take into account for the endogeneity of $p_{z,p,t}$ and $ns_{z,p,t}$, due to simultaneity and reverse causality, we estimate (2.4.6) using a 2SLS procedure. Following Khandelwal (2010) we instrument $ns_{z,p,t}$ with the number of varieties exported by country d, while $p_{z,p,t}$ is instrumented by the real exchange rate at time t. We drop observations with extreme unit values and consider only industries with no-less than 20 varieties.[35] The median of the instrumented coefficient for price, $\widehat{\beta_1}$ is negative, and equal to -0.275, while $\widehat{\beta_2}$ reports a positive coefficient, 0.706. These values

[35] We employ observations reporting unit values above the 5th and below the 95th percentile.

are not too far from the ones obtained by Khandelwal (2010) on US data, reporting a median 2SLS coefficient of 0.46 for the nest share and of -0.58 for the price elasticity.

Product quality is then defined by the sum of the product fixed component, λ_p, the time fixed component λ_t and residuals, $\lambda_{z,p,t}$. We are then able to obtain time-varying estimates of quality for each importing market, $q_{z,p,t} \equiv \widetilde{\lambda}_p + \widetilde{\lambda}_t + \widetilde{\lambda}_{z,p,t}$. These new quality estimates at the product level are then employed as a new dependent variable in our usual specification, (2.4.1).

Tables 2.9 and 2.10, reporting estimates obtained using exporter, year and product fixed effects and clustering standard errors at the importing country level, confirm that income inequality is negatively correlated with the quality of imported products. The coefficients for the Interquintile Ratio and the Gini Index are negative and significant at the 1% in all specifications.

[Table 2.9 here]
[Table 2.10 here]

Based on the coefficient reported in specification (6) of Table 2.9, a 1% increase in the Interquintile Ratio lowers the quality of imported manufactured products by more than 1.48%. This effect is significantly larger with respect to the one obtained in specifications using unit values as a proxy for product quality.

The coefficient for average income is positive and significant in few of these specifications, while distance reports the usual positive coefficient, significant at the 1%. These results confirm conclusions drawn on regressions using unit values as a dependent variable.

2.5 Robustness checks

In this section, we report several checks pursued to test the robustness of results commented above.

F.o.b. Unit Values. In Table 2.11, another proxy for product quality is considered. We use Free On Board, f.o.b., unit values of products traded among country pairs in our database.[36] The Free on Board value is the total monetary value of products as recorded from the exporting country. Therefore, it does not include any freight or insurance cost that might affect unit values employed in the previous estimations. By implementing this robustness check we want to verify whether our results are affected by the procedure employed at CEPII to compute unit values considered in the previous specifications.

[Table 2.11 here]

[36] Available from the Cepii website.

We report results for specifications introducing our full set of controls and consider also the presence of an interaction between average income and the different proxies for income inequality. Interestingly, the Interdecile Ratio, the Interquintile Ratio and the Gini Index enter all specifications of this table with a negative coefficient, significant at 1%. The magnitude of coefficients is not statistically different with respect to the one of coefficients obtained in the previous section. Distance reports a positive significant coefficient. Dummy variables used as proxies for the fixed costs of exporting among country dyads report not significant coefficients in all specifications, as expected, since we are using f.o.b. unit values. Moreover, interaction terms between average income and the different proxies for income inequality report negative, significant coefficients. This last result is in line with what predicted by the theoretical framework.

Excluding Small Trade Flows. We continue our study proposing estimations of the econometric model described in (2.4.1) on different samples. In Table 2.12 we only consider trade flows larger than 1 ton, in order to check whether our results are not driven by trade flows of negligible amount.

[Table 2.12]

Results previously described are confirmed on this smaller sample. Our measures for income inequality report negative coefficients, significant at 1%, while average income and distance report positive coefficients. Based on this evidence, we conclude that our results are not driven by small trade flows.

Different Proxy for Education. The percentage of the population enrolled in tertiary education might not be a precise proxy for the human capital of the labour force employed in the importing country. In table 2.13 we introduce the percentage of the labour force with secondary education as a proxy for the technological content of production in the importing country.

[Table 2.13 here]

This variable reports a non-significant coefficient. However, the magnitude and significance of the three variables representing income inequality does not change. Income inequality is negatively correlated with the unit value of imported goods even when controlling for a different proxy of human capital in the importing country. All other covariates report coefficients similar in size and magnitude to those described above.

Non linearities. A further step in order to check the robustness of our results, is to follow Bekkers et al. (2012) who assume that the relation between unit values and certain country characteristics is non-linear. More precisely, we introduce squared terms and interactions for our measures of income inequality, average income and population. As Table 2.14 shows,

[Table 2.14 here]

the coefficient for squared income-inequality appears, in all specifications, with a negative non-significant coefficient while the coefficient for the non-squared variable is negative and significant, as found in other specifications. Moreover, when the total marginal effect is computed, in specifications (4) to (6), this reports a negative and significant coefficient. The magnitude of these coefficients is similar to the one obtained in the last specifications of Tables 2.4, 2.5, 2.6. Therefore, even considering non-linearities, results confirm that a higher level of income inequality, either measured by the Interdecile Ratio, the Interquintile Ratio or the Gini Index, is associated with a lower unit value of imported products. Average income reports a positive significant coefficient. Products of higher quality are imported by richer markets. Moreover, the coefficient for distance enters with the usual, positive and significant coefficient while the coefficient for population reports a negative coefficient. All other variables enter with magnitudes and signs comparable to those found in previous regressions.

Demand Elasticities. Following Flach and Janeba (2013) we merge to our data-set estimates of import demand elasticities proposed by Broda et al. (2010). Elasticities are estimated at the 3-digit HS for more than 70 countries. By controlling for demand elasticity in the importing country we should be capable to consider the impact of average mark-ups, at the country-sectoral level, on unit values.

[Table 2.15 here]

Results show that our proxies for income inequality remain negatively correlated with unit values when we consider demand elasticity in the importing country. The coefficient for demand elasticity is never significant.

Quality Ladders. Khandelwal (2010) estimates the length of quality ladders at the sectoral level in the US. We introduce this variable in order to consider the scope for quality differentiation and its impact on unit values. Our prior is that this variable should be positively correlated with unit values: the higher the scope for quality differentiation, the higher should be the average unit value of that product. We also propose specifications in which the length of quality ladder is interacted with our proxies for income inequality. Income inequality should impact more on unit values for products belonging to "long" quality ladders, these products are in fact the ones for which quality differentiation should have a prominent role.

[Table 2.16 here]

As reported in Table 2.16 this additional control reports a, non-significant, positive coefficient. The interaction term does not report a significant coefficient, moreover, it does not affect signs and magnitudes of the other variables.

2.6 Conclusion

We investigated the linkages between income inequality and the quality of imported products using implications drawn from an extension of the quality heterogenous-firms trade model. Under a demand side perspective, income inequality increases importing market's size for manufactured products thanks to the assumption of non-homothetic preferences for manufactured products. The increase in market size, leading more firms to enter the market, reduces the marginal cost cutoff and the quality produced by the infra-marginal exporting firm. This chapter also proposed a new and different explanation for the positive correlation between quality and importing country's average income: given that the fixed cost of exporting is increasing in importing country's average income, the quality of exported product is increasing in average income, and this does not depend on the assumption of non-homothetic preferences which affects the size of the market for manufactured products.

Overall, our results confirm that income inequality is negatively associated with the quality of imported products. Results are confirmed when estimating product quality following Khandelwal's procedure and allowing for the presence of a selection bias in our estimations.

2.7 Appendix: Income Inequality and Total Expenditure

The total expenditure on manufactured products in country z is equal to:

$$E_{tot,z} = \left[\gamma n_z \Phi_{M,r,z}(I_{r,z}) I_{r,z} + (1-\gamma) n_z \Phi_{M,p,z}(I_{p,z}) I_{p,z}\right]. \tag{2.7.1}$$

Since $I_{p,z} = \eta_z \widetilde{I}_z$ and $I_{r,z} = \left[\frac{1-\gamma\eta_z}{1-\gamma}\right] \widetilde{I}_z$, we have:

$$E_{tot,z} = \left\{\gamma n_z \Phi_{M,r,z}\left(I_{r,z}\right)\left[\frac{1-\gamma\eta_z}{1-\gamma}\widetilde{I}_z\right] + (1-\gamma) n_z \Phi_{M,p,z}(I_{p,z})\left[\eta_z \widetilde{I}_z\right]\right\} \tag{2.7.2}$$

Taking the partial derivative with respect to η_z,

$$\begin{aligned}\frac{\partial E_{tot,z}}{\partial \eta_z} &= \gamma n_z \widetilde{I}_z \left[\frac{\partial \Phi_{M,r,z}\left(I_{r,z}\right)}{\partial \eta_z}\left(\frac{1-\gamma\eta_z}{1-\gamma}\right) + \Phi_{M,r,z}\left(\frac{-\gamma}{1-\gamma}\right)\right] \\ &\quad + (1-\gamma) n_z \widetilde{I}_z \left[\frac{\partial \Phi_{M,p,z}\left(I_{p,z}\right)}{\partial \eta_z}\left(\eta_z\right) + \Phi_{M,p,z}\right].\end{aligned} \tag{2.7.3}$$

$$\begin{aligned}\frac{\partial E_{tot,z}}{\partial \eta_z} &= \gamma n_z \widetilde{I}_z \left[\frac{\partial \Phi_{M,r,z}\left(I_{r,z}\right)}{\partial \eta_z}\left(\frac{1-\gamma\eta_z}{1-\gamma}\right) + \Phi_{M,r,z}\left(\frac{-\gamma}{1-\gamma}\right)\right] \\ &\quad + (1-\gamma) n_z \widetilde{I}_z \left[\frac{\partial \Phi_{M,p,z}\left(I_{p,z}\right)}{\partial \eta_z}\left(\eta_z\right) + \Phi_{M,p,z}\right].\end{aligned} \tag{2.7.4}$$

Total expenditure on manufactured goods, $E_{tot,z}$, increases when inequality rises, if $\frac{\partial E_{tot,z}}{\partial \eta_z} < 0$. This happens when

$$\begin{aligned}&\gamma\left[-\frac{\partial \Phi_{M,r,z}\left(I_{r,z}\right)}{\partial \eta_z}\left(\frac{1-\gamma\eta_z}{1-\gamma}\right) + \Phi_{M,r,z}\left(\frac{\gamma}{1-\gamma}\right)\right] \\ >\ &(1-\gamma)\left[\frac{\partial \Phi_{M,p,z}\left(I_{p,z}\right)}{\partial \eta_z}\left(\eta_z\right) + \Phi_{M,p,z}\right].\end{aligned} \tag{2.7.5}$$

That is equal to

$$\begin{aligned}&\frac{\gamma}{(1-\gamma)}\left[-\frac{\partial \Phi_{M,r,z}\left(I_{r,z}\right)}{\partial \eta_z}\left(1-\gamma\eta_z\right) + \Phi_{M,r,z}\left(\gamma\right)\right] \\ >\ &(1-\gamma)\left[\frac{\partial \Phi_{M,p,z}\left(I_{p,z}\right)}{\partial \eta_z}\left(\eta_z\right) + \Phi_{M,p,z}\right].\end{aligned}$$

We know that $\frac{\partial \Phi_{M,r,z}(I_{r,z})}{\partial \eta_z} < 0$, therefore $-\frac{\partial \Phi_{M,r,z}(I_{r,z})}{\partial \eta_z} > 0$. We can then claim that $\frac{\partial E_{tot,z}}{\partial \eta_z} < 0$ if:

$$\left[\frac{\partial \Phi_{M,r,z}\left(I_{r,z}\right)}{\partial \eta_z}\frac{\gamma\left(1-\gamma\eta_z\right)}{\left(1-\gamma\right)^2}+\Phi_{M,r,z}\left(\frac{\gamma}{1-\gamma}\right)^2\right]$$
$$> \left[\frac{\partial \Phi_{M,p,z}\left(I_{p,z}\right)}{\partial \eta_z}\left(\eta_z\right)+\Phi_{M,p,z}\right] \tag{2.7.6}$$

We can assume that $\gamma > \frac{1}{2}$, since the share of the poor individuals in the population is, usually, higher than the share of rich individuals. Therefore we have $\left(\frac{\gamma}{1-\gamma}\right)^2 > 1$. Moreover, $\Phi_{M,r,z} > \Phi_{M,p,z}$, since $I_{r,z} > I_{p,z}$ and $\frac{\partial \Phi_{M,i,z}}{\partial I_{i,z}} > 0$. We conclude that $\Phi_{M,r,z}\left(\frac{\gamma}{1-\gamma}\right)^2 > \Phi_{M,p,z}$. Furthermore, we know that $\frac{\partial \Phi_{M,r,z}(I_{r,z})}{\partial \eta_z} < 0$, $\frac{\gamma(1-\gamma\eta_z)}{(1-\gamma)^2} < 1$ and $\frac{\partial \Phi_{M,p,z}(I_{p,z})}{\partial \eta_z}\left(\eta_z\right) > 0$.

