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Exporting under financial constraints: margins, switching dynamics and prices

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Exporting under financial constraints: margins, switching dynamics and prices*

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Abstract

Using data on cross border transactions together with an informative measure of financing constraints this paper provides new evidence that limited access to external capital narrows the scale of foreign sales, the exporters' product scope and the number of trade partners. It shows that constrained firms have a reduced probability of adding and a higher probability of dropping products and destinations. Further it documents that constrained firms sell their products at higher prices as compared to unconstrained firms. All the results are robust to specific control for unobserved heterogeneity, self-selection into export and potential endogeneity of the financial constraints proxy.

JEL codes: F10, F14, F30, G20

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1 Introduction

Informational asymmetries and imperfect screening in capital or credit markets give raise to situations where financing constraints prevent potentially successful and growth enhancing projects or businesses to be undertaken. There are a few reasons why access to finance plays a particularly important role for firms involved in export activities. Firstly, the need to build ad-hoc distributional networks, to acquire specific information on destination markets, or to customize products, all the way to the mere transportation of goods imply that fixed and variable costs tend to be higher for exporters. Moreover the time lag between production and actual realization of the corresponding revenues is, in general, longer, and international sales contracts are usually more complex, riskier and less enforceable than in domestic markets. Building upon these ideas, within the broad literature on firm heterogeneity and micro-dynamics of international trade (see Bernard et al., 2011a, for a review), an increasing number of theoretical and empirical papers has recently focused on the effects of financing frictions on firms' exporting activities. These works show that financial constraints reduce firms' ability to enter international markets and the volume of trade, and limit exporters' product scope as well as the number of trade partners.

In the present paper we extend the focus of previous empirical analyses to consider both the role of financial frictions on the probability of product/country switching, i.e. of adding or dropping products or destinations over time, as well as their impact on firms' export prices. Exploiting detailed data on cross-border transactions (i.e. at product/destination level) for a large and representative sample of Italian manufacturing firms, the paper provides three distinct contributions.

First, we move beyond the static picture delivered by existing studies. Exploring product/country switching, indeed, adds new insights on the role of financial constraints within a dynamic framework where firms potentially export multiple products to multiple countries and their profitabilities evolve over time. This exercise is in the spirit of recent advancements in heterogeneous firms trade theory, which try to explain how and why firms rearrange their products and destinations portfolios (cfr. Bernard et al., 2010b). The key feature of these models is that product and geographical diversification change over time in response to shocks to firm specific characteristics (ability, productivity, competences) and to product specific attributes (technology, demand for product characteristics), with the latter possibly idiosyncratic also across destinations. The role of financial frictions is not explicitly considered in these models. Simple economic intuition suggests, however, that financing constraints can clearly play a role, making firms more vulnerable to negative shocks and preventing them to fully catch the benefits from positive shocks. Our empirical analysis sheds light on this question, so far largely unexplored.

Second, this paper considers whether there is any relationship between financing constraints and export pricing. Recently, the empirical works on firm heterogeneity in international trade have documented the systematic variation in export prices across firms, products and trade partners (Bastos and Silva, 2010; Manova and Zhang, 2012; Harrigan et al., 2011). None of these works explores the relation between financial frictions and export prices. The only exception is Manova et al. (2011), who however focus on sectoral rather than on firm-level constraints, and find that Chinese affiliates to multinational corporations set lower export prices in financially vulnerable sectors, while the opposite seems true for joint ventures with foreign ownerships. Further, in that work the issue of financial constraints is tackled only in light of the debate on the relative merits of efficiency sorting models (Melitz, 2003; Melitz and Ottaviano, 2008) as compared to models with quality sorting (Verhoogen, 2008; Kneller and Yu, 2008; Kugler and Verhoogen, 2011). In these two frameworks the predictions on pricing and financial constraints are different. Since it does not seem likely that constrained firms can afford the additional costs of quality, related to new fixed costs or to the purchase of higher quality inputs, one expects them to export lower quality goods at lower prices, as compared to unconstrained firms. Productivity-driven selection would suggest the opposite: to the extent that constrained firms are also less productive, they operate at higher marginal costs, and thus are expected to set higher

prices.

In both quality or efficiency sorting models, however, prices are not explicitly modeled as a strategic variable that firms directly manipulate. Even when mark-ups are endogenous in the models, firm prices vary across destinations in relation to factors outside direct control of the firm (strength of competition and other destination country characteristics). In contrast, models developed outside the international trade literature show that prices represent an important strategic variable *per se* under financing problems. Constrained firms have indeed an apparent incentive to raise short term revenues in order to sustain cash flow, to provide enough guarantees to creditors, as a way to ultimately relax the constraints (among others, cfr. Dasgupta and Titman, 1998; Pichler et al., 2008). To achieve higher revenues, firms can either try to attract additional demand via price cuts, or to raise the price per unit sold. The latter strategy seems more likely to work in the short-run as it does not require to expand production and to face the related additional costs. On the other hand, an increase of prices is likely to increase revenues only if the demand is sufficiently rigid in the short run, and only to the extent that customers adapt slowly to price changes. This idea underlies customer market models (Phelps and Winter, 1991; Lundin et al., 2009), which have attracted some interest in the study of export prices under financial constraints at the macroeconomic level (Gottfries, 2002). Similarly, one might explicitly assume that the adjustment costs for changing quantities are high, while prices can be varied more flexibly (Gagnon, 1989). In other circumstances, however, a price war might be a more attractive option. Which effect dominates the other, and thus which interpretation is more reasonable, is an open empirical question that we investigate in the paper.

Finally, this paper presents also methodological improvements regarding the choice of the variable used to measure firm's financial status and the econometric approach implemented in the analyses. With respect to the measure of credit rationing, our contribution builds upon the intuition that the availability and the cost of external resources depend on many factors, which do not simply map one-to-one with productivity. Indeed, credit institutions make an overall assessment of firms' ability to repay loans, looking at their ability to generate profits, digging into their financial structures and in their past history as debtors. Moreover, financing problems can also arise for otherwise well performing firms, as an effective screening of the different credit seekers is often severely limited by substantial informational imperfections characterizing credit markets. Also, investors' maybe unwilling to take high perceived risk, especially when economic conditions are very uncertain. In keeping with recent research in industrial organization (see Bottazzi et al., 2010), we bring these considerations to the empirical analysis by measuring financing constraints through an official credit rating issued by an independent institution and available for all the firms in the dataset. Compared to other proxy of financing constraints, either based on balance sheets variables or surveys, credit ratings incorporate the credit markets' view on the creditworthiness of a firm, thus getting close to the actual way investors' decide to provide external finance. The specific rating index that we use is relied upon by banks, and is tightly linked with availability and cost of credit. A similar approach is followed in Muuls (2008)'s study of financial constraints to export of Belgian firms.

Concerning the econometric approach, there are two well known potential sources of bias that one needs to tackle when dealing with financial constrained and exporting firms. A first issue concerns self-selection into export, as hidden factors affecting firms decision to enter foreign markets can be correlated with unobserved factors influencing export performance (export values, number of products and destinations, quantity and prices across products and destinations). Second, an endogeneity problem can arise from potential joint determination of export performance and availability of financial resources: although export performance does not enter the rating scores that we use to proxy for financial constraints, factors influencing credit conditions might also influence export activities. Among previous empirical studies on financial constraints to export, only Minetti and Zhu (2011) address both issues. They employ a modified Heckman-type procedure to address selection, and exploit exogenous variation in the provincial supply of banking services to find appropriate instruments for their proxy of credit constraints (following Guiso et al., 2004). Though, their analysis does not control

for unobserved heterogeneity in the selection equation and is limited to firm-level export regressions.

In this paper we account for both selection and endogeneity within the framework developed in Semykina and Wooldridge (2010). A key advantage of the methodologies employed is that we can allow for arbitrary correlation between unobserved heterogeneity and regressors in both the selection and primary equations, thus fully exploiting the panel dimension of the data. We include diverse sources of unobserved heterogeneity, at firm, product or destination level, or combinations of the former, depending on the empirical specification. At the same time, the methods are constructed to allow for standard instrumental variable treatment of potentially endogenous variables.

The paper is organized as follows. Related literature is briefly reviewed in Section 2. In Section 3 we present the data, our proxy of financing constraints and the other main variables. Section 4 describes the econometric strategy that we adopt, with specific attention to sample selection and endogeneity. Section 5 presents the evidence on how financing constraints associate with firm level intensive margin and product/country extensive margins. Section 6 reports results on the impact of financing constraints on product/country switching. In Section 7 we focus on the analysis of financing constraints and transaction level pricing decisions. We then conclude in Section 8.

2 Related literature

In exploring the relationship between firm level financing constraints and export activities, this work relates to a rather small subset of theoretical and empirical studies within the broad literature of firm heterogeneity in international trade.

From the theoretical side, all the existing models incorporate financing problems within the standard framework proposed in Melitz (2003). The common underlying intuition is that firms may fall short of the additional finance needed to sustain export activities. Such shortage of financial resources may come from different channels. Chaney (2005) stresses an internal channel by modeling the effects on export activity of exogenous shocks to firms liquidity. The model developed in Manova (2006, 2011) assumes instead that international activities are fully financed via external capital and financing constraints arise from imperfect contractibility of financial contracts: firms productivity is observed by investors and must be high enough to meet their participation constraint. Muuls (2008) borrows from both approaches to propose a model featuring three sources of constraints: shortage of internal finance (due to low productivity), exogenous shocks to liquidity and imperfect access to external credit. Feenstra et al. (2011) introduce also an informational asymmetry where banks do not observe firms productivities. Despite their differences, all these models share a common mechanism where financing problems reinforce selection into export of more productive firms. The prediction is therefore that constrained firms are less likely to enter foreign markets and, conditional on entry, they export sub-optimal volumes. In this context, it is not difficult to envisage extensions (cfr. the models without financial frictions proposed by Chaney, 2008; Bernard et al., 2011b) where a similarly distorting mechanisms works also along the product/country extensive margins: with product-specific or destination-specific trade costs constrained firms export less products and serve less countries (Manova, 2006, 2011).

The available empirical evidence tend to corroborate these predictions. A considerably large body of studies exploit firm level data. At this level, most works find that financing constraints affect both the extensive and the intensive margin. Consistent results are presented in Muuls (2008) for Belgium, in Bellone et al. (2010) for France, in Minetti and Zhu (2011) for a cross-section of Italian firms, and in Li and Yu (2009) and Manova et al. (2011) for Chinese firms. The only contrasting evidence is in Greenaway et al. (2007) for UK, where the probability of entry into exporting is not affected by financing problems, and in Berman and Hricourt (2010), where financing problems do not influence export values in a sample of nine developing countries.

The role of financing constraints at the product/destination level is much less investigated. Muuls

(2008) shows that less credit constrained firms export more products to more destinations, also documenting that firms with easier access to finance are more likely to expand the number of destinations they serve. Similarly, Askenazy et al. (2011) confirm that better financial conditions are positively associated with expansion and survival in export markets. Manova et al. (2011), despite measuring sectoral rather than firm-level dependence on external finance, show that limited access to outside capital restricts both the number of destinations served and the range of products exported.

3 Data and measurement

The analysis draws upon different sources of data, combining information on export transaction flows and firms' characteristics. In this section we describe the data, define our proxy of financial constraints and present the other main variables exploited in the empirical exercises. Details on econometric specification and strategy are in Section4.

Data and sample

The analysis combines three sources of data: the Italian Foreign Trade Statistics (COE), the Italian Register of Active Firms (ASIA) and a firm level accounting dataset (CEBI-CERVED). The first two datasets are collected by the Italian Statistical Office (ISTAT), while the latter is available through ISTAT but collected by the Italian Company Account Data Service (CADS).[1]

The COE dataset is the official source for trade flows of Italy. It records separately the f.o.b. value (in Euros) and the quantity (in kilos) involved in each export and import cross-border transaction performed by a firm allowing to compute export and import prices (unit values). Traded products are classified at the six digit level of the Harmonized System (HS6), for a total of $5,329$ product categories. Moreover, 236 different destination countries are covered in the sample period 2000-2003.

The ASIA register covers the universe of Italian firms active in the same time span, irrespectively of their export status. It reports annual figures on number of employees, sector of main activity, and information about geographical location of the firms (municipality of principal activity or legal address). Total sales are available only in 2000 and 2003.

The CEBI-CERVED-CADS dataset collects annual reports for all Italian *limited liability* firms. Centrale dei Bilanci (CEBI) was founded as a joint agency of the Bank of Italy and the Italian Banking Association in the early 1980s to assist in supervising risk exposure of the Italian banking system. Today part of CERVED, the leading group in business information services in Italy, CEBI was a private company during the sample period, owned by major Italian banks which exploited its services in gathering and sharing information about firms. The long term institutional role of CEBI ensures high data quality, substantially limiting measurement errors.

The sample exploited merges the three data sources and virtually covers the entire population of Italian limited firms (exporters and non exporters), active in manufacturing over the years 2000-2003. The panel is open and includes a total of $149,414$ firms. The representativeness with respect to the whole Italian manufacturing is quite satisfactory, with only a very mild over-representation of bigger and more productive firms: although about 20% of the total number of Italian manufacturing firms is included, we cover about 60% of all exporting firms and about 84% of the total value of exports. Further details are reported in Appendix A.

[1]The datasets have been made available for work after careful screening to avoid disclosure of individual information. The data were accessed at the ISTAT facilities in Rome.

Financing constraints

Our measure of financing constraints is based on the credit rating index available through the CEBI-CERVED-CADS dataset. In fact, credit ratings enjoy those features which are considered as crucial for a good measure of financial constraints (Cleary, 1999; Lamont et al., 2001). First, credit ratings usually result from a multivariate score, thus summarizing a wide range of firms' financial and non-financial characteristics. Second, they vary over time, thus allowing for the identification of time effects. Third, and more generally, credit ratings represents "the opinion [of the markets] on the future obligor's capacity to meet its financial obligations"(Crouhy et al., 2001), thus capturing the actual propensity of investors to grant credit. While these features are common to CEBI ratings and other ratings issued by well known international agencies or other institutions, the ratings exploited in this work also enjoy three specific advantages. Firstly, they give an assessment of the *overall* situation of a firm, rather than judging the quality of a single liability of a company. Second, all the firms included in the dataset receive a rating in every year, whereas international rating institutions typically rates a much less representative sub-sample of firms. Third, our index is perceived as an official rating, due to the long lasting relationship of CEBI with the Italian banking and credit systems. This motivates the heavy reliance of banks on this specific rating index, and the tight link between the index and the availability and cost of external finance: it is very unlikely that a firm with poor rating can receive any credit (cfr. Pistaferri et al., 2010), and there is evidence that bad ratings have a strong association with higher cost of credit (Panetta et al., 2009). Finally, and related, it is exactly a proxy of what banks do, rather than a benchmark for potential lenders in general. This is particularly appropriate, given the well known disproportionate dependence of the Italian industrial system on bank credit due to underdevelopment of bond and stock markets in Italy as compared to other countries.