2.8 Figures

	Country	Years
1	Albania	2002; 2004
2	Argentina	2002; 2004; 2006
3	Armenia	2002; 2004; 2006
4	Burundi	2006
5	Belarus	2002; 2004; 2006
6	Brazil	2002; 2004
7	Chile	2006
8	China	2002
9	Colombia	2006
10	Costa rica	2004
11	Estonia	2002; 2004
12	Georgia	2002; 2004
13	Ghana	2006
14	Honduras	2002; 2004
15	Hungary	2004
16	Indonesia	2002
17	Jamaica	2002
18	Jordan	2006
19	Kazakhstan	2002; 2004; 2006
20	Kyrgyzstan	2006
21	Cambodia	2004
22	Lithuania	2002; 2004
23	Moldova, republic of	2002; 2004; 2006
24	Maldives	2004
25	Mexico	2002; 2004; 2006
26	Macedonia, the former yugoslav republic of	2002; 2006
27	Mauritania	2004
28	Malawi	2004
29	Malaysia	2004
30	Pakistan	2006
31	Panama	2006
32	Peru	2006
33	Philippines	2006
34	Poland	2004; 2006
35	Romania	2006
36	Russian federation	2002; 2004
37	Rwanda	2006
38	Slovakia (slovak republic)	2004; 2006
39	Slovenia	2002; 2004
40	Thailand	2002; 2006
41	Turkey	2002; 2004; 2006
42	Uganda	2002; 2006
43	Ukraine	2004; 2006
44	Uruguay	2006
45	Venezuela	2004
46	Viet nam	2006

Figure 2.6. List of Countries and Years considered in the main estimation.

2.9 Tables

Table 2.1: Expenditure on Consumption and Market Size, 1960-2008

	(1) Expenditure on Consumption
Ln Gini Index	0.518***
	(0.052)
Ln Avg Income	1.200***
	(0.020)
Ln Population	0.952***
	(0.009)
Observations	537
R^2	0.961

Notes: This table studies how the Gini Index, Average Income and Population are correlated with the Total Expenditure on Consumption Goods. Robust standard errors reported in parentheses.

Table 2.2: Import Shares and Size Determinants, 1960-2008

	(1) Manufactured prod. imports	(2) Food imports
Ln Gini Index	8.706***	0.681
	(1.868)	(0.750)
Ln Avg Income	10.549***	-3.469***
	(0.916)	(0.368)
Ln Population	1.156***	-0.804***
	(0.394)	(0.158)
Ln Domestic Price Index	0.106***	-0.021*
	(0.028)	(0.011)
Observations	405	405
R^2	0.361	0.243

Notes: This table studies how the Gini Index, Average Income, Population and the Domestic Price Index are correlated with the Import Share of Manufactured Products and with the Import Share of Food Products. Robust standard errors reported in parentheses.

Table 2.3: Summary Statistics, 2004

	Mean	Median	SE-Mean	Min	Max	p5	p95	Obs.
Unit Value	37.31	9.30	.91	.01	293116.6	.84	132.72	357417
Quantity	175.70	1.88	6.92	.00	911101.8	.04	275.53	357417
Value	390.65	16.63	9.29	1	1305458	1.34	1002.34	357417
Interdecile Ratio	16.78	10.14	.04	5.33	70.73	5.95	69.89	191998
Interquintile Ratio	8.4	6.32	.01	3.80	27.68	4.15	24.24	191998
Gini Index	37.85	35.96	.02	26.22	58.49	28.11	57.68	191998
Avg Income	9803.0	10030	9.94	610	22010	2890	15340	191998
Population	53.87	10.40	.27	.09	1311.80	1.46	151.85	351970
Competitive Disadvantage	-.49	-.39	.002	-11.15	6.95	-3.00	1.57	357417
Enrolled in Ter. Ed.	48.22	59.69	.05	.21	72.83	17.15	72.83	166439
Labour Force Sec. Ed.	49.33	57.20	.06	16.8	78.10	16.8	78.10	116007
Distance	3016.49	1100.80	9.05	117.34	19812.04	215.07	11437.29	191998
Common Official Lang. (d)	.22	0	.0006	0	1	0	1	357417
Common Legal Origin (d)	.65	1	.0007	0	1	0	1	357417
Regional Trade Agr. (d)	.06	0	.0004	0	1	0	1	357417
Landlocked (d)	.16	0	.0006	0	1	0	1	357417
Gatt (d)	.39	0	.0008	0	1	0	1	357417
N	357417							

Notes: This table reports summary statistics on the variables at our disposal for Year 2004. Unit Value is measured in US dollars per Kilogram for each product-country dyad. Quantity is measured in tons. Value is measured in thousands of US dollars. The Interdecile Ratio is the ratio between the income share of the top 10 percent and the income share of the bottom 10 percent of the income distribution. The Interquintile Ratio is the ratio between the income share of the top 20 percent and the income share of the bottom 20 percent of the income distribution. The Gini Index measures the inequality among values of a frequency distribution, the higher is this index the higher is income inequality. The Average Income is the GNI per capita, PPP at current international US dollars. Population is measured in millions of individuals. Competitive disadvantage is a measure of relative imports at the product-country level measuring the relative competitiveness of a country at producing a particular HS-6 product. Enrolled in tertiary education is the total enrollment in tertiary education expressed as a percentage of the total population of the five-year age group following on from secondary school leaving. Labour Force with Secondary Education is the percentage of individuals holding a secondary degree in the working population. Distance is the geodesic distance in kilometers between the capital cities of a country dyad. Common Official Language is a dummy for country dyads sharing the same official language. Common Legal Origin is a dummy for country dyads sharing the same legal system. Regional Trade Agreement is a dummy for countries belonging to a Regional Trade Agreement. Landlocked is a dummy for countries surrounded by land. Gatt is a dummy for countries that are members of the General Agreement on Trade and Tariffs.

Table 2.4: Import Unit Values and Interdecile Ratio

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value	(5) Unit Value	(6) Unit Value	(7) Unit Value
Ln Interdecile Ratio	-0.031***	-0.023***	-0.063***	-0.061***	-0.066***	-0.058***	-0.076***
	(0.002)	(0.002)	(0.015)	(0.016)	(0.015)	(0.014)	(0.017)
Ln Avg Income		0.086***	0.079***	0.078***	0.095***	0.088***	0.082***
		(0.002)	(0.017)	(0.017)	(0.016)	(0.015)	(0.016)
Ln Distance			0.109***	0.119***	0.122***	0.115***	0.123***
			(0.009)	(0.011)	(0.010)	(0.010)	(0.010)
Ln Population				-0.016	-0.015*	-0.018*	-0.025***
				(0.011)	(0.009)	(0.009)	(0.009)
Perc. Enrolled in Tertiary Education					-0.010	-0.009	-0.011
					(0.021)	(0.020)	(0.020)
Ln Competitive disadvantage					-0.083***	-0.082***	-0.081***
					(0.005)	(0.005)	(0.004)
Common official language (d)						-0.130***	-0.107***
						(0.037)	(0.032)
Common legal origin (d)						-0.033*	-0.024
						(0.019)	(0.019)
Regional Trade Agreement (d)						0.016	-0.010
						(0.019)	(0.022)
Landlocked (d)							-0.093***
							(0.018)
Gatt (d)							0.042*
							(0.021)
Observations	461388	461388	461388	461388	461388	461388	461388
R^2	0.000	0.005	0.019	0.020	0.036	0.039	0.041

Notes: This table studies the impact of our proxy for Income Inequality, "Ln Interdecile Ratio" on Ln Unit Value. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.5: Import Unit Values and Interquintile Ratio

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value	(5) Unit Value	(6) Unit Value	(7) Unit Value
Ln Interquintile Ratio	-0.037***	-0.027***	-0.084***	-0.080***	-0.089***	-0.077***	-0.103***
	(0.003)	(0.003)	(0.022)	(0.022)	(0.021)	(0.020)	(0.024)
Ln Avg Income		0.087***	0.079***	0.078***	0.095***	0.088***	0.082***
		(0.002)	(0.018)	(0.017)	(0.016)	(0.015)	(0.016)
Ln Distance			0.110***	0.119***	0.122***	0.115***	0.124***
			(0.009)	(0.011)	(0.010)	(0.010)	(0.010)
Ln Population				-0.016	-0.015	-0.017*	-0.025***
				(0.011)	(0.009)	(0.009)	(0.009)
Perc. Enrolled in Tertiary Education					-0.010	-0.009	-0.012
					(0.021)	(0.020)	(0.020)
Ln Competitive disadvantage					-0.083***	-0.082***	-0.081***
					(0.005)	(0.005)	(0.004)
Common official language (d)						-0.129***	-0.105***
						(0.038)	(0.032)
Common legal origin (d)						-0.034*	-0.024
						(0.020)	(0.019)
Regional Trade Agreement (d)						0.017	-0.009
						(0.019)	(0.022)
Landlocked (d)							-0.095***
							(0.018)
Gatt (d)							0.042*
							(0.021)
Observations	461388	461388	461388	461388	461388	461388	461388
R^2	0.000	0.005	0.019	0.020	0.036	0.039	0.041

Notes: This table studies the impact of our proxy for Income Inequality, "Ln Interquintile Ratio" on Ln Unit Value. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.6: Import Unit Values and Gini Index

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value	(5) Unit Value	(6) Unit Value	(7) Unit Value
Ln Gini Index	-0.059***	-0.029***	-0.199***	-0.185***	-0.215***	-0.188***	-0.242***
	(0.007)	(0.007)	(0.065)	(0.063)	(0.058)	(0.058)	(0.065)
Ln Avg Income		0.087***	0.078***	0.078***	0.097***	0.089***	0.084***
		(0.002)	(0.018)	(0.017)	(0.015)	(0.015)	(0.016)
Ln Distance			0.112***	0.120***	0.124***	0.116***	0.126***
			(0.009)	(0.011)	(0.010)	(0.010)	(0.010)
Ln Population				-0.015	-0.014	-0.017*	-0.024***
				(0.011)	(0.009)	(0.009)	(0.009)
Perc. Enrolled in Tertiary Education					-0.015	-0.013	-0.017
					(0.021)	(0.020)	(0.021)
Ln Competitive disadvantage					-0.083***	-0.082***	-0.081***
					(0.005)	(0.005)	(0.004)
Common official language (d)						-0.128***	-0.105***
						(0.039)	(0.033)
Common legal origin (d)						-0.036*	-0.025
						(0.020)	(0.020)
Regional Trade Agreement (d)						0.020	-0.004
						(0.019)	(0.021)
Landlocked (d)							-0.095***
							(0.019)
Gatt (d)							0.040*
							(0.021)
Observations	461388	461388	461388	461388	461388	461388	470943
R^2	0.000	0.004	0.019	0.020	0.036	0.038	0.041

Notes: This table studies the impact of our proxy for Income Inequality, "Ln Gini Index" on Ln Unit Value. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.7: Import Unit Values and Interquintile Ratio, Interaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Ln Interquintile Ratio	-0.037***	-0.027***	-0.027***	-0.085***	-0.081***	-0.090***	-0.079***	-0.106***
	(0.003)	(0.003)	(0.003)	(0.022)	(0.021)	(0.020)	(0.019)	(0.022)
Ln Avg Income		0.087***	0.084***	0.074***	0.076***	0.090***	0.083***	0.076***
		(0.002)	(0.002)	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)
Ln Interquintile Ratio X Ln Avg Income			-0.026***	-0.044	-0.025	-0.051	-0.049	-0.062*
			(0.006)	(0.036)	(0.036)	(0.033)	(0.033)	(0.035)
Ln Distance				0.111***	0.119***	0.122***	0.115***	0.124***
				(0.009)	(0.011)	(0.010)	(0.010)	(0.010)
Ln Population					-0.015	-0.013	-0.016*	-0.023***
					(0.012)	(0.009)	(0.009)	(0.009)
Perc. Enrolled in Tertiary Education						-0.011	-0.010	-0.013
						(0.020)	(0.020)	(0.020)
Ln Competitive disadvantage						-0.084***	-0.083***	-0.082***
						(0.005)	(0.005)	(0.004)
Common official language (d)							-0.129***	-0.104***
							(0.038)	(0.032)
Common legal origin (d)							-0.034*	-0.024
							(0.020)	(0.019)
Regional Trade Agreemet (d)							0.015	-0.012
							(0.019)	(0.022)
Landlocked (d)								-0.098***
								(0.018)
Gatt (d)								0.042**
								(0.021)
Observations	461388	461388	461388	461388	461388	461388	461388	461388
R^2	0.000	0.005	0.005	0.020	0.020	0.037	0.039	0.041