While the method to construct the rating index is proprietary information of CEBI, it is known that information on firms' international activities does not enter the score. However, other firm characteristics which are likely to simultaneously affect financing problems and export performance, enter the score. In the empirical analysis we thus include firm level controls that help separating financial constraints from other confounding factors. These are described below. Here we notice that previous studies exploiting CEBI data find that the rating index is highly correlated with banks' internal definition of default status (Bottazzi et al., 2011) and that an important fraction of highly productive, highly profitable and fast growing firms receive poor scores (Bottazzi et al., 2008, 2010). These results imply that the index does not merely reflect firms' performances, but actually captures a more complex set of information that a bank would consider when lending to firms. In this respect, the motivation behind using a rating index is in line with the similar exercise performed by Muuls (2008) on Belgian exporters.

We exploit the information on credit ratings in the following way. The original index ranks firms in 9 categories of creditworthiness: 1-high reliability, 2-reliability, 3-ample solvency, 4-solvency, 5-vulnerability, 6-high vulnerability, 7-risk, 8-high risk, and 9-extremely high risk.[2] In keeping with the binary categorization traditionally employed in the literature, we distinguish between Non Financially Constrained (NFC) firms, rated from 1 to 7, and Financially Constrained (FC) firms, with rating 8 or 9. Accordingly, we build a FC dummy that takes value 1 if a firm is rated 8 or 9, and 0 otherwise.[3] Firms can switch between the FC and the NFC class over the period, but the degree of persistence is very high, also due to the short time window available. Finally notice that the index is updated at the end of each year. It is therefore the rating in $t-1$ that is relevant for credit suppliers' present

[2]These definitions are valid over the sample time period. Changes in the definition and the number of score classes occurred afterwards, following subsequent changes in CEBI ownership and updates in rating procedures.

[3]In exploratory exercises we broke down the sample in three categories, inserting an intermediate class of Mildly Financially Constrained (MFC) firms, defined as those rated 5 to 7. This attempt could in principle help to explore the relationship between exporting activities and different degrees of financing constraints. However, the results for the group of MFC firms did not displayed significant differences as compared to NFC firms. This is in line with the results reported in Bottazzi et al. (2010) in the context of size-growth dynamics of firms.

decisions on credit provision.

Preliminary evidence on the unconditional correlation between financing constraints and the different export performances that we investigate in this work are presented in Appendix B. First, financing constraints associate with a reduction in the level of foreign activities: as compared to NFC firms, FC firms export less both overall and per transaction (about 40% less in value, and 35% less in quantity, on average), ship less products (about 50% on average) and serve less countries (average 50% reduction). Second, financing constraints associate with higher prices: f.o.b. unit values of transactions performed by constrained firms are, on average, 25% higher.

Controls and Instruments

A further set of variables are employed in the paper. Firm level controls are intended to separate out from the rating index some of the factors that influence both credit conditions and exporting activities. Based on standard results in the literature, the following variables are selected. First, given the well established result that smaller and younger firms tend to be more prone to financing problems (Cabral and Mata, 2003; Angelini and Generale, 2008), it is important to control for size and age of the firms. We use the number of employees (*Empl*) as a proxy for firm size, and compute age (*Age*) by year of foundation. Secondly, one needs to control for financial factors that may interact with external financing constraints in determining the overall amount of financial resources available to a firm. In keeping with the vast literature on financing constraints and firm dynamics (cfr. for instance Fazzari et al., 1988; Kaplan and Zingales, 2000; Almeida et al., 2004), and with models of financing constraints to export, a key dimension is represented by the amount of internally generated resources. Firms' able to generate more internal funds are less likely to need external finance, and also more likely to obtain larger and less expensive credit lines. Among several alternatives suggested in previous studies, we proxy internal resources with the Gross Operating Margin (*GOM*, equivalent to the EBIDTA). This allows to focus on the resources originated from the mere operational activities of a firm, at the same time getting rid of confounding factors related to external debt service, taxation and amortization policies. A further important control variable concerns availability of collateral. Contractual guarantees on some of the assets of a firm are often required by potential lenders or sometimes even by the law as a pre-condition which can ease the access to and reduce the cost of external financing. The stock of Total Assets is used as a proxy for collateral (*Assets*).[4]

While controls indirectly help in mitigating possible endogeneity of the FC classification, we also construct a set of instrumental variables. As in Minetti and Zhu (2011), we follow Guiso et al. (2004) and exploit the exogenous variation in local credit supply determined by the progressive removal in the 1990s of the restrictions in banking services supply introduced in 1936 by the Bank of Italy. As shown in that study, the geographical distribution of banks and branches in 1936 across Italian provinces came about as the response to the norms enacted by the regulatory authority, while unrelated with the structural characteristics and the level of development of the province itself. The subsequent removal of the regulation during the 1990s impacted on banks' possibility to open new affiliates is expected to directly affect the availability of credit but not directly impact on export behavior. In this spirit, we build three instruments that capture the degree of constrictiveness of the legislation as well as the shock induced by its removal, at the provincial level: (1) number of saving banks and (2) number of cooperative banks per 1000 inhabitants in 1936; (3) number of branches created annually by banks, per 1000 inhabitants and imputed as the average in 1990-1998.[5]

[4] All the nominal variables are deflated with appropriate sectoral price indexes collected by the Italian statistical office. Complete deflator series are available only at the 2-digit level. We therefore perform deflation at this level of aggregation. The base year is 2000.

[5] Minetti and Zhu (2011) are the first to apply the approach in the empirical study of financing constraints to export. The methodology has however an extensive application in the empirical literature on Italy (see Herrera and Minetti, 2007; Guiso et al., 2006; Alessandrini et al., 2010).

In addition, we also consider a measure of fixed costs of entry into foreign markets, providing the exclusion restriction required by the procedures implemented to correct for potential selection bias. This proxy is constructed starting from the concept of Local Labour Systems (LLSs). These are geographical areas defined by the Italian Statistical Office as an aggregation of municipalities according to the degree of connectivity of labour market, and thus identifying local areas where production-labour relationships are tight. Tight connections at the local level are likely characterized by activities such as sharing same trade services, accessing pools of established distribution networks, exploiting knowledge of neighbors' experience in dealing with foreign contracts and foreign legislations. These and possibly other factors all tend to facilitate the entry into export markets. Following Bernard and Jensen (2004) and Bernard et al. (2010a), for each firm f, we define a proxy for (the inverse of) the sunk cost of entry into exports ($ExpCost_f$) computed as minimum between firm export entry and exit rates in the LLS wherein a firm is located. A higher level of entry and exit indicates lower sunk costs of exporting.[6]

4 Econometric procedures

This section provides details on the econometric procedures followed in our empirical analysis. As mentioned, the techniques we use are primarily devised to tackle self-selection into export and potential endogeneity of financing constraints.