Notes: This table studies the impact of our proxy for Income Inequality, "Ln Interquintile Ratio" on Ln Unit Value. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.8: Import Unit Values and Gini Index, Interaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Ln Gini Index	-0.059***	-0.029***	-0.026***	-0.196***	-0.184***	-0.214***	-0.187***	-0.250***
	(0.007)	(0.007)	(0.007)	(0.064)	(0.062)	(0.057)	(0.057)	(0.063)
Ln Avg Income		0.087***	0.085***	0.074***	0.075***	0.093***	0.086***	0.079***
		(0.002)	(0.002)	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)
Ln Gini Index X Ln Avg Income			-0.082***	-0.113	-0.065	-0.110	-0.106	-0.147
			(0.013)	(0.098)	(0.100)	(0.090)	(0.091)	(0.095)
Ln Distance				0.112***	0.120***	0.123***	0.116***	0.125***
				(0.009)	(0.011)	(0.010)	(0.010)	(0.010)
Ln Population					-0.014	-0.012	-0.015	-0.022**
					(0.012)	(0.009)	(0.009)	(0.009)
Perc. Enrolled in Tertiary Education						-0.015	-0.013	-0.018
						(0.021)	(0.020)	(0.021)
Ln Competitive disadvantage						-0.084***	-0.083***	-0.082***
						(0.005)	(0.005)	(0.004)
Common official language (d)							-0.128***	-0.102***
							(0.039)	(0.033)
Common legal origin (d)							-0.036*	-0.027
							(0.020)	(0.020)
Regional Trade Agreement (d)							0.018	-0.006
							(0.018)	(0.022)
Landlocked (d)								-0.099***
								(0.018)
Gatt (d)								0.040*
								(0.021)
Observations	461388	461388	461388	461388	461388	461388	461388	461388
R^2	0.000	0.004	0.005	0.019	0.020	0.037	0.039	0.041

Notes: This table studies the impact of our proxy for Income Inequality, "Ln Gini Index" on Ln Unit Value. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.9: Import Unit Values and Income Inequality, Selection

	(1) Unit Value	(2) Unit Value	(3) Unit Value
Ln Interdecile Ratio	-0.027**		
	(0.012)		
Ln Interquintile Ratio		-0.037**	
		(0.019)	
Ln Gini Index			-0.099*
			(0.057)
Ln Avg Income	0.103***	0.104***	0.105***
	(0.020)	(0.020)	(0.020)
Ln Population	-0.005	-0.004	-0.004
	(0.007)	(0.007)	(0.007)
Ln Competitive disadvantage	-0.042***	-0.043***	-0.043***
	(0.003)	(0.003)	(0.003)
Perc. Enrolled in Ter. Ed.	-0.055***	-0.055***	-0.058***
	(0.020)	(0.020)	(0.021)
Ln Distance	0.060***	0.061***	0.061***
	(0.009)	(0.009)	(0.009)
Common legal origin (d)	-0.025	-0.027	-0.029
	(0.020)	(0.020)	(0.020)
Common official language (d)	0.007	0.009	0.008
	(0.016)	(0.018)	(0.019)
Landlocked (d)	-0.080**	-0.081***	-0.080**
	(0.030)	(0.030)	(0.031)
Gatt (d)	-0.022	-0.022	-0.024
	(0.020)	(0.020)	(0.021)
Regional Trade Agreement (d)	0.045*	0.045*	0.043*
	(0.025)	(0.025)	(0.025)
Selection Parameter Intedec.	-0.204***		
	(0.004)		
Selection Parameter Interq.		-0.204***	
		(0.004)	
Selection Parameter Gini			-0.205***
			(0.004)
Observations	461388	461388	461388
R^2	0.198	0.199	0.200

Notes: This table studies the impact of our proxies for Income Inequality on Ln Unit Value taking into consideration the Selection of varieties in the importing market. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.10: Quality and Interquintile Ratio

	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality	(6) Quality
Ln Interquintile Ratio	-0.896***	-1.082***	-1.082***	-1.098***	-1.339**	-1.489***
	(0.065)	(0.371)	(0.373)	(0.401)	(0.524)	(0.521)
Ln Avg Income		0.231	0.237	0.306	0.278	0.516**
		(0.288)	(0.294)	(0.259)	(0.257)	(0.231)
Ln Distance		0.352***	0.362***	0.335**	0.474**	0.455**
		(0.101)	(0.126)	(0.131)	(0.179)	(0.178)
Ln Population			-0.015	-0.009	-0.039	-0.137
			(0.094)	(0.093)	(0.083)	(0.108)
Perc. Enrolled in Tertiary Education				-0.147	-0.058	-0.350
				(0.391)	(0.348)	(0.364)
Ln Competitive disadvantage				0.018	0.021	0.042
				(0.070)	(0.070)	(0.073)
Common official language (d)					2.215	2.087
					(1.368)	(1.354)
Common legal origin (d)					-0.153	-0.108
					(0.423)	(0.423)
Regional Trade Agreement (d)					-0.144	-0.192
					(0.430)	(0.561)
Landlocked (d)						-0.992
						(0.680)
Gatt (d)						-0.049
						(0.469)
Observations	28256	28256	28256	28256	28256	28256
R^2	0.006	0.012	0.012	0.012	0.021	0.027

Notes: This table studies the impact of our proxy for Income Inequality "Ln Interquintile Ratio" on Ln Quality. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.11: Quality and Gini Index

	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality	(6) Quality
Ln Gini Index	-1.969***	-2.508***	-2.507***	-2.598**	-3.161**	-3.559***
	(0.145)	(0.895)	(0.900)	(1.015)	(1.297)	(1.267)
Ln Avg Income		0.214	0.220	0.318	0.291	0.542**
		(0.290)	(0.298)	(0.270)	(0.269)	(0.236)
Ln Distance		0.382***	0.392***	0.356***	0.501**	0.486**
		(0.102)	(0.128)	(0.130)	(0.185)	(0.183)
Ln Population			-0.015	-0.005	-0.035	-0.137
			(0.097)	(0.095)	(0.085)	(0.110)
Perc. Enrolled in Tertiary Education				-0.208	-0.130	-0.446
				(0.409)	(0.374)	(0.386)
Ln Competitive disadvantage				0.014	0.017	0.038
				(0.068)	(0.068)	(0.070)
Common official language (d)					2.250	2.125
					(1.372)	(1.354)
Common legal origin (d)					-0.157	-0.109
					(0.420)	(0.419)
Regional Trade Agreement (d)					-0.146	-0.189
					(0.430)	(0.560)
Landlocked (d)						-1.032
						(0.689)
Gatt (d)						-0.063
						(0.464)
Observations	28256	28256	28256	28256	28256	28256
R^2	0.006	0.013	0.013	0.013	0.022	0.029

Notes: This table studies the impact of our proxy for Income Inequality "Ln Gini Index" on Ln Quality. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.12: F.o.b Unit Values and Income Inequality, Check 1

	(1)	(2)	(3)	(4)	(5)	(6)
	Fob Unit Value	Fob Unit Value	Fob Unit Value	Fob Unit Value	Fob Unit Value	Fob Unit Value
Ln Interdecile Ratio	-0.043**	-0.051***				
	(0.017)	(0.015)				
Ln Interdecile Ratio X Avg Income		-0.081***				
		(0.025)				
Ln Interquintile Ratio			-0.060**	-0.070***		
			(0.024)	(0.021)		
Ln Interquintile Ratio X Ln Avg Income				-0.107***		
				(0.036)		
Ln Gini Index					-0.141**	-0.153**
					(0.067)	(0.061)
Ln Gini Index X Ln Avg Income						-0.241**
						(0.102)
Ln Avg Income	0.035	0.028	0.035	0.028	0.038	0.033
	(0.023)	(0.022)	(0.023)	(0.023)	(0.024)	(0.024)
Ln Population	-0.015*	-0.012	-0.015*	-0.011	-0.014*	-0.011
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln Competitive disadvantage	-0.029***	-0.031***	-0.029***	-0.031***	-0.030***	-0.031***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Perc. Enrolled in Tertiary Education	0.003	0.003	0.003	0.003	-0.001	-0.001
	(0.029)	(0.027)	(0.029)	(0.028)	(0.031)	(0.029)
Ln Distance	0.108***	0.107***	0.109***	0.108***	0.110***	0.109***
	(0.014)	(0.013)	(0.014)	(0.013)	(0.014)	(0.013)
Common official language (d)	-0.087	-0.084	-0.085	-0.082	-0.084	-0.080
	(0.058)	(0.057)	(0.059)	(0.058)	(0.060)	(0.059)
Common legal origin (d)	0.048	0.045	0.048	0.045	0.045	0.043
	(0.037)	(0.035)	(0.037)	(0.035)	(0.037)	(0.036)
Regional Trade Agreement (d)	0.020	0.011	0.021	0.013	0.025	0.020
	(0.033)	(0.032)	(0.033)	(0.032)	(0.033)	(0.032)
Landlocked (d)	-0.024	-0.028	-0.025	-0.030	-0.025	-0.032
	(0.030)	(0.027)	(0.029)	(0.027)	(0.030)	(0.028)
Gatt (d)	0.016	0.019	0.015	0.018	0.014	0.014
	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.019)
Observations	195405	195405	195405	195405	195405	195405
R^2	0.014	0.015	0.014	0.015	0.014	0.015

Notes: This table studies the impact of our proxies for Income Inequality on Ln Fob Unit Value. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.13: Import Unit Values and Income Inequality, Check 2

	(1) Unit Value	(2) Unit Value	(3) Unit Value
Ln Interdecile Ratio	-0.052***		
	(0.018)		
Ln Interquintile Ratio		-0.068***	
		(0.026)	
Ln Gini Index			-0.155**
			(0.073)
Ln Avg Income	0.113***	0.113***	0.115***
	(0.020)	(0.020)	(0.020)
Ln Population	-0.007	-0.006	-0.006
	(0.010)	(0.010)	(0.010)
Ln Competitive disadvantage	-0.071***	-0.071***	-0.071***
	(0.005)	(0.005)	(0.005)
Perc. Enrolled in Tertiary Education	-0.035	-0.036	-0.039
	(0.025)	(0.025)	(0.026)
Ln Distance	0.075***	0.075***	0.075***
	(0.011)	(0.011)	(0.011)
Common official language	-0.041	-0.040	-0.039
	(0.030)	(0.031)	(0.032)
Common legal origin (d)	-0.008	-0.009	-0.011
	(0.024)	(0.024)	(0.024)
Regional Trade Agreement (d)	-0.000	0.001	0.006
	(0.023)	(0.023)	(0.023)
Landlocked (d)	-0.100***	-0.101***	-0.099***
	(0.025)	(0.025)	(0.026)
Gatt (d)	0.011	0.010	0.008
	(0.027)	(0.027)	(0.028)
Observations	272080	272080	272080
R^2	0.031	0.031	0.031

Notes: This table studies the impact of our proxies for Income Inequality on Ln Unit Value, excluding small trade flows. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.14: Import Unit Values and Income Inequality, Check 3

	(1) Unit Value	(2) Unit Value	(3) Unit Value
Ln Interdecile Ratio	-0.043**		
	(0.020)		
Ln Interquintile Ratio		-0.055**	
		(0.027)	
Ln Gini Index			-0.129*
			(0.073)
Ln Avg Income	0.079***	0.078***	0.080***
	(0.023)	(0.024)	(0.023)
Ln Population	-0.030***	-0.029***	-0.028***
	(0.009)	(0.010)	(0.010)
Ln Competitive disadvantage	-0.078***	-0.078***	-0.078***
	(0.005)	(0.005)	(0.005)
Perc. Labour Force with Sec. Educ.	-0.009	-0.010	-0.011
	(0.031)	(0.031)	(0.032)
Ln Distance	0.130***	0.130***	0.131***
	(0.010)	(0.010)	(0.010)
Common official language (d)	-0.129***	-0.126***	-0.122**
	(0.043)	(0.044)	(0.046)
Common legal origin (d)	-0.006	-0.006	-0.007
	(0.021)	(0.021)	(0.021)
Regional Trade Agreement (d)	-0.025	-0.024	-0.020
	(0.022)	(0.022)	(0.022)
Landlocked (d)	-0.078***	-0.079***	-0.083***
	(0.021)	(0.021)	(0.022)
Gatt (d)	0.074***	0.074***	0.072***
	(0.020)	(0.020)	(0.020)
Observations	340349	340349	340349
R^2	0.042	0.042	0.042

Notes: This table studies the impact of our proxies for Income Inequality on Ln Unit Value, employing an alternative proxy for Human Capital in the importing country. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.15: Import Unit Values and Income Inequality, Check 4