We adopt two basic strategies, exploiting the different firm- or transaction- level information of the data. Both strategies entail an application of the Heckman type 2-stage approach developed in Semykina and Wooldridge (2010), which provides consistent estimation of panel data models with selection controlling for heterogeneity also in presence of correlated unobserved effects and endogenous regressors.

In a first set of empirical investigations we explore to what extent financing constraints affect export margins using data at the firm level. The model includes two equations

$$\ln Y_{f,t} = \gamma_1 FC_{f,t-1} + \boldsymbol{\beta}\mathbf{Z}_{f,t-1} + FE_{1f} + \epsilon_{1f,t} \tag{1}$$

$$s_{f,t} = 1\left[\gamma_2 IV^{FC}_{f,t} + \boldsymbol{\delta}_t \mathbf{W}_{f,t-1} + FE_{2f} + \epsilon_{2f,t} > 0\right] \quad . \tag{2}$$

Equation (1) is the equation of interest, where the dependent variable $Y_{f,t}$ is the export performance of firm f at time t along the different margins (the value of foreign sales, the number of exported products or the number of destination countries) and $FC_{f,t-1}$ is our potentially endogenous dummy for constrained firms. The set $\mathbf{Z}_{f,t-1}$ includes firm-level controls (*Empl, Age, Assets and GOM*) all in logs. With the only exception of *Age* which is taken at time t, all variables are measured at year $t-1$, thus reducing simultaneity problems.[7] Further, FE_{1f} is a firm fixed effect possibly correlated with the other regressors, and $\epsilon_{1f,t}$ is a standard error term. Equation (2) is a Probit selection equation, where s_{ft} is a binary indicator for firms' export status (1 if a firm is exporter in t, 0 otherwise), $1[\cdot]$ is the indicator function, $IV^{FC}_{f,t}$ is an instrumental variable for $FC_{f,t}$, $\mathbf{W}_{f,t-1}$ is a set of exogenous explanatory variables, FE_{2f} is an unobserved firm fixed effect, and $\epsilon_{2f,t}$ a usual error term. Note that $\mathbf{Z}_f \subset \mathbf{W}_f$, since $\mathbf{W}_f$ includes firm-level controls and also the proxy of sunk cost of exports, $ExpCost_f$, as the exclusion restriction variable.

The parameter of main interest is γ_1, which captures differences in export performance due to financial constraints. Because of the presence of unobserved effects also in the selection equation (2), adding the inverse Mills ratio and simply using Fixed Effects does not produce consistent estimates of equation (1). However, a solution is available via adding time averages of all the exogenous

[6] We use the ISTAT definition of LLS in 2001, amounting to 683 locations.

[7] As a matter of compact notation, we use the subscript $t-1$ for the set of controls, bearing however in mind that *Age* is measured at time t.

explanatory variables both in the main equation (controls and instruments for FC) and in the selection equation (controls, $ExpCost_f$ and the instruments for FC).[8]

A consistent estimate of γ_1 is obtained with the following procedure:

Procedure 4.1

1. *generate the instrument $IV_{f,t}^{FC}$ as the fitted probability from a Probit regression of our binary indicator FC on the controls in $\mathbf{Z}_f$ and on the 3 provincial level instruments for credit conditions: (1) number of saving banks and (2) number of cooperative banks per 1000 inhabitants in 1936, and (3) number of branches created annually by banks, per 1000 inhabitants and imputed as the average in 1990-1998;*[9]

2. *for each t, obtain the inverse Mills ratio $\hat{\lambda}_{f,t}$ from a Probit estimate of equation* (2) *augmented with the time averages of the instrument $IV_{f,t}^{FC}$ and time averages of the controls in $\mathbf{W}_f$;*

3. *estimate via pooled 2SLS equation* (1) *augmented with the time averages of the generated instrument $IV_{f,t}^{FC}$, with the time averages of the explanatories in $\mathbf{Z}_f$, and with the inverse Mills ratio $\hat{\lambda}_{f,t}$ obtained in Step 2 together with its interactions with time dummies; use $\mathbf{Z}_f$, $IV_{f,t}^{FC}$, all the time averages and $\hat{\lambda}_{f,t}$ as instruments;*

4. *use a "panel bootstrap", sampling across sectional units, to obtain asymptotic standard errors corrected for problems related to general heteroskedasticity, serial correlation and generated regressors.*[10]

In a second set of exercises we exploit the transaction level disaggregation of the data to explore the role of financing constraints on firms' switching among products and destinations, and on their pricing strategies. The methodology is quite similar to the procedure employed above. However, the more detailed information available allows to model selection into export as the outcome of a Tobit regression. The advantage is that, in this case, there is no need for an exclusion restriction, since the variation in the dependent variable in the Tobit is used to identify the parameters in the main equation. Moreover a pure Fixed Effects approach is allowed and more appropriate in estimating the main equation.

In general terms, the model still consists of two equations

$$Y_{\cdot,t} = \gamma_1 FC_{f,t-1} + \boldsymbol{\beta}\mathbf{Z}_{f,t-1} + FE_{1,\cdot} + \epsilon_{1\,\cdot,t} \tag{3}$$

$$ExpVal_{\cdot,t} = \text{Max}\left[0, \gamma_2 IV_{f,t}^{FC} + \boldsymbol{\delta}\mathbf{Z}_{f,t-1} + FE_{2,\cdot} + \epsilon_{2fpc,t}\right] \quad , \tag{4}$$

where a "$\cdot$" in the subscript indicates that the variables can be taken at different combination of firm f, product p and destination country c level depending on the precise specification we intend to estimate. In the primary equation the dependent variable of interest (the probability of dropping products or destinations or the log of unit values) is regressed against the FC dummy, the firm level controls

[8] More precisely, we are modeling $FE_{2f} = \xi \bar{IV}_f^{FC} + \bar{\mathbf{W}}_f\boldsymbol{\xi} + a_{2f}$, where a bar indicates time averages of a variable, and modeling $a_{2f}|IV_f^{FC}, \mathbf{W}_f \sim \text{Normal}(0, \sigma_a^2)$. This is equivalent to assume that FE_{2f} is related to IV_f^{FC} and to $\mathbf{W}_f$ only through their time averages, while the remainder is independent of IV_f^{FC} and $\mathbf{W}_f$. Likewise, the other implicit assumption is that the main equation unobserved effect is modeled as $FE_{1f} = \eta \bar{FC}_f + \bar{\mathbf{Z}}_f\boldsymbol{\eta} + a_{1f}$. This transformation, similar in spirit to fixed effects estimator discussed in Mundlak (1978), uses time averages of the explanatories computed over the entire sample of exporters and non-exporters and it is therefore free of selection bias (see Semykina and Wooldridge, 2010, for details).

[9] This follows the Procedure 19.2 in Wooldridge (2010)

[10] This is suggested in Semykina and Wooldridge (2010) as an alternative to analytical computation of sandwich standard errors. Throughout the paper, we always report bootstrapped standard errors. Nonetheless, we checked when possible that the two alternatives give very close estimates of standard errors.