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value	(5) Unit Value	(6) Unit Value
Ln Interdecile Ratio	-0.081***			-0.079***		
	(0.015)			(0.016)		
Ln Interdecile Ratio Squared	-0.003					
	(0.015)					
Ln Interquintile Ratio		-0.108***			-0.106***	
		(0.020)			(0.021)	
Ln Interquintile Ratio Squared		-0.008				
		(0.028)				
Ln Gini Coefficient			-0.258***			-0.249***
			(0.055)			(0.055)
Ln Gini Index Squared			-0.089			
			(0.186)			
Ln Avg Income	0.071***	0.070***	0.071***	0.073***	0.072***	0.072***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Ln Avg Income Squared	0.010	0.009	0.009			
	(0.015)	(0.015)	(0.015)			
Ln Avg Income X Ln Interdecile Ratio	-0.043					
	(0.026)					
Ln Avg Income X Ln Interquintile Ratio		-0.052				
		(0.034)				
Ln Avg Income X Ln Gini Index			-0.078			
			(0.089)			
Ln Population	-0.022***	-0.021***	-0.022***	-0.024***	-0.024***	-0.024***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln Population Squared	-0.004	-0.005	-0.005			
	(0.005)	(0.005)	(0.005)			
Ln Population X Ln Avg Income	-0.011	-0.010	-0.007			
	(0.009)	(0.009)	(0.010)			
Ln Population X Ln Interdecile Ratio	0.030***					
	(0.010)					
Ln Population X Ln Interquintile Ratio		0.044***				
		(0.013)				
Ln Population X Ln Gini Index			0.120***			
			(0.035)			
Ln Competitive disadvantage	-0.081***	-0.081***	-0.081***	-0.081***	-0.081***	-0.081***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Perc. Enrolled in Tertiary Education	-0.011	-0.011	-0.014	-0.011	-0.011	-0.014
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Ln Distance	0.122***	0.123***	0.124***	0.122***	0.123***	0.124***
	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)
Common official language (d)	-0.103***	-0.102***	-0.104***	-0.103***	-0.102***	-0.104***
	(0.032)	(0.033)	(0.034)	(0.032)	(0.033)	(0.034)
Common legal origin (d)	-0.023	-0.024	-0.027	-0.023	-0.024	-0.027
	(0.018)	(0.018)	(0.019)	(0.018)	(0.018)	(0.019)
Landlocked (d)	-0.101***	-0.104***	-0.102***	-0.101***	-0.104***	-0.102***
	(0.018)	(0.018)	(0.017)	(0.018)	(0.018)	(0.017)
Gatt (d)	0.033*	0.034*	0.034*	0.033*	0.034*	0.034*
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Regional Trade Agreement (d)	-0.008	-0.008	-0.003	-0.008	-0.008	-0.003
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Observations	461388	461388	461388	461388	461388	461388
R^2	0.042	0.042	0.042	0.042	0.042	0.042

Notes: This table studies the impact of our proxies for Income Inequality on Ln Unit Value, allowing for non-linearities in the econometric model. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.16: Import Unit Values and Income Inequality, Check 5

	(1) Unit Value	(2) Unit Value	(3) Unit Value
Ln Interdecile Ratio	-0.055**		
	(0.022)		
Ln Interquintile Ratio		-0.073**	
		(0.032)	
Ln Gini Index			-0.176*
			(0.094)
Ln Avg Income	0.113***	0.114***	0.120***
	(0.032)	(0.032)	(0.031)
Ln Demand Elasticity	0.002	0.002	0.001
	(0.021)	(0.021)	(0.020)
Ln Population	-0.011	-0.011	-0.010
	(0.010)	(0.010)	(0.010)
Ln Competitive disadvantage	-0.069***	-0.070***	-0.070***
	(0.004)	(0.004)	(0.004)
Perc. Enrolled in Tertiary Education	-0.004	-0.005	-0.011
	(0.025)	(0.025)	(0.027)
Ln Distance	0.122***	0.123***	0.123***
	(0.012)	(0.012)	(0.012)
Common official language (d)	-0.029	-0.027	-0.026
	(0.034)	(0.036)	(0.037)
Common legal origin (d)	-0.018	-0.019	-0.021
	(0.021)	(0.022)	(0.022)
Regional Trade Agreement (d)	-0.025	-0.024	-0.021
	(0.024)	(0.024)	(0.023)
Landlocked (d)	-0.101***	-0.102***	-0.105***
	(0.025)	(0.024)	(0.024)
Gatt (d)	0.026	0.026	0.024
	(0.022)	(0.022)	(0.022)
Observations	253356	253356	253356
R^2	0.042	0.042	0.042

Notes: This table studies the impact of our proxies for Income Inequality on Ln Unit Value, controlling for demand elasticities in the importing country. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Table 2.17: Import Unit Values and Income Inequality, Check 6

	(1)	(2)	(3)	(4)	(5)	(6)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Ln Interdecile Ratio	-0.075***	-0.075***				
	(0.016)	(0.016)				
Ln Interdecile Ratio X Ln Quality Ladder		-0.036				
		(0.027)				
Ln Interquintile Ratio			-0.102***	-0.102***		
			(0.024)	(0.024)		
Ln Interquintile Ratio X Ln Quality Ladder				-0.052		
				(0.035)		
Ln Gini Index					-0.241***	-0.241***
					(0.064)	(0.064)
Ln Gini Index X Ln Quality Ladder						-0.123
						(0.080)
Ln Quality Ladder	0.010	0.009	0.010	0.009	0.009	0.007
	(0.016)	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)
Ln Avg Income	0.079***	0.079***	0.079***	0.079***	0.081***	0.081***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Ln Population	-0.023**	-0.023**	-0.022**	-0.022**	-0.021**	-0.021**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)
Ln Competitive disadvantage	-0.080***	-0.080***	-0.080***	-0.080***	-0.080***	-0.080***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Enrolled in Tertiary Education	-0.011	-0.011	-0.012	-0.012	-0.018	-0.018
	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)
Ln Distance	0.120***	0.120***	0.121***	0.121***	0.123***	0.123***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Common official language (d)	-0.099***	-0.099***	-0.097***	-0.097***	-0.097***	-0.097***
	(0.030)	(0.030)	(0.031)	(0.031)	(0.032)	(0.032)
Common legal origin (d)	-0.021	-0.021	-0.022	-0.022	-0.023	-0.023
	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)	(0.020)
Regional Trade Agreement (d)	-0.010	-0.010	-0.009	-0.009	-0.004	-0.004
	(0.022)	(0.022)	(0.022)	(0.022)	(0.021)	(0.021)
Landlocked	-0.089***	-0.089***	-0.091***	-0.091***	-0.091***	-0.091***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Gatt (d)	0.041*	0.041*	0.041*	0.041*	0.038*	0.038*
	(0.021)	(0.021)	(0.022)	(0.022)	(0.021)	(0.021)
Observations	382072	382072	382072	382072	389967	389967
R^2	0.040	0.040	0.040	0.040	0.040	0.040

Notes: This table studies the impact of our proxies for Income Inequality on Ln Unit Value considering the interaction between Income Inequality and Quality Ladders. All specifications include product/exporter/year fixed effects, (d) indicates a dummy variable. All regressions include a constant term and cluster standard errors, reported in parentheses, at the importer/year level. *, ** and *** indicate significance at the 1%, 5% and 10% level respectively.

Chapter 3

Export Dynamics and Firm Level Unit Values

Abstract

This chapter studies unit values of incumbent firms in the destination market. Using firm-level data from Peru during the period 1993-2009, we observe that unit values and revenues in the export market are serially correlated within firm. We then investigate differences in unit values between incumbents and entrants exporting similar products to the same destination. We find that incumbent firms charge higher unit values than entrants. Variations of the Most Favoured Nation (MFN) tariff at the product-level in the importing country are then used as an exogenous shock for the pricing strategy of incumbent firms. Results show that incumbents react to an exogenous increase in competition, due to a decrease in tariffs, lowering unit values. Tariff changes do not affect the pricing strategy of firms entering a product-country pair for the first time.

3.1 Introduction and Related Literature

Exporting firms differ from non-exporting ones under several dimensions: they are larger, more productive, and employ a more skilled labour force (Bernard et al., 2007). Exporting firms, however, are also different among themselves, especially for what concerns their performance in the importing market over the years. In fact, certain firms are able to export in a single market for long periods of time while others export only for a limited period. Eaton et al. (2007) find that, in a single year, half of Colombian exporters are entrants. These new-exporters contribute for a small amount of Colombian total exports and often do not continue exporting in the following year. In fact, the large part of export revenues is mainly due to large continuing exporters. It is then crucial to focus on the dimensions under which incumbent firms differ from entrants exporting to the same destination.

This work investigates whether incumbent exporting firms charge different unit values with respect to entrants in the foreign market. In order to address this research question, we employ a very detailed firm-level data-set on exports at the HS 6-digits product-level from Peruvian firms during the period 1993-2009. For each trade flow we have information on total exported quantity, total value, destination country, and the identification code of each exporting firm. This data-set allows us to study differences in unit values charged by incumbent exporting firms and entrants, over-time, across markets, and within product category. Starting from a simple descriptive analysis, we observe that the number of Peruvian exporting firms has been increasing over time due to a raise in the number of firms entering foreign markets and to an increase in the survival rate of entrants in the various destination markets. We find that revenues and unit values are serially correlated within firm-product pairs, suggesting that firms selling more and at a higher unit value in the current year are more likely to do so in the following one. Consequently, firms seem more likely to be incumbents when they first enter a foreign destination charging high unit values. Moreover, we observe that, on average, incumbent firms charge higher unit values with respect to entrants, across time and within destination-products. Incumbent firms also report higher total revenues across the various destination markets.

We further investigate on this preliminary evidence using a linear regression framework. Our dependent variable is the unit value of products exported by a firm to a specific destination market, while our explicative variable is a dummy variable indicating that the firm is an incumbent in that market. Specifically, a firm is defined as an incumbent in year t if it was present in that market also in year *t-1*. We consider other factors usually considered in the literature as being correlated with unit values, we introduce: distance to the destination market, Gdp and average income of importing country.[1] We control, as well, for an index representing the relative comparative disadvantage of an importing country at producing a specific good; we also consider firm size and introduce firm, product and year fixed effects in our specifications. Preliminary evidence confirms that incumbent firms charge higher unit values with respect to entrants exporting to the same destination market. This result is not found on unsuccessful entrants, those firms exporting only for a single year. Our estimates are consistent with Schott (2004), Hallak (2006), and Crinò-Epifani (2012) finding a positive correlation between average income of the importing country and unit values of imported products. Our estimations confirm, as well, the positive correlation between distance to the destination market and product unit values as in as in Hummels and Skiba (2004), Bastos and Silva (2010), and Martin (2012).

Endogeneity of our explicative variable might bias our results. The first possible cause of endogeneity is the existence of omitted variables. For example, several time-varying

[1] See Hummels and Skiba, 2004; Hallak, 2006; Crinò and Epifani, 2008; Martin, 2012.

factors, specific to the firm and/or to the area of Peru in which this firm is headquartered might be correlated with the probability of being an incumbent in the foreign market and with f.o.b. unit values. Reverse causality might also have a role. A firm might be more likely to become an incumbent in the foreign market if it produces a good for which demand elasticity is very low in that market, as it is the case for goods of higher quality.

We address endogeneity employing destination countries' import tariffs as an exogenous source of variation for the pricing strategy of Peruvian exporting firms. In order to disentangle the link between being an incumbent and unit values, we interact our dummy variable for incumbent firms with MFN tariffs at the HS 6-digits product level in each importing country. Results show that a decrease in the MFN tariff by the importing country is associated with a reduction in f.o.b. unit values charged by incumbent exporting firms. An exogenous increase in competition, caused by a tariff reduction, leads then incumbents to charge lower unit values. Conversely, a decrease in competition caused by a tariff increase leads incumbent firms to charge higher unit values.

This finding is not at-odds with results suggesting that firms, after an increase in competition, vary unit values due to a decrease in product quality or to a change in mark-ups.[2] Our results point instead to the heterogenous impact of market competition on product unit values, given a firm's status (being incumbent or not) in the destination market.

Several studies focused on export dynamics per-se, without investigating the relation between trade dynamics at the firm level and product unit values. Eaton et al. (2007), using transactions level customs data from Colombian firms, find that nearly half of Colombian exporters are new exporters in a given year. Moreover, they observe that Colombian exporters gradually expand their network of importing countries depending on their initial destination market. Alvarez and Fuentes (2011), using data on Chilean exports by firm, product and destination over the period 1991-2001, present several stylized facts on the behavior of unit values charged by exporting firms both over time and across destinations. Alvarez and Fuentes (2011) find that entry is generally associated with higher unit values, especially for firms exporting reference-price and differentiated products. However, price differences do not seem to persist over time, since the two authors fail to find evidence of higher unit values for entrants four years after their entry in the market. Fan et al. (2013), similarly to Bas and Strauss-Khan (2012) find that a reduction in import tariffs leads exporters to upgrade the quality (i.e. increase the unit value) of their exported output. Moreover, the positive impact on quality of a tariff reduction in the home-market impacts more on producers in sectors where the scope for quality differentiation is higher. In fact, firms use tariff cuts to access high quality inputs in order to upgrade the quality of their export.

[2] See Baldwin and Harrigan (2011) and Flach (2013).

A recent strand of the international trade literature has studied the determinants of differences in product unit values across countries. The literature on export quality has in fact used unit values, within narrow product categories, as the main proxy for unobserved output quality. Hallak (2006), investigating the linkages between importing countries' characteristics and quality of imported products finds a positive correlation between importing country's per-capita income and unit value of imported products. Bastos and Silva (2010), employing firm-level data from Portugal, find that f.o.b unit values increase systematically with distance and tend to raise with importing country's average income. Bastos and Silva (2010) claim that this findings reflect not only the selection of firms across markets, but also within-firm selection of product varieties across destinations. These results are confirmed by Manova and Zhang (2012) on data from Chinese exporting firms. Among firms selling the same product, those charging higher unit values are able to enter more markets and report larger revenues in each destination. Across destinations, firms set higher prices in richer, larger and bilaterally more distant markets. Moreover, firms that enter more markets and export more, employ costly inputs to produce their output. Rodrigue and Tan (2013), investigating the evolution of prices and quality choice at the firm level, both across markets and over time, is the paper complementing our empirical investigation. Employing a structural estimation model on firm-level data from China, Rodrigue and Tan (2013) find that entrants in the export market produce goods of low quality, and that, as sales grow, prices and quality increase. Contrary to Alvarez and Fuentes (2011), Rodrigue and Tan (2014) conclude that incumbent firms supply goods of higher-quality in the export market. This chapter contributes to the literature by employing detailed firm level data for a large time span, so to consider time-varying effects constant across exporters. Moreover, it employs a novel empirical strategy to address endogeneity of the incumbent dummy. We find an additional source of heterogeneity among exporting firms related to the intensive margin of trade. In fact, incumbent firms report larger revenues with respect to entrants not only because they tend to sell larger quantities but also because they are able to charge higher unit values for the same product.