$\mathbf{Z}_f$ and a set of fixed effect FE_1 controlling for diverse sources of unobserved factors. The selection equation is a Tobit on the ($\log$ of the) value of export, $ExpVal$, with explanatory variables given by the generated instruments $IV_{f,t}^{FC}$, the firm-level controls and a fixed effect capturing the same type of unobserved heterogeneity modeled in the primary equation. Notice that in this equation, as in Procedure 4.1 above, the fixed effects are inserted by adding the time averages of the proper explanatory variables. As we control for country-level fixed effects in some specifications, the selection equation, when appropriate, will be also augmented with a set of standard gravity-like destination country characteristics, $\mathbf{Z}_c$, including market size, consumer income and an iceberg trade costs.[11]

Consistent estimates are obtained through the following procedure

Procedure 4.2

1. *build the instrument $IV_{f,t}^{FC}$ as in Procedure 4.1;*
2. *for each t, obtain the residuals from a Tobit estimate of equation (4) augmented with the time averages of $IV_{f,t}^{FC}$, and the time averages of firm-level and/or country-level controls, depending on the type of fixed effects chosen for the main equation (3);*[12]
3. *estimate via pooled 2SLS equation (3) with appropriate fixed effects, augmented with the generated instrument $IV_{f,t}^{FC}$ and with the residuals obtained in Step 2 together with their interactions with time dummies; use $IV_{f,t}^{FC}$, firm-level and/or country-level controls, and the Step 2 residuals as instruments;*
4. *use a "panel bootstrap", sampling across sectional units, to obtain asymptotic standard errors corrected for problems related to general heteroskedasticity, serial correlation and generated regressors.*

Some of our empirical analyses on the relation between financing constraints on firms' performance in international markets are not new *per se*. However, previous studies, even when addressing selection and endogeneity, do not control for unobserved heterogeneity both in the selection and primary equation. The methodologies we adopt give additional confidence of proper identification of the key parameters. For completeness and comparison with previous findings, the following Sections also reports more standard estimates (OLS, Probit or Fixed Effects) of the main equations of interest.

5 Financing constraints and firm export margins

This section explores how financing constraints relate with export values, number of exported products and number of destination countries at the firm level. Most of previous empirical studies have focussed on similar regressions. We improve the confidence in the estimates by fully controlling unobserved heterogeneity, self-selection and potential endogenity of our variable of interest.

We start by exploring the relation between financing constraints and the ($\log$ of the) value of firm level exports ($Exports$). The equation of interest is

$$Exports_{f,t} = \gamma FC_{f,t-1} + \boldsymbol{\beta}\mathbf{Z}_{f,t-1} + FE_f + \epsilon_{f,t} \tag{5}$$

[11] We measure these variables by GDP, GDP per capita (GDPPC) and bilateral geographical distance (DIST). Data on GDP and GDP per capita are taken from the World Bank Development Indicators (nominal figures). Distance of destination countries from Italy is computed via the great circle method (Mayer and Zignago, 2005) on the CEPII database.

[12] This involves inflating the dataset with lots of zeros, corresponding to the products/destinations potentially available but not exported by a firm. This enormously increases the data dimension, rapidly exceeding reasonable computational limits. Our solution is either to drop some relatively unimportant product/destination pairs, or to compute estimates via resampling. Details are reported in the proper sections and in Appendix A.S.

Table 1: Within-Firm Financial Constraints and Total Exports

	$\ln Exports_{f,t}$ POLS (1)	$\ln Exports_{f,t}$ FE (2)	$\ln Exports_{f,t}$ Procedure 4.1* (3)	$\ln Exports_{f,t}$ Procedure 4.1 (4)
$FC_{f,t-1}$	-0.227***	-0.091***	-0.061**	-0.476*
	(0.028)	(0.028)	(0.026)	(0.270)
$\ln Empl_{f,t-1}$	0.211***	0.130***	0.033*	0.019
	(0.012)	(0.020)	(0.017)	(0.021)
$\ln Age_{f,t}$	-0.116***	-0.037	0.462***	0.246**
	(0.012)	(0.076)	(0.089)	(0.098)
$\ln ASSETS_{f,t-1}$	0.943***	0.515***	0.475***	0.426***
	(0.011)	(0.031)	(0.029)	(0.031)
$\ln GOM_{f,t-1}$	0.063***	0.022***	0.023***	0.005
	(0.0044)	(0.004)	(0.004)	(0.011)
$\hat{\lambda}_{f,t}$			0.645***	0.154*
			(0.085)	(0.091)
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	Yes
R-squared	0.443	0.911	0.400	0.403
N.Observations	123597	123597	123597	113225
N.Firms	53173	53173	53173	48776

Note: Table reports regression using data on 2001-2003. The dependent variable used is reported at the top of each column. $FC_{f,t-1}$ is a dummy for financially constrained firms. Column 1 includes sectoral and province fixed effects. All the regressions include a constant term. Robust standard errors clustered at firm level are reported in parenthesis below the coefficients: in columns 3 and 4 these are computed out of 1000 bootstrap runs. Asterisks denote significance levels (***:p<1%; **: p<5%; *: p<10%). Procedure 4.1* controls only selection by performing Procedure 4.1 without instrumenting $FC_{f,t-1}$.

where FC_f is our dummy variable identifying constrained firms, $\mathbf{Z}_f$ is the set of firm level control variables, and FE_f is a firm fixed effect capturing differences in firm export due to time invariant firm specific characteristics. Identification therefore comes from variation within firm over time.[13]

Columns 1-2 of Table 1 report pooled OLS (POLS) and Fixed Effects (FE) estimates. These results already provide a clear picture: financing constraints are significantly associated with reduced export values. The coefficient of the FC dummy in the FE specification is significantly smaller in absolute value than the OLS estimates. This suggests a negative correlation between omitted variables and assignment to the FC class, as it is indeed expected for unmeasured factors such as managerial ability or productivity, for instance.

In columns 4 we directly address selection and endogeneity bias via the Procedure 4.1 described in Section 4. The term $\hat{\lambda}_{f,t}$ is the inverse Mills ratio estimated in step 2 of the procedure: significance of the coefficient on $\hat{\lambda}_{f,t}$ confirms that selection is indeed an issue. We shall also notice that the relevance and the validity of the instrument for FC, i.e. the fitted probabilities IV^{FC}, is confirmed in the preliminary Probit from step 1 of the procedure, where we observe that the coefficients on the number of saving banks, on the number of cooperative banks per 1000 inhabitants in 1936, and on th number of branches created annually by banks during the 1990s, are jointly statistically significant ($\chi^2 = 13.97$ with $p - value < 0.002$).[14]

The main message remain valid, though: firms with limited or no access to external finance export significantly less in value than unconstrained firms. The reduction is sizeable, as the estimated co-

[13]Here and in the following, negative values of GOM (corresponding to about 30% of the observations) are changed into 1 before taking logs: within the context of our research, negative or zero operating revenues equivalently signal the inability of firms to rely on internal resources and thus a strong need of outside capital.

[14]Notice that the construction of IV^{FC} remains identical in all the analyses presented in the paper. Moreover, since the number of provinces rise from 95 to 103 from 1936 to 2001, regressions only use the information for the 95 original provinces.

efficient of -0.476 implies that constrained firms export about 38% less, *ceteris paribus*.[15] This is a smaller effect than the estimate obtained in Minetti and Zhu (2011) on a different, and smaller sample of Italian firms. It is also remarkable that the negative effect is stronger than what we could conclude from OLS or FE estimates. The latter turn upward biased (smaller coefficients in absolute value), suggesting that the endogenous component of our FC classification produces an underestimation of the true detrimental effect of being constrained on exporting activities.[16] Concerning the controls, all the estimation methods tend to agree that age and collateral display a stronger correlation, while the elasticities of exports to size and internal resources reveal a second order role of these variables. In fact, selection-endogeneity corrected estimates in Column 4 show that both age and collateral have a positive association with exporting activity, while the other two controls are not significant.