The chapter proceeds as follows. In section 2 we describe data at our disposal and we review some of the regularities in our data-set. In section 3 we describe the baseline specification and report on our findings. In section 4 we propose a strategy to isolate the impact of being an incumbent firm in the importing market on unit values, and show that results are robust to different specifications. Section 5 concludes the chapter.

3.2 The Data

The empirical analysis carried out in the following sections is based on the Exporter Dynamics Database (EDD) compiled by the World Bank and containing comparable in-

formation on trade flows by exporting firm, product and destination country for a group of developing and developed economies. We focus on data from Peruvian exporting firms during the period 1993-2009. The data-set reports variables at different levels of disaggregation, we use the following one: importing country/year/HS 6-digits product. The data-set was assembled by obtaining custom-level data from Peru, reporting yearly information on the identification code of exporting firms, HS 6-digits products, destination country, total value and quantity of trade flows. To take into account changes in product codes occurred from the HS1992 classification through the HS2007, a consolidation procedure has been adopted by the compilers of the data-set. The monetary value of export flows is measured in Free on Board (f.o.b.) US Dollars (US $), therefore it does not include any cost associated with shipping and freights. Export quantities are measured in kilograms. We focus only on exports of manufactured products, therefore we keep in our database only trade flows for products belonging to the HS 2-digits sectors 28 to 98. We drop observations on transactions reporting unit values above the 95th percentile and below the 5th percentile, this amounts to dropping 10% of the observations in our sample. The number of exporting firms ranges from 3175 in 1994 to 7297 in 2009. On average, during this period, Peruvian firms exported more than 20 products across the various destinations.

3.2.1 Main Variables

Our variable of interest is the unit value of a HS-6 product exported by a Peruvian firm j in the importing market, z in year t. We compute unit values dividing total value (US $) by total quantity (kilograms), therefore unit value is measured in US dollars per kilogram. This variable is available at the firm, j, product, p, destination, z, year, t level: $uv_{j,p,z,t}$. The main explicative variable is a dummy variable equal to one for firms that were exporting a specific product to a destination, z, in year *t-1* and in year t. In this way we identify incumbent firms in the destination market z. We also consider those firms that exported only for a single year a specific product to destination z. These firms are labelled as unsuccessful entrants. We proxy firm size by summing each firm's revenues across all destinations in year *t-1*. For each destination country, z, we obtain data on Average PPP Income, proxied by the GNI-PPP per capita at current international US dollars, GDP, in current international US dollars, and distance, measured in kilometers.[3]

To take into account demand patterns and specialization in the destination market we build an index of relative comparative disadvantage. For each destination z, we compute the index $\varkappa_{z,p,t}$ dividing imports of a particular product in year t, $IM_{z,p,t}$, by the amount of imports of all other products in the same destination, $IM_{z,t}$, and then dividing this ratio by an analogous one computed for all importing countries, $(IM_{p,t}/IM_t)^{all}$.

[3] These variables are available on the CEPII website.

$$\varkappa_{z,p,t} = \frac{IM_{z,p,t}/IM_{z,t}}{(IM_{p,t}/IM_t)^{all}}$$

Higher $\varkappa_{z,p,t}$, the less productive are the firms in the importing country z at producing that particular product. This index measures the competitiveness of a country's at producing a particular HS 6-digits product. The lower this index, the higher the quality of imported products, given that high quality firms are supposed to be the most productive. A country with a relatively low $\varkappa_{z,p,t}$ for a product has, in fact, a fringe of competitive domestic firms producing that good; in order to find their own niche in this market, foreign firms must then export there high-quality products.

3.2.2 Descriptive Statistics and Facts

In this section we highlight some important facts observed in our data-set. We focus on all firms exporting manufactured products. The following graph shows that the number of exporting firms has increased steadily after the year 2000. Figure 3.1, reports the total number of exporting firms and the number of entrants in the foreign market. Each year the total number of exporting firms is the sum of incumbent exporting firms and entrants. We notice that, from 1995 to 2000 the number of exporting firms has been constant due to a decreasing amount of entrants in the export market. The increase of exporting firms from year 2000 onwards might be due to an increase in the number of entrants or/and to a decrease of the firms' exit rate.[4]

Figure 3.1. Total Number of Exporting Firms.

Figure 3.2, reporting the evolution over time for the number of entrants in the export market, clearly shows that an increasing number of firms started exporting manufactured

[4] We have evidence of a reduction in firm's exit rate from year 2000 onwards. The graph is available upon request.

products from Peru after 2000. This positive trend reverts only in 2008. These two graphs show two important facts: Peruvian firms increased the rate of success in foreign markets, while the number of new exporters kept increasing over time.

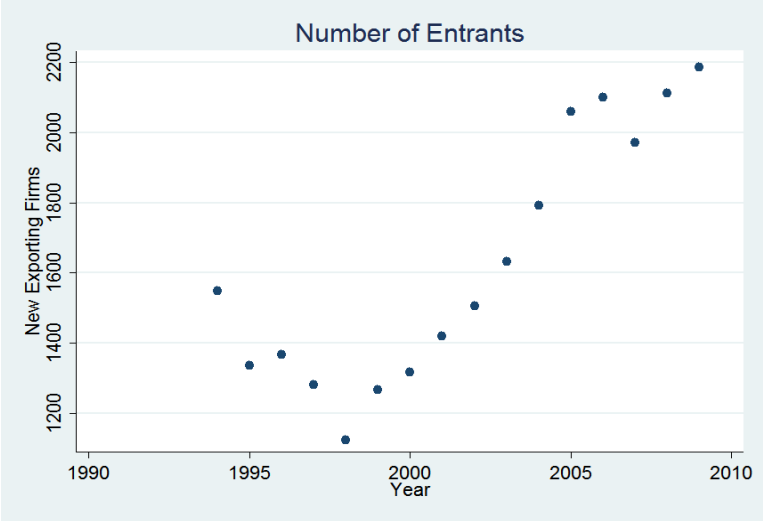

Figure 3.2. Number of Entrants.

Fact 1: *Exported values and quantities are serially correlated.* Following Rodrigue and Tan (2013), in Table (3.1) we investigate whether there is evidence of serial correlation in the series of exported value and exported quantity. We run the following specification, where $\alpha_{f,p}$ and $\beta_{p,z,t}$ represent firm-product and product-destination-time fixed effects while x is either the exported value in US dollars or the quantity in kilograms for each firm in our database.

$$\ln x_{f,p,z,t} = \alpha_{f,p} + \beta_{p,z,t} + \gamma \ln x_{f,p,z,t-1} + \varepsilon_{f,p,z,t} \tag{3.1}$$

In Table 3.1, it is possible to observe that the both time series are serially correlated.

[Table 3.1 here]

In specification (1) and (3) we exploit variation across firm-product within years, product and destinations by using destination-product-year fixed effects. While in specifications (2) and (4) we introduce firm-product fixed effects to take into account time invariant features at the firm-product level. This preliminary evidence suggests that there is a remarkable inertia in export values: exporting firms, when succeeding in the destination market, tend to increase their revenues in that market together with the number of items sold. Firms exporting more in year *t-1* are likely to increase their exports in year *t*. It is interesting to notice that this result arises when controlling for persistent firm-product characteristics, such as average productivity at the firm level.

Fact 2: *unit values are positively correlated with past unit values and with past Exported Value.* Since we are mainly interested in investigating how export dynamics are related

to firms' unit values, we proceed by studying the correlation between unit values at time *t* and export value, export quantity and unit value at time *t-1*, employing a specification similar to (3.1).

[Table 3.2 here]

Results reported in Table 3.2 show that when controlling for firm-product and/or product-destination-time fixed effects, unit values are negatively correlated with past exported quantities and positively correlated with revenues and unit values in the preceding year. Firms reporting higher revenues in *t-1* are more likely to charge higher unit values in *t*. This result holds after controlling for firm-product fixed effects: firms react to an increase in revenues by raising unit values in the following period. In columns (5) and (6) it is possible to observe that lagged unit values are positively correlated with current unit values, after conditioning for demand patterns in the importing market, thus confirming that firms tend to increase prices over the years.

Fact 3: *Incumbents and Entrants report different unit values, across time within markets.* In order to have a grasp of differences in unit values charged by incumbent exporting firms and entrants, we show a graph reporting the median of the average unit value for manufactured products for the two groups of firms: incumbents and entrants.[5] Figure 3.3 shows that incumbents charge higher unit values with respect to entrants.

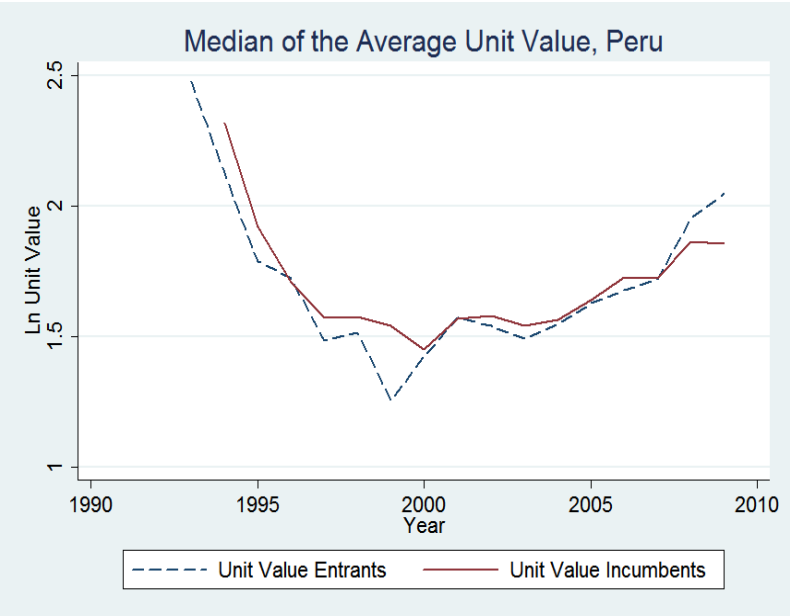

Figure 3.3. Median of the Average Unit Value

In the graph above we used data on the median of the average unit value charged by firms across various destinations and products: it might be misleading to draw inference

[5] Unit values used in this section have been deflated by the Peruvian Consumer Price Index.

relying on a graph based on such aggregated data. In Figure 3.4 we repeat this exercise focusing on Peruvian firms exporting cotton T-shirts to the US.[6] Peru is one of the world leaders in the production of textiles, in fact cotton T-shirts was the product most exported by Peruvian firms during the period 2000-2009. This graph shows that incumbent firms charge higher unit values than entrants in the same market. Moreover, the median unit value charged by entrants reports more variation than the one of incumbents. The median unit value for incumbent firms does not vary much over time and it is constantly increasing right after 2005, the year in which the multifiber agreement expired.

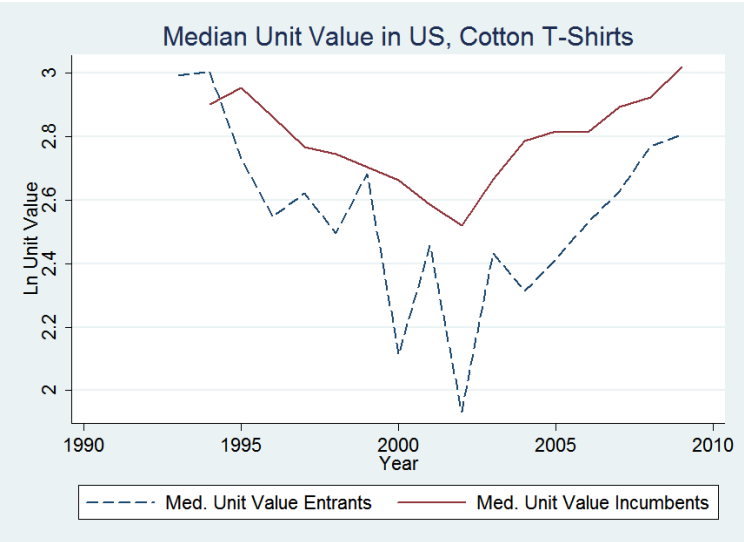

Figure 3.4. Median Unit Value in US, Cotton T-Shirts.

Given results obtained in the literature on exported product quality, we expect firms exporting to richer, more competitive and distant markets to charge higher unit values.[7] In the following graph, we study whether incumbent exporters selling cotton T-shirts to Chile tend to charge higher or lower unit values with respect to incumbent firms exporting the same product in the US. Figure 3.5 confirms that, incumbent firms exporting to the richer and more distant market charge higher unit values. Moreover, after 2005, exporters of cotton T-shirts adopt different pricing strategies, depending on the destination they are exporting to. In fact, the median unit value for exporters to Chile is decreasing while the median unit value for exporters in the US is increasing.

[6] We employ unit values of firms exporting the product having the following HS 6-digit code: 610910. Corresponding to T-shirts, Singlets, Other Vests, Knitted or Crocheted, of Cotton.

[7] See Hallak (2006), Bastos and Silva (2010), Crinò and Epifani (2012) and Martin (2012), among others.

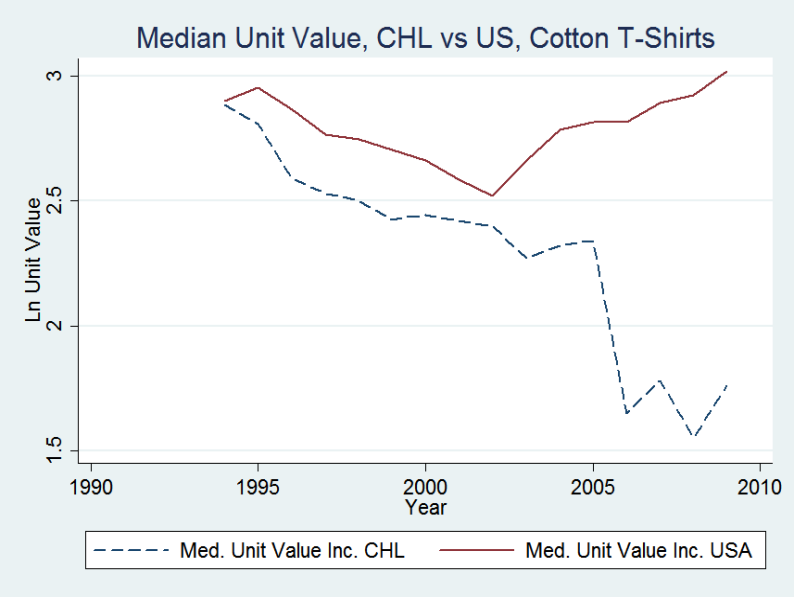

Figure 3.5. Median Unit Value, CHL vs US, Cotton T-Shirts

Previous graphs suggest a series of important differences between incumbent firms and entrants in the foreign market. We further investigate on these by considering some of the variables at our disposal and checking if these are, on average, different among incumbents and entrants in the destination market. In Table 3.3 we test for differences in means in the following variables: the logarithm of total value, quantity, unit value and firm size.

[Table 3.3 here]

Results reported in Table 3.3 reinforce our comments on previous graphs. Incumbent firms sell, on average, bigger quantities and make larger revenues. Moreover, these firms are larger, given that they are more likely to report positive revenues in other foreign markets and export goods with a higher unit value. These differences in means among the two groups of firms are all statistically significant at the 1%. Since firms belonging to the two categories might be different with respect to the type of markets to which they export, we now test if incumbent firms and entrants differ with respect to the average per-capita income, distance, gross-domestic product and comparative disadvantage of countries importing their products.

[Table 3.4 here]

Table 3.4 confirms that incumbents, on average, sell their products to richer, more distant and larger markets relatively to new exporters. As expected, an incumbent firm is more likely to export its products to countries that have a higher comparative disadvantage in producing the exported product.

To conclude, the number of Peruvian exporting firms has been increasing over time due both to an increase in the number of firms entering foreign markets and to an increase

in the survival rate of entrants. Revenues and unit values are serially correlated within firm-product pairs, suggesting that firms selling more and at a higher unit value in the current period are more likely to do so in the following one. Therefore, firms seem more likely to become incumbents when they first enter a market charging high unit values. In fact, incumbent and entrants charge different prices on average, both across time and within markets/products. Incumbent firms report higher total revenues across all-markets and export to richer, more distant and larger markets.

3.3 Empirical Strategy

3.3.1 Main Specification

In this section we further investigate on the regularities previously described by employing a standard OLS framework. We estimate the following specification on our repeated, unbalanced, cross-section:

$$\begin{aligned} \ln(uv)_{j,p,z,t} &= \alpha_p + \beta_j + \gamma_t + \lambda Inc_{j,p,z,t} + \mu \ln(FirmS_{j,t}) + \eta \ln(X_{z,t}) + \\ &\quad + \chi \ln(Dist_z) + \delta(\varkappa_{z,p,t}) + \varepsilon_{j,p,z,t}. \end{aligned} \tag{3.2}$$

Here $\ln(uv)_{j,p,z,t}$ is the logarithm of the unit value of product p exported by firm j, to destination z at time t. We control for time-invariant features of the product by using a product fixed-effect, α_p. Firm characteristics not varying over time and constant across markets and products, such as firm location in Peru and average firm productivity across products, are considered in the firm fixed-effect, β_j. We also take into consideration time-varying factors common to all Peruvian firms such as the Consumer Price Index or the Peruvian Gdp growth by introducing a time fixed-effect, γ_t.

Our main variable of interest $Inc_{j,p,z,t}$, is firm, product and destination specific. A single multiproduct firm can be labelled as an incumbent for a specific product or as an entrant for another product in the same destination. Suppose that firm j is exporting cotton T-shirts to the US in year *t-1*; in t, j starts exporting blue jeans to the US while continuing to export cotton T-shirts. In year t, we label this firm as an incumbent for the US T-shirts' market and as an entrant for the blue-jeans market.

We use the logarithm of a firm's total revenues in all destinations, in year *t-1*, as a proxy for firm size, $FirmS$. Given that more productive exporting firms report higher revenues, we expect this variable to capture a part of the variation in unit values due to within firm, time-varying, productivity. In vector, $X_{z,t}$, we control for importing market's characteristics that might affect unit value. In particular, we use the average income and the Gdp of the importing country as proxies for the average wealth and market size of the destination, respectively. Referring to the literature in the field, we expect

average income to be positively correlated with unit values.[8] Our prior on the relationship between Gdp and unit value is not clear-cut instead. Firms might be willing to decrease unit values in larger markets in order to face price-competition or they might instead decide to charge higher prices if they are more likely to obtain higher mark-ups in a market: this last channel is more likely to be at work in larger markets. We control for the logarithm of distance between Peru and the importing market, z. Following Hummels and Skiba (2004) and Martin (2012), we should find a positive correlation between unit values and distance. In fact, a greater proportion of high unit value products is exported to more distant markets to cover higher per-unit transportation costs. The term $\varkappa_{z,p,t}$ represents the comparative disadvantage of the importing country at producing a specific HS-6 product. We expect this variable to enter with a negative coefficient since a country importing large quantities of a product, relatively to its peers, should be a (relatively) larger market for imports, thus leading to a reduction in unit values through a market size effect.

In specification (1) to (6) of Table 3.5 we report results obtained using data on firms exporting differentiated manufactured products, according to the Rauch (1999) conservative classification. We control for firm, product and time fixed effects, while standard errors are clustered at the importing country-year level. We cluster errors at this dimension since, in several of our specifications, we consider country-year specific variables. Standard errors significantly decrease when clustering at the firm-product-destination-year level, the dimension at which our variable of interest, *Inc*, is defined.

[Table 3.5 here]

In specification (1) we consider only our dummy for incumbent firms and introduce firm, product and destination fixed effects. Being an incumbent firm in a product, destination, in year t increases the f.o.b unit value by 2.1 percentage points. This coefficient remains quite stable across specifications, (2) to (5), where we introduce distance, Gdp, average income and comparative disadvantage. Distance, Gdp and average income are positively correlated with unit values. Firms export goods with a higher unit value to more distant, richer and larger markets. It is important to notice that the coefficient for Gdp becomes smaller and loses significance when we control for average income. In specification (5) we introduce our proxy for comparative disadvantage. This variable reports a negative non-significant coefficient. In specification (6) we consider our proxy for firm size. This variable reports a positive significant coefficient. Controlling for firm-size impacts on the coefficient for incumbent, the magnitude of this coefficient is now smaller: being an incumbent firm is associated with an increase in unit values equal to 0.9 percentage

[8] Refer to Hallak (2006), Bastos and Silva (2010), Crinò and Epifani (2012) and to Fajgelbaum et al. (2011).

points. This result confirms that large firms tend to be incumbents in several importing markets. In specification (7) we check if incumbent firms producing homogenous products according to the Rauch (1999) classification report higher unit values. Our dummy for incumbent firms reports now a positive, non-significant coefficient. This result leads us to claim that there are characteristics inherent to the product itself that enable a firm to adopt a different pricing strategy when being an incumbent. Only firms exporting differentiated products increase unit values when being an incumbent. This finding can be explained by observing that firms have positive mark-ups and quality differentiate their products only when producing horizontally differentiated goods.

In Table 3.6 we report results obtained when using a specification similar to (3.2). In this case, however, we consider only observations on firms entering a product-destination for the first time. Among these firms we differentiate between firms exporting a product to a market only for a single year and the ones exporting to a foreign market in the following years as well. In fact, the dummy variable for "unsuccessful entrant" is equal to 1 in year t, if a firm sells a product, p, in market z in that year only and not in year $t+1$. The variable takes value 0 for firms exporting product p to z in year t and in year $t+1$. In these estimations, we exclude firms exporting for more than two consecutive years a specific product to destination z.

[Table 3.6 here]

In specification (1) of Table 3.6 we introduce our dummy for unsuccessful entrants together with firm, product and destination fixed effects. Being an unsuccessful entrant in a product, destination, year, reduces the unit value by 1.2%. The magnitude of this coefficient doubles in the following specifications, (2) to (5), where we control for distance, Gdp, average income and comparative disadvantage. Distance, Gdp and average income report positive and significant coefficients, as found in Table 3.5. The coefficient for Gdp becomes smaller and less significant when we control for average income. In (5) we introduce our proxy for comparative disadvantage. This variable reports the expected negative significant coefficient. In specification (6) we control for firm size. This variable enters Table 3.6 with a positive significant coefficient. Large exporters charge higher unit values. The coefficient for our variable of interest does not change magnitude and significance when we introduce this variable. Similarly to Table 3.5, in specification (7) of Table 3.6 we check if unsuccessful entrants producing homogenous products, according to the Rauch (1999) classification, report lower unit values. As expected, our variable of interest enters this specification with a non-significant coefficient. Firms exporting homogenous products do not use different pricing strategies depending on their "seniority" in the destination market z.

We continue to highlight differences between incumbent firms and unsuccessful entrants in Table 3.7. We now employ a specification similar to (3.2), substituting the

dependent variable with exported quantity, in specifications (1) and (3),

$$\begin{aligned} \ln(q)_{f,p,z,t} &= \alpha_p + \beta_f + \gamma_t + \lambda Inc_{f,p,z,t} + \mu \ln(FirmS_{f,t}) + \eta \ln(X_{z,t}) + \\ &+ \chi \ln(Dist_z) + \delta(\varkappa_{z,p,t}) + \varepsilon_{p,z,t.} \end{aligned} \tag{3.3}$$

While in (2) and (4) our dependent variable is the total value of products exported to destination z,

$$\begin{aligned} \ln(v)_{f,p,z,t} &= \alpha_p + \beta_f + \gamma_t + \lambda Inc_{f,p,z,t} + \mu \ln(FirmS_{f,t}) + \eta \ln(X_{z,t}) + \\ &+ \chi \ln(Dist_z) + \delta(\varkappa_{z,p,t}) + \varepsilon_{p,z,t.} \end{aligned} \tag{3.4}$$

In all specifications we control for firm, product and year fixed effects and cluster standard errors at the importing country-year level.

[Table 3.7 here]

In (1) and (2) we observe that unsuccessful entrants sell smaller quantities and make less revenues than successful entrants. While from (3) and (4) we find that incumbent firms sell larger quantities and report larger revenues. This result strongly confirms the evidence found in Tables 3.1 and 3.2. As expected, there is a remarkable inertia in firms' sales within markets: incumbent firms make large revenues and sell more items over time. Interestingly, distance and average income are negatively correlated with exported quantity. Peruvian firms sell relatively smaller quantities to richer and more distant markets, this outcome might be due to the geographical position of Peru a distant supplier for the majority of OECD countries. Our proxies for market size and relative comparative disadvantage report instead positive significant coefficients. Coherently with the economic intuition discussed above, the larger and less competitive a destination market is, the larger is the quantity of items sold and revenues for firms exporting there.

3.4 On Endogeneity

Inference based on results from specification (3.2) could be biased by endogeneity of our explicative variable. The primal possible cause of endogeneity is omitted variables. In fact, several time-varying factors, specific to the firm and/or to the area of Peru in which this is headquartered might be correlated with the probability of being an incumbent in the foreign market and with f.o.b unit values. Suppose that firms producing cotton textiles are located in a particular area of Peru, an area characterized by a widespread know-how on the production of these specific products. It is possible that firms operating

in this area are more likely to be incumbents in the foreign market since information on destination markets is more diffused among firms producing in that area of Peru. Moreover, the aggregation of firms producing similar products in a particular location often gives rise to technological innovations that can lead to an increase in product quality and consequently to a raise in f.o.b unit values. Controlling for time varying measures of know-how at product level in the location where the firm is headquartered would account for this channel. Since know-how is positively correlated with unit values in the export market and with the probability that a firm is an incumbent, our baseline results should report upward biased coefficients. Our database does not report any information on firm's location in Peru. Controlling for firm fixed effects only partially reduces the impact of this source of endogeneity.