In unreported regressions (available upon request), we check the robustness of our results to alternative specifications. The main results, revealing the negative impact of financing problems on export values remain consistently unchanged. The reduced exporting capacity of constrained firms still appear when we add a measure of TFP among the controls, explicitly accounting for the key role played by productivity in theoretical models of heterogeneous firms and trade. [17] Also, the main results remain valid when we restrict the analysis to those firms which always export over the sample period, and and also when we use export volumes in place of export values as the dependent variable. Finally, we explore the relationship between financing constraints and firms' domestic sales: in line with the theoretical predictions, we establish that financing constraints reduce domestic sales much less than they do for exports.

Our second exercise investigates the role of financing constraints along the product and destination margins. We replace the dependent variable in equation (5) with either the ($\log$ of the) number of destinations served ($\#Countries$) or the ($\log$ of the) number of exported products, aggregated at the level of each firm. The primary equations are

$$\#Countries_{f,t} = \gamma FC_{f,t-1} + \boldsymbol{\beta}\mathbf{Z}_{f,t-1} + FE_f + \epsilon_{f,t} \quad , \tag{6}$$

and

$$\#Products_{f,t} = \gamma FC_{f,t-1} + \boldsymbol{\beta}\mathbf{Z}_{f,t-1} + FE_f + \epsilon_{f,t} \tag{7}$$

while selection is still modeled as the export participation decision detailed above, with firm fixed effects and including $ExpCost$ as the exclusion restriction variable.

Table 2 reports the results, again for POLS, FE with firm fixed effects, and selection-endogeneity corrected estimates from Procedure 4.1. The main finding is that financing problems hamper the ability of firms to operate along both margins. The result does not vary much across different estimation methods, although, similarly to the above regression on export values, the POLS and FE estimates of the FC coefficient are upward biased with respect to the more reliable selection-endogeneity corrected estimates. Taking these estimates (in Column 4 and 8), we find that financing constraints associate with a 27% reduction in the number of destination countries, and with a 26% reduction in the number of exported products.[18] Concerning the control variables, selection-endogeneity corrected

[15] This figure is obtained by $exp(-0.476) - 1$.

[16] Indeed, in the first stage of the 2SLS estimates from Step 3 of the procedure, the fitted probabilities IV^{FC} is positively and significantly correlated with the FC dummy (coefficient ~ 1.149, S.E. 0.068), confirming the upward bias in OLS and FE estimates.

[17] As we do not have data on intermediate inputs and investment required by reliable estimation of production functions (see Olley and Pakes, 1996; Levinsohn and Petrin, 2003), TFP is computed as the residual of a FE estimate of a 2 inputs production function, taking value added as a proxy for output, and employees and gross tangible assets to proxy labour and capital inputs. Due to this limitation, after checking that the main results are not affected, we do not include this control in the following analyses.

[18] The estimated coefficient on IV^{FC} in the first stage of the 2SLS are obviously identical to the above-mentioned estimates of the export value regression. Significant coefficients on $\hat{\lambda}$ confirm that selection is an issue in the choice of both the scope of export product variety and of the extent of geographical diversification.

Table 2: Within-Firm Financial Constraints and the Extensive Margins of Trade

	$\#Countries_{f,t}$	$\#Countries_{f,t}$	$\#Countries_{f,t}$	$\#Countries_{f,t}$	$\#Products_{f,t}$	$\#Products_{f,t}$	$\#Products_{f,t}$	$\#Products_{f,t}$
	POLS	FE	Procedure 4.1*	Procedure 4.1	POLS	FE	Procedure 4.1*	Procedure 4.1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$FC_{f,t-1}$	-0.085***	-0.048***	-0.034***	-0.314**	-0.086***	-0.045***	-0.031***	-0.302**
	(0.014)	(0.012)	(0.012)	(0.121)	(0.013)	(0.014)	(0.011)	(0.120)
$\ln Empl_{f,t-1}$	0.131***	0.079***	0.026***	0.022**	0.078***	0.065***	0.024***	0.018**
	(0.006)	(0.009)	(0.008)	(0.010)	(0.006)	(0.009)	(0.008)	(0.009)
$\ln Age_{f,t}$	0.025***	0.022	0.267***	0.184***	-0.031***	-0.055	0.144***	0.020
	(0.007)	(0.033)	(0.043)	(0.046)	(0.006)	(0.037)	(0.043)	(0.047)
$\ln ASSETS_{f,t-1}$	0.350***	0.201***	0.136***	0.126***	0.339***	0.196***	0.179***	0.155***
	(0.006)	(0.013)	(0.013)	(0.014)	(0.005)	(0.014)	(0.013)	(0.013)
$\ln GOM_{f,t-1}$	0.029***	0.005***	0.004**	-0.008	0.019***	0.006***	0.005***	-0.006
	(0.002)	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.002)	(0.005)
$\hat{\lambda}_{f,t-1}$			-0.066	-0.165***			0.388***	0.134***
			(0.043)	(0.044)			(0.044)	(0.046)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
R-squared	0.364	0.929	0.303	0.302	0.342	0.876	0.249	0.253
N.Observations	123597	123597	123597	113225	123597	123597	123597	113225
N.Firms	53173	53173	53173	48766	53173	53173	53173	48766

Note: Table reports regressions using data on 2001-2003. The dependent variable is reported at the top of each column. $FC_{f,t-1}$ is a dummy for financially constrained firms. Columns 1 and 5 include sectoral and province fixed effects. All the regressions include a constant term. Robust standard errors clustered at firm level are reported in parenthesis below the coefficients: in columns 3-4 and 7-8 these are computed out of 1000 bootstrap runs. Asterisks denote significance levels (***:p<1%; **: p<5%; *: p<10%). Procedure 4.1* controls only selection by performing Procedure 4.1 without instrumenting $FC_{f,t-1}$.

estimates show that size, age and collateral tend to display a positive correlation with export activity, although the coefficient on age is not significant in the destination margin regression. We also find that internal resources do not play a role along the margins, once we account for selection and endogeneity.

Summing up, the results of this section are consistent with theoretical predictions and with previous empirical studies. First, the evidence confirms that constrained firms that enter foreign markets export second best values thus lending support to the hypothesis that external funds are needed to cover both fixed and variable export costs. Second, our findings also support the existence of country-specific and product-specific fixed costs of exporting, as indeed FC firms export a narrower range of products to a smaller number of countries as compared to unconstrained exporters.

6 Financing constraints and product/country switching

The analysis above explores the relationship between financing constraints and the overall product/destination extensive margins. In this section we take a dynamic perspective and investigate to what extent firm-level financing constraints play a role in the process of dropping or adding products and destinations. These relations are rarely addressed in previous studies, and never investigated with explicit controls for unobserved heterogeneity, selection and endogeneity.

Product-Country dropping

In examining dropping dynamics we exploit the firm-product and firm-destination dimensions of the data, over time. We define two indicator variables of dropping. For product dropping, the indicator $DropP_{fpt}$ takes value 1 if product p is exported by firm f at time $t-1$, but not exported in year t, and 0 otherwise. Symmetrically, for destination dropping we define the indicator $DropC_{fct}$, that equals 1 if country c is served by firm f at time $t-1$, but not served in year t, and 0 otherwise.