Reverse causality might also have a role. A firm might be more likely to become an incumbent in the foreign market if it produces a good for which demand elasticity is very low in that market, such as a high-quality product. In this case, we should find more incumbents producing goods with high unit values. If this channel is at work, estimates discussed so far should be biased upward.

Our aim is to find a source of exogenous variation through which we can disentangle the causal linkage between being an incumbent in a product-destination-year and f.o.b. unit values charged in the destination market. We use the Most Favoured Nation (MFN) tariff for each HS-6 manufactured product in the destination z in the years during the period 1993-2009, as a source of exogenous variation for Peruvian exporting firms' unit values.[9] A decrease in the MFN tariff, by raising competition in the destination market, should affect unit values only through its impact on the firm via its incumbent status in the foreign market. Only incumbent firms might be affected by a change in tariffs since for them this is equivalent to a change in competition. This is the specification employed in the following regressions,

$$\ln(uv)_{j,p,z,t} = \alpha_p + \beta_j + \gamma_t + \lambda Inc_{j,p,z,t} + \phi(Inc_{j,p,z,t} * Tar_{p,z,t}) + \chi Tar_{p,z,t} + \mu \ln(FirmS_{j,t}) + \eta \ln(X_{z,t}) + \chi \ln(Dist_z) + \delta(\varkappa_{z,p,t}) + \varepsilon_{j,p,z,t} \quad (3.5)$$

With respect to specification (3.2) we introduce here the variable $Tar_{p,z,t}$, representing the MFN tariff in year t, destination z for product p, and $Inc_{j,p,z,t} * Tar_{p,z,t}$, the interaction term between the tariff and the dummy for incumbent firms in the foreign market.[10]

Conditioning on the tariff level in year t, a reduction in tariffs in the importing market causes an exogenous increase in market competition faced by incumbent firms in the importing country. We can therefore identify the causal impact of the increase in competition

[9] Data on for tariffs at level of HS 6-digit products in the importing countries is obtained from the WITS database. The concordance tables available on the WITS website are used to match the tariff data-set with the firm level database on Peru.

[10] Refer to the previous section for a description of other variables employed in this specification.

on incumbents' f.o.b unit values. Our identification strategy relies on assuming that incumbent exporters based in Peru are not able to influence foreign governments' decisions regarding changes in MFN tariffs. Table 3.8 reports results obtained when estimating (3.5).

[Table 3.8 here]

In these specifications, we employ the Simple Average MFN Tariff as a proxy for product-level import tariffs.[11] In specification (1) we introduce our variables of interest, the interaction term and its components, and add the controls in the following specifications.[12] Our interaction term reports a positive, significant coefficient in all regressions.[13] A decrease in the MFN tariff by the importing country leads incumbent firms to decrease the f.o.b unit value for products exported to that country. An exogenous increase in competition, caused by a tariff reduction, leads then incumbent firms to charge lower unit values. Similarly, a decrease in competition caused by a tariff increase leads incumbents to charge higher unit values. This coefficient remains stable across specifications (2) to (5), where we introduce distance, Gdp, average income and comparative disadvantage. Distance, Gdp and average income are positively correlated with unit values. Firms export goods with a higher unit value to more distant, richer and larger markets. In specification (5) we introduce our proxy for comparative disadvantage. This variable enters with a positive, non-significant, coefficient. In specification (6) we control for firm-size. This variable reports a positive significant coefficient. Introducing this variable impacts on the coefficient of the interaction term. The magnitude of this coefficient slightly increases: a 1% reduction in tariffs reduces the unit value charged by incumbent firms by 1.2% percent. When tariffs are equal to zero, incumbent firms charge higher unit values, while tariffs are negatively correlated with unit values, for non-incumbent firms, as expected. We continue our investigation in Table 3.9, reporting results obtained interacting the Weighted Average MFN Tariff with the incumbent dummy.

[Table 3.9 here]

Results are similar to the ones reported in Table 3.8. However, the coefficient estimated in specification (6) is slightly larger than the one reported in Table 3.8. All other variables

[11] In the WITS database it is possible to access data on Simple Average Tariffs and on Weighted Average Tariffs. The simple average is the average duty across products in the same HS 6-digit classification, while the weighted average computes the average duty weighting each duty by the import share of the relative product.

[12] We do not have data on tariffs for all countries/years employed in the previous specifications. Our dataset employs 1/6 of observations previously considered.

[13] In the last specification of this Table the coefficient is significant at the 5%.

report coefficients comparable in magnitude and significance to the ones discussed in the previous table.

Overall, after reviewing these results, we conclude that incumbents in the foreign markets respond to an increase in competition by decreasing the unit value of products exported to that market. This result, at a first glance, seems to be at odds with a theory suggesting that firms use product quality as a device to face competition in the export market. Would this be the case, incumbent firms should increase prices when tariffs decrease, leading us to obtain a negative coefficient for our interaction term instead of a positive one. Overall, our results seem to suggest, instead, that Peruvian firms react to an increase in competition by lowering exported output quality.

3.4.1 Robustness Checks

In this section we test the robustness of our estimates. Our first objective is to check whether results obtained on incumbent firms are found on non-incumbent firms. Precisely we want to investigate if the variation in MFN tariffs has also an impact on unit values charged by unsuccessful entrants, a group of firms whose pricing strategy should not be affected by the tariff in the year in which they first enter a specific destination market.

In Table 3.10 we report results obtained when interacting our dummy for unsuccessful entrants with the Simple Average Tariff for HS 6-digits products in the destination market. This is the group of firms entering the market in year t for the first time and not going to export again to that market in year *t+1*.

[Table 3.10 here]

Results show that the interaction term reports now a negative, non-significant coefficient. All other coefficients, including the dummy for unsuccessful entrant report instead coefficients similar in size and in magnitude to the ones reported in Table 3.6. In Table 3.11 we repeat the same exercise interacting the Weighted Average Tariff with the dummy for Unsuccessful Entrants.

[Table 3.11 here]

Our findings confirm conclusions drawn on the previous table: the variation in tariffs affects only unit values charged by incumbent exporting firms. In order to verify that we are capturing the impact of the change in tariffs on incumbent firms' pricing strategy, we now interact the average tariff in year *t-1* with our dummy for incumbent firms. By doing so we verify that there is not a time-invariant impact of tariffs on unit values through the incumbent status.

[Table 3.12 here]

In Table 3.12 we also include lagged Average PPP Income and Gdp. Results show that the lagged average income is positively correlated with current unit values together with distance and current firm size. Coefficients obtained when interacting our incumbent dummy with the Simple and the Average tariff in *t-1* report instead non-significant positive magnitudes. The same result is obtained when interacting the dummy for unsuccessful entrant with our tariff measures. Unsuccessful entrants' unit values in t are not affected by importing country's tariffs in the previous year. In case of tariffs equal to zero, being an incumbent is positively correlated with unit values in the importing market while being an unsuccessful entrant is negatively correlated with unit values.

We now merge to our database the estimates for import demand elasticities proposed by Broda et al. (2006). We use this data on demand elasticity at the sectoral level in order to check if results are driven by firms operating in sector-destination country pairs allowing them to obtain positive mark-ups. Elasticities are estimated at the 3-HS digits for more than 70 countries. Controlling for this variable, we should be capable to explain variation in unit values across destinations due to average mark-ups at the country-sectoral level.

[Table 3.13 here]

Reviewing coefficients reported in Table 3.13, we observe that our results are not affected. Specifications (1) and (2) confirm that an increase in competition due to a decrease in the Simple Average Tariff or in the Weighted Average Tariff leads incumbent firms to decrease their prices. This effect is not found on unsuccessful entrants. Demand elasticity reports instead a negative, non significant coefficient in all specifications. These results, although preliminary, seem to suggest that, after a change in competition, variations in unit values are mainly caused by adjustments in product quality.

Given the, relatively, small number of Peruvian exporters, our results might be driven by those firms exporting large amounts, such as multinational companies producing in Peru. We account for this channel in Table 3.14. Estimates reported in this table, are obtained when restricting our sample to trade flows whose amount in kilograms is below the 75th percentile of the exported products distribution.

[Table 3.14 here]

We restrict our sample to firms exporting less than 1.5 tons of a product in each year/destination. Results support conclusions discussed above. An increase in competition faced in the destination market affects only incumbent firms by decreasing the unit value of products exported in this destination. The coefficients for distance, average income, Gdp, comparative disadvantage and firm size are all similar, in magnitude and significance, to those previously commented.

3.5 Conclusion

We studied differences in unit values between incumbent firms and new exporters in specific product-destination pairs. We find that Peruvian incumbent exporting firms charge higher unit values, export in larger amounts and obtain larger revenues with respect to entrants in the same product-destination pair. By using cross-sectional variation of MFN tariffs at the product-level in the importing market we find that incumbent firms report lower unit values after a decrease of import tariffs. An exogenous change in competition affects only the pricing strategy of incumbent firms and not the one of entrants. A 1 percent reduction in tariffs decreases, by 1.2 percent, unit values charged by incumbent firms. Results are robust to different specifications. Our findings might be explained by variations in mark-ups or by changes in product quality. The next step is to find data and estimation strategies capable to disentangle which of these two channels has a leading role at explaining variations in unit values across incumbent firms and to develop a theoretical framework capable to rationalize the mechanisms at work.

3.6 Tables

Table 3.1: Value and Quantity, time correlations, manufactured products

	(1) Value	(2) Value	(3) Quantity	(4) Quantity
Value, t-1	0.711***			
	(0.002)			
Value, t-1		0.455***		
		(0.004)		
Quantity, t-1			0.700***	
			(0.002)	
Quantity, t-1				0.451***
				(0.004)
Destination-Product-Year F.E.	Y	Y	Y	Y
Firm-Product F.E.	N	Y	N	Y
Observations	247809	247809	247809	247809
R^2	0.134	0.221	0.132	0.219

Notes: This table reports on serial correlation in exported Value and Quantity at the firm-product-destination level. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.2: Unit Value, time correlations, manufactured products

	(1)	(2)	(3)	(4)	(5)	(6)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Quantity, t-1	-0.050***					
	(0.001)					
Quantity, t-1		-0.025***				
		(0.001)				
Value, t-1			0.067***			
			(0.001)			
Value, t-1				0.018***		
				(0.001)		
Unit Value, t-1					0.722***	
					(0.003)	
Unit Value, t-1						0.328***
						(0.005)
Destination-Product-Year F.E.	Y	Y	Y	Y	Y	Y
Firm-Product F.E.	N	Y	N	Y	N	Y
Observations	247809	247809	247809	247809	247809	247809
R^2	0.012	0.003	0.021	0.002	0.391	0.070

Notes: This table studies correlation between Ln Unit Value, Quantity t-1, Value t-1 and Unit Value t-1 at the firm-product-destination level. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.3: Summary statistics for Incumbent and Entrants, Peru 1993-2009

Variable	**Mean Incumbent**	**Std. Dev. Incumbent**	**Mean Entrant**	**Std. Entrant**	**TTest**
Ln Value	8.112	2.868	6.655	2.687	1.458***
Ln Quantity	5.573	3.181	4.137	2.827	1.437***
Ln Unit Value	2.539	1.484	2.518	1.576	0.021***
Firm Size	2.535	0.212	2.431	0.237	0.104***
Observations	350845				
Period	1993-2009				

Notes: This Table studies difference in means for Incumbent and Entrant Firms for Ln Value, Ln Quantity, Ln Unit Value and Firm Size. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.4: Summary statistics for Incumbent and Entrants, Peru 1993-2009

Var.	**Mean Inc.**	**Std. Dev. Inc.**	**Mean Ent.**	**Std. Ent.**	**TTest**
Ln Per Capita Income, Imp.	9.824	0.810	9.755	0.794	0.0693***
Ln Distance, Imp.	8.459	0.766	8.390	0.738	0.0699***
Ln Gdp, Imp.	27.499	1.953	27.345	1.928	0.154***
Competitive Disadvantage, Imp.	0.256	1.296	0.066	1.409	0.190***
Observations	350845				
Period	1993-2009				

Notes: This Table studies difference in means for Incumbent and Entrant Firms for Ln Per Capita Income, Ln Distance, Ln Gdp and Competitive Disadvantage of the importing country. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.5: Incumbent and Unit Values

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value	(5) Unit Value	(6) Unit Value	(7) U. V. - Hom. Prod.
Incumbent	0.021***	0.026***	0.022***	0.020***	0.021***	0.009**	0.000
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.004)	(0.013)
Distance		0.143***	0.114***	0.082***	0.080***	0.090***	-0.013
		(0.007)	(0.008)	(0.009)	(0.009)	(0.005)	(0.013)
Gdp			0.022***	0.006*	0.006*	0.007***	-0.004
			(0.003)	(0.003)	(0.003)	(0.002)	(0.006)
Avg. Income				0.072***	0.073***	0.080***	0.055***
				(0.010)	(0.010)	(0.006)	(0.011)
Comparative Disadvantage					-0.005	-0.005***	-0.023***
					(0.003)	(0.002)	(0.004)
Firm Size						0.098***	0.055***
						(0.002)	(0.006)
Firm F.E.	Y	Y	Y	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y
Observations	350845	350845	350845	350845	350845	350845	22247
R^2	0.000	0.007	0.008	0.008	0.008	0.025	0.018

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on the dummy for Incumbent firms. In specifications (1) to (6) only data on firms exporting differentiated products are used, while in (7) we restrict the sample to homogenous products. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.6: Unsuccessful Entrant and Unit Values

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value	(5) Unit Value	(6) Unit Value	(7) U. V. - Hom. Prod.
Uns. Entr.	-0.012*	-0.023***	-0.022***	-0.023***	-0.024***	-0.023***	-0.013
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.021)
Distance		0.161***	0.129***	0.099***	0.097***	0.106***	0.014
		(0.011)	(0.010)	(0.012)	(0.012)	(0.012)	(0.018)
Gdp			0.023***	0.007	0.007	0.008	0.003
			(0.004)	(0.004)	(0.004)	(0.005)	(0.008)
Avg. Income				0.069***	0.071***	0.081***	0.072***
				(0.013)	(0.013)	(0.013)	(0.018)
Comparative Disadvantage					-0.007*	-0.007*	-0.027***
					(0.004)	(0.004)	(0.007)
Firm Size						0.104***	0.030***
						(0.005)	(0.010)
Firm F.E.	Y	Y	Y	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y
Observations	186803	186803	186803	186803	186803	186803	7598
R^2	0.000	0.007	0.008	0.009	0.009	0.026	0.010

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on the dummy for Unsuccesfull Entrant. In specifications (1) to (6) only data on firms exporting differentiated products are used, while in (7) we restrict the sample to homogenous products. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.7: Incumbent/Unsuc. Entrants, Value and Quantity

	(1) Quantity	(2) Value	(3) Quantity	(4) Value
Incumbent			1.691***	1.721***
			(0.049)	(0.047)
Unsuc. Entrant	-0.870***	-0.894***		
	(0.019)	(0.020)		
Firm Size	0.337***	0.443***	0.299***	0.405***
	(0.007)	(0.008)	(0.007)	(0.009)
Distance	-0.097***	0.005	-0.110***	-0.008
	(0.029)	(0.028)	(0.033)	(0.031)
Avg. Income	-0.360***	-0.279***	-0.403***	-0.323***
	(0.033)	(0.032)	(0.033)	(0.032)
Gdp	0.050***	0.057***	0.040***	0.047***
	(0.011)	(0.010)	(0.013)	(0.013)
Comparative Disadvantage	0.056***	0.049***	0.055***	0.048***
	(0.007)	(0.008)	(0.007)	(0.008)
Firm F.E.	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y
Observations	186803	186803	186803	186803
R^2	0.078	0.099	0.083	0.105

Notes: This Table reports coefficients obtained when regressing Ln Value and Ln Quantity on the dummy for Unsuccesfull Entrant and the dummy for Incumbent firms. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.8: Incumbent and Unit Values

	(1)	(2)	(3)	(4)	(5)	(6)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Incumbent	0.035***	0.038***	0.034***	0.033***	0.033***	0.020**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Simple Avg. Tariff	-0.022***	-0.013**	-0.012**	-0.009*	-0.009*	-0.011**
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Incumbent X Simple Avg. Tariff	0.016***	0.011*	0.011*	0.010*	0.010*	0.012**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Distance		0.125***	0.096***	0.062***	0.063***	0.073***
		(0.013)	(0.013)	(0.015)	(0.015)	(0.015)
Gdp			0.022***	0.004	0.004	0.007
			(0.004)	(0.006)	(0.006)	(0.006)
Avg. Income				0.079***	0.079***	0.079***
				(0.018)	(0.018)	(0.018)
Comparative Disadvantage					0.003	0.002
					(0.005)	(0.005)
Firm Size						0.097***
						(0.006)
Firm F.E.	Y	Y	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y
Observations	80883	80883	80883	80883	80883	80883
R^2	0.002	0.007	0.008	0.008	0.008	0.026

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on the interaction term Incumbent X Simple Avg. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.9: Incumbent and Unit Values

	(1)	(2)	(3)	(4)	(5)	(6)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Incumbent	0.036***	0.038***	0.035***	0.034***	0.034***	0.021**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Weighted Avg. Tariff	-0.023***	-0.014***	-0.014***	-0.011**	-0.011**	-0.012**
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Incumbent X Weighted Avg. Tariff	0.018***	0.013**	0.013**	0.011*	0.011*	0.014**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Distance		0.124***	0.096***	0.062***	0.063***	0.073***
		(0.012)	(0.013)	(0.015)	(0.015)	(0.015)
Gdp			0.022***	0.004	0.004	0.007
			(0.004)	(0.006)	(0.006)	(0.006)
Avg. Income				0.077***	0.077***	0.078***
				(0.018)	(0.018)	(0.018)
Comparative Disadvantage					0.002	0.002
					(0.005)	(0.005)
Firm Size						0.097***
						(0.006)
Firm F.E.	Y	Y	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y
Observations	80883	80883	80883	80883	80883	80883
R^2	0.002	0.007	0.008	0.009	0.009	0.026

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on the interaction term Incumbent X Weighted Avg. Tariff. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.10: Unsuccessful Entrant and Unit Values, Check 1

	(1)	(2)	(3)	(4)	(5)	(6)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Uns. Entr.	-0.039***	-0.046***	-0.047***	-0.049***	-0.048***	-0.045***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Simple Avg. Tariff	-0.023***	-0.013*	-0.013*	-0.010	-0.010	-0.012*
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Uns. Entr. X Simple Avg. Tariff	-0.013	-0.009	-0.009	-0.008	-0.008	-0.009
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Distance		0.127***	0.103***	0.073***	0.074***	0.083***
		(0.018)	(0.018)	(0.020)	(0.020)	(0.020)
Gdp			0.018***	0.002	0.002	0.006
			(0.006)	(0.008)	(0.008)	(0.008)
Avg. Income				0.069***	0.068***	0.070***
				(0.025)	(0.025)	(0.025)
Comparative Disadvantage					0.005	0.004
					(0.006)	(0.006)
Firm Size						0.104***
						(0.008)
Firm F.E.	Y	Y	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y
Observations	41349	41349	41349	41349	41349	41349
R^2	0.002	0.006	0.007	0.007	0.007	0.025

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on the interaction term Unsuccesful Entrant X Simple Avg. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.11: Unsuccessful Entrant and Unit Values, Check 2

	(1)	(2)	(3)	(4)	(5)	(6)
	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value	Unit Value
Uns. Entr.	-0.039***	-0.046***	-0.046***	-0.049***	-0.048***	-0.045***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Weighted Avg. Tariff	-0.025***	-0.015**	-0.015**	-0.012*	-0.012*	-0.014*
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Uns. Entr. X Weighted Avg. Tariff	-0.010	-0.007	-0.006	-0.005	-0.005	-0.007
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Distance		0.126***	0.102***	0.073***	0.074***	0.083***
		(0.018)	(0.018)	(0.020)	(0.020)	(0.020)
Gdp			0.018***	0.003	0.002	0.006
			(0.006)	(0.008)	(0.008)	(0.008)
Avg. Income				0.067***	0.065**	0.068***
				(0.025)	(0.025)	(0.025)
Comparative Disadvantage					0.004	0.004
					(0.006)	(0.006)
Firm Size						0.104***
						(0.008)
Firm F.E.	Y	Y	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y
Observations	41349	41349	41349	41349	41349	41349
R^2	0.002	0.006	0.007	0.007	0.007	0.025

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on the interaction term Unsuccesful Entrant X Weighted Avg. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.12: Firm Dynamics and Unit Values, Lagged Tariffs, Check 3

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value
Incumbent	0.021**	0.022**		
	(0.009)	(0.009)		
Simple Avg. Tariff, t-1	-0.008**		-0.012*	
	(0.004)		(0.007)	
Weighted Avg. Tariff, t-1		-0.009**		-0.014*
		(0.004)		(0.007)
Incumbent X Simple Avg. Tariff, t-1	0.008			
	(0.006)			
Incumbent X Weighted Avg. Tariff, t-1		0.010		
		(0.006)		
Unusuc. Entrant			-0.045***	-0.045***
			(0.012)	(0.012)
Unusuc. Entrant X Simple Avg. Tariff, t-1			-0.009	
			(0.008)	
Unsuc. Entrant X Weighted Avg. Tariff, t-1				-0.007
				(0.008)
Firm Size	0.097***	0.097***	0.104***	0.104***
	(0.006)	(0.006)	(0.008)	(0.008)
Distance	0.074***	0.074***	0.083***	0.083***
	(0.015)	(0.015)	(0.020)	(0.020)
Avg. Income, t-1	0.080***	0.079***	0.070***	0.068***
	(0.017)	(0.017)	(0.025)	(0.025)
Gdp, t-1	0.006	0.007	0.006	0.006
	(0.006)	(0.006)	(0.008)	(0.008)
Comparative Disadvantage	0.003	0.002	0.004	0.004
	(0.005)	(0.005)	(0.006)	(0.006)
Firm F.E.	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y
Observations	80963	80962	41349	41349
R^2	0.026	0.026	0.025	0.025

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on interaction terms using lagged variables. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.13: Firm Dynamics and Unit Values, Demand Elasticity, Check 4

	(1) Unit Value	(2) Unit Value	(3) Unit Value	(4) Unit Value
Incumbent	0.021**	0.021**		
	(0.009)	(0.009)		
Simple Avg. Tariff	-0.011**		-0.013	
	(0.005)		(0.008)	
Weighted Avg. Tariff		-0.013**		-0.014*
		(0.005)		(0.008)
Incumbent X Simple Avg. Tariff	0.013**			
	(0.006)			
Incumbent X Weighted Avg. Tariff		0.015**		
		(0.006)		
Unusuc. Entrant			-0.046***	-0.047***
			(0.013)	(0.012)
Unusuc. Entrant X Simple Avg. Tariff			-0.013	
			(0.008)	
Unsuc. Entrant X Weighted Avg. Tariff				-0.010
				(0.009)
Import Dem. Elasticity	-0.006	-0.003	-0.115	-0.114
	(0.655)	(0.654)	(0.720)	(0.719)
Firm Size	0.099***	0.099***	0.105***	0.105***
	(0.006)	(0.006)	(0.008)	(0.008)
Distance	0.066***	0.066***	0.072***	0.072***
	(0.016)	(0.016)	(0.022)	(0.022)
Avg. Income	0.096***	0.095***	0.095***	0.093***
	(0.019)	(0.020)	(0.028)	(0.028)
Gdp	0.004	0.005	0.001	0.001
	(0.007)	(0.007)	(0.009)	(0.009)
Comparative Disadvantage	0.001	0.001	0.002	0.002
	(0.005)	(0.005)	(0.007)	(0.007)
Firm F.E.	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y
Observations	75968	75968	38800	38800
R^2	0.028	0.028	0.026	0.026

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on interaction terms controlling for Demand Elasticities in the importing country. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.14: Firm Dynamics and Unit Values, Excluding Large Trade Flows, Check 5

	(1)	(2)	(3)	(4)
	Unit Value	Unit Value	Unit Value	Unit Value
Incumbent	0.030***	0.031***		
	(0.010)	(0.010)		
Simple Avg. Tariff	-0.018***		-0.019**	
	(0.006)		(0.008)	
Weighted Avg. Tariff		-0.020***		-0.022***
		(0.006)		(0.008)
Incumbent X Simple Avg. Tariff	0.012*			
	(0.007)			
Incumbent X Weighted Avg. Tariff		0.014*		
		(0.007)		
Unusuc. Entrant			-0.055***	-0.055***
			(0.012)	(0.012)
Unusuc. Entrant X Simple Avg. Tariff			-0.011	
			(0.009)	
Unsuc. Entrant X Weighted Avg. Tariff				-0.007
				(0.009)
Firm Size	0.124***	0.124***	0.122***	0.122***
	(0.006)	(0.006)	(0.008)	(0.008)
Distance	0.077***	0.077***	0.085***	0.085***
	(0.020)	(0.020)	(0.024)	(0.024)
Avg. Income	0.083***	0.080***	0.071**	0.068**
	(0.026)	(0.026)	(0.032)	(0.032)
Gdp	0.005	0.005	0.002	0.003
	(0.007)	(0.007)	(0.009)	(0.009)
Comparative Disadvantage	0.010*	0.010*	0.008	0.008
	(0.005)	(0.005)	(0.007)	(0.007)
Firm F.E.	Y	Y	Y	Y
Product F.E.	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y
Observations	64840	64840	36516	36516
R^2	0.035	0.035	0.031	0.031

Notes: This Table reports coefficients obtained when regressing Ln Unit Value on interaction terms restricitng our sample to firms exporting less than 1.5 tons of a product in each year/destination pair. Standard errors clustered at the importing country/year level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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