Then, we explore the impact of being constrained in one year on the subsequent year probability of dropping products

$$\Pr(DropP_{fpt}=1)=\gamma FC_{f,t-1}+\boldsymbol{\beta}\mathbf{Z}_{f,t-1}+FE_{fp}+\epsilon_{fpt} \tag{8}$$

or dropping destinations

$$\Pr(DropC_{fct}=1)=\gamma FC_{f,t-1}+\boldsymbol{\beta}\mathbf{Z}_{f,t-1}+FE_{fc}+\epsilon_{fct} \quad , \tag{9}$$

where $\mathbf{Z}_f$ is our usual set of firm-level controls, and we also include firm-product or firm-country fixed effects, accounting for any time invariant firm-product or firm-destination characteristic that may influence the decision to drop a product or a destination. Notice that the analysis only considers those firms that do not drop all their products or withdraw from all the destinations in two consecutive years (surviving firms). This shall avoid confounding factors related to the likely different motivations behind the choice to completely exit from export markets.[19]

Columns 1-4 of Table 3 presents results of the product dropping equation. In column 1 we report marginal effects of Probit estimates, ignoring fixed effects. Then, in column 2, we follow Bernard et al. (2010b) and estimate a linear probability model with firm-product fixed effects, so that identification comes from variation within firm and product, across time and destinations. Finally, in columns 3-4 we address selection and endogeneity. Estimates are in this case obtained following Procedure 4.2

[19]Results must be therefore interpreted as informative on dropping conditional on survival in export markets between two consecutive years.

Table 3: Product-Country dropping and firm's financial constraints

	Surviving firms $DropP_{fpt}$ Probit	Surviving firms $DropP_{fpt}$ FE	Surviving firms $DropP_{fpt}$ Procedure 4.2*	Surviving firms $DropP_{fpt}$ Procedure 4.2	Surviving firms $DropC_{fct}$ Probit	Surviving firms $DropC_{fct}$ FE	Surviving firms $DropC_{fct}$ Procedure 4.2*	Surviving firms $DropC_{fct}$ Procedure 4.2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$FC_{f,t-1}$	0.035***	0.028**	0.036***	0.415***	0.042***	0.036***	0.040***	0.420***
	(0.005)	(0.013)	(0.0004)	(0.036)	(0.004)	(0.008)	(0.007)	(0.036)
ln $Empl_{f,t-1}$	-0.003	-0.024***	-0.045***	-0.037***	-0.014***	-0.037***	-0.057***	-0.051***
	(0.002)	(0.007)	(0.003)	(0.003)	(0.001)	(0.006)	(0.006)	(0.002)
ln $Age_{f,t}$	-0.002	0.168***	0.213***	0.241***	0.004***	0.158***	0.064***	0.081***
	(0.001)	(0.020)	(0.008)	(0.009)	(0.001)	(0.123)	(0.012)	(0.006)
ln $ASSETS_{f,t-1}$	-0.013***	-0.097***	-0.112***	-0.105***	-0.013***	-0.079***	-0.108***	-0.093***
	(0.002)	(0.013)	(0.004)	(0.004)	(0.001)	(0.009)	(0.009)	(0.003)
ln $GOM_{f,t-1}$	-0.005***	-0.001	-0.001*	0.009***	-0.010***	-0.002**	-0.003***	0.007***
	(0.001)	(0.004)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
$\hat{\epsilon}_2$			0.001**	-0.002***			-0.024***	-0.024***
			(0.000)	(0.000)			(0.001)	(0.000)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-Firm FE		Yes	Yes	Yes				
Country-Firm FE						Yes	Yes	Yes
R-squared	0.004	0.528	0.539		0.018	0.558	0.561	
N.Observations	1257193	1257193	1256899	680620	1414292	1414051	1414051	1414051

Note: Table reports regression using data on 2001-2003. The regression sample is firms that export at least one product or serve at least one destination in both $t-1$ and t (Surviving firms). The dependent variable is a dummy indicating a firm-product drop or firm-country drop between $t-1$ and t. All the regressions include a constant term. Robust standard errors clustered at firm level are reported in parenthesis below the coefficients: in columns 3-4 and 7-8 these are computed out of 200 bootstrap runs. Asterisks denote significance levels (***:p<1%; **: p<5%; *: p<10%). Procedure 4.2* controls only selection by performing Procedure 4.2 without instrumenting $FC_{f,t-1}$.

presented in Section 4, with the Tobit selection equation involved in step 2 appropriately modified to include firm-product fixed effects.[20]

The findings across the different estimation methods agree in indicating that FC firms are more likely to discard products. FE estimates reveal a downward bias in POLS estimates. This is consistent with standard omitted variable bias, given the expected negative correlation between product drop and unmeasured firm-product factors (firm ability in a specific product market, for instance), and the likely negative correlation between these factors and being financially constrained. The magnitude of the effect of FCs is however severely underestimated if we do not control for selection and endogeneity.[21] Taking the more robust estimates in Column 4, we find that financing constraints increase of 41.5 percentage points the probability of firm-product drop. Given an average drop rate of 42.7% among unconstrained firms, this means that the probability of product dropping is about 97% higher for constrained firms. Also, and quite intuitively, size and collateral reduce the probability to drop a product: firms that are bigger and with more collateral are more likely to maintain their current product portfolio, *ceteris paribus*. Age has instead a positive sign, which suggests that older firms tend to discard more products, possibly due to higher frequency of products at later stages of their life cycle among older firms. Also, availability of internal resources has a positive, although very limited role.

Columns 5-8 of Table 3 then show the corresponding findings from the destination dropping equation (9). [22] In this case the main equation includes firm-country fixed effects. In line with results on product dropping, we find that constrained firms have a significantly higher probability to leave a destination market. The main finding does not change if we estimate a Probit, a linear probability model, or a selection-endogeneity corrected model. Taking corrected estimates in column 6, financing constraints increase the probability of country dropping by 42 percentage points. Against an average drop rate of 21.8% among unconstrained firms, this implies that the probability of country drop is almost twice as big as that for constrained firms.[23] Estimates on control variables almost perfectly reproduce the results from the product dropping equation: size and collateral reduce country-dropping, while age and GOM have a positive effect. As for the product dropping analysis, we perform a robustness check where we also control for the number of countries served by a firm at $t-1$. The coefficient on the FC dummy remains positive and significant.

Product-Country adding

We next turn to explore if limited access to external finance influences firms' decisions of adding products or countries to their export portfolios. Differently from the dropping regressions, recording the adding decisions at firm-product or firm-country level is unfeasible. Indeed, that would require to create, for each firm, an observation for each product-country combination present in the dataset at time $t-1$ (even for transactions not actually performed by the firm), and then to see which of these products or destinations are added at time t. This cannot be managed given the high number of firms, products and destinations in the data. We therefore aggregate the information at the firm level and, following Bernard et al. (2010b), we examine the probability that a current exporter adds at least a new product or a new destination to its export portfolio between two consecutive years. We define an indicator of product adding, $AddP_{f,t}$, that takes value 1 if at least one product which was not exported by firm f at time $t-1$ is exported at time t, and 0 otherwise. Likewise, we construct an indicator of country adding, $AddC_{f,t}$, which equals 1 if at least one new destination is served by firm f at time t, as compared to the set of countries served at time $t-1$, and 0 otherwise.

[20] Details on how the dataset has been prepared to estimate equation 8 are in Appendix C.

[21] Estimated coefficient on IV^{FC} in the first stage of the 2SLS is 0.910 with a standard error of 0.023.

[22] See Appendix C for details on how the dataset has been prepared for the estimation.

[23] Estimated coefficient on IV^{FC} in the first stage of the 2SLS-IV is 0.710 with a standard error of 0.021.

Table 4: Adding new Products-Country and firm's financial constraints

	Surviving firms $AddP_{f,t}$ Probit (1)	Surviving firms $AddP_{f,t}$ FE (2)	Surviving firms $AddP_{f,t}$ 2SLS-IV (3)	Surviving firms $AddC_{f,t}$ Probit (4)	Surviving firms $AddC_{f,t}$ FE (5)	Surviving firms $AddC_{f,t}$ 2SLS-IV (6)
$FC_{f,t-1}$	-0.018***	-0.022**	-0.024***	-0.021***	-0.015**	-0.018**
	(0.005)	(0.007)	(0.006))	(0.006)	(0.007)	(0.006)
$\ln Empl_{f,t-1}$	0.015***	-0.003	-0.002	0.017***	-0.006*	-0.005*
	(0.002)	(0.004)	(0.003)	(0.002)	(0.003)	(0.002)
$\ln Age_{f,t}$	-0.024***	-0.019***	-0.020***	-0.013***	-0.023***	-0.022***
	0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
$\ln ASSETS_{f,t-1}$	0.033***	0.028***	0.029***	0.061***	0.024***	0.024***
	(0.002)	(0.004)	(0.003)	(0.002)	(0.005)	(0.003)
$\ln GOM_{f,t-1}$	0.004***	0.002	0.002**	0.004***	-0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-Mix*Year FE	No	Yes	Yes			
Country-Mix*Year FE				No	Yes	Yes
R-squared	0.035	0.091	0.010	0.062	0.182	
N.Observations	110425	110425	98374	110425	110425	88021
N.Firms	45722	45722	41860	45722	45722	41789

Note: Table reports regression using data on 2001-2003. The regression sample is firms that export at least one product or serve at least one destination in both $t-1$ and t (surviving firms). The dependent variable is a dummy indicating a firm adding at least a new product or a new destination country between $t-1$ and t. All the regressions include a constant term. Robust standard errors clustered at product-mix or country-mix level are reported in parenthesis below the coefficients. Asterisks denote significance levels (***:p<1%; **: p<5%; *: p<10%).

The equations of interest are

$$\Pr(AddP_{f,t}=1)=\gamma FC_{f,t-1}+\boldsymbol{\beta}\mathbf{Z}_{f,t-1}+FE_{p-mix}\times t+\epsilon_{f,t} \tag{10}$$

for product adding, and

$$\Pr(AddC_{f,t}=1)=\gamma FC_{f,t-1}+\boldsymbol{\beta}\mathbf{Z}_{f,t-1}+FE_{c-mix}\times t+\epsilon_{f,t} \tag{11}$$

for country adding, where FC is the usual indicator of constrained firms and $\mathbf{Z}_f$ the usual set of firm characteristics. We also include product-mix or country-mix fixed effects (FE_{p-mix} and FE_{c-mix}), interacted with year fixed effects, controlling for common characteristics of those firms that export the same bundle of products or serve the same geographical area in the initial year $t-1$.[24]

Since selection does not represent an issue, as indeed adding new markets is equivalent to the entry decision itself, the two equations are estimated via a simple Probit, ignoring fixed effects, and via a linear probability model with appropriate fixed effects. In this second case, we also employ a standard 2SLS-IV estimator to correct for endogeneity of the FC dummy, with usual instrument given by the fitted probabilities IV^{FC}. Symmetrically to the dropping analysis, the regressions are performed on the sub-sample of firms who export at least one product or are active in at least one country in $t-1$ (surviving firms). This helps to get rid of confounding factors behind a firm's choice to start exporting for the first time.

Columns 1-3 of Table 4 show the results for product adding. The three specifications provide a consistent picture: constrained firms are significantly less likely to add new products than unconstrained firms. Endogeneity-corrected estimates show that the probability of observing a constrained firm that adds at least one product is 2.9% lower than for an unconstrained firm (2.4 percentage points less compared to an average add rate of 84% among unconstrained firms).[25] Concerning the controls, we find a negative and strongly significant coefficient on age. Paired with the finding that age increases the probability to drop products, this results tends to confirm that older firms are relatively

[24]More precisely, product-mixes are defined as the main sections of the HS classification. Country-mixes are based on aggregation of countries into geographical areas following the geo-economic classification provided by the European Commission (see http://www.coeweb.istat.it/english/default.htm). The US, Canada, Japan, Brazil, India, China and major European countries are each treated as independent geographical destinations, given their obvious importance.

[25]Estimated coefficient on IV^{FC} in the first stage of the 2SLS-IV is 1.409 with a standard error of 0.047.

more involved in exporting more mature products, and thus less likely to switch to new product markets. Availability of collateral has the expected positive sign, with magnitude comparable to the effect of age. Internal resources also have a positive, although much weaker association. The coefficient on size is not statistically significant.

The results for country adding are then presented in columns 4-6. The findings fit well with the picture emerged from product adding regressions. We still observe a negative and significant coefficient on the FC dummy: problems to access external finance significantly reduce the ability to widen geographical diversification. According to the endogeneity-corrected estimates, constrained firms have a 2.3% lower probability to add at least one destination (1.8 percentage points lower compared to an average add rate of 78% among unconstrained firms).[26] The other controls display coefficients quite close to those observed for product adding. The more sizeable coefficients are found for age and for the availability of collateral, which respectively decrease and increase the likelihood to serve new countries. Size and internal resources have a second order relevance, with coefficients only barely significant or not significant at all. In unreported regressions (available upon request), we have confirmed that the results are robust to an explicit control for either the number of products exported or the number of countries served in the initial year.

Altogether, the findings of this section emphasize financial constraints as a relevant factor, previously unexplored, in explaining the process of within-firm selection of products and destinations. More specifically, and read in view of recent attempts to model such processes (cf. Bernard et al., 2010b), the results support that constrained firms benefit from positive shocks less than unconstrained firms, and thus have a reduced probability to add markets, while they are at the same time also more sensitive to adverse shocks, and thus drop more frequently.

7 Financing constraints and export prices

We now turn to explore the association of financing constraints with export prices exploting our dataset at the transaction level. Labeling with UV_{fpc} the (log of the) unit value of export by firm f in product p to country c, we estimate the model

$$UV_{fpc,t} = \gamma FC_{f,t-1} + \boldsymbol{\beta}\mathbf{Z}_{f,t-1} + FE_{pc} + \epsilon_{fpc,t} \quad , \tag{12}$$

where FC_f is the usual dummy for constrained firms, $\mathbf{Z}_f$ the usual set of firm-level controls, and we also include product-country fixed effects, FE_{pc}. This greatly helps identification, as it indeed implies that we ask whether financing constraints influence price variation across firms performing the same product-country transactions.

In Table 5 we report simple FE estimates, and control for selection and endogeneity bias via the Procedure 4.2 described in Section 4.[27]

FE estimates reveal that, conditional on other factors, constrained firms charge higher prices (an increase of 9.4%) than unconstrained firms. The elasticity of size is positive and significant, while availability of collateral associates with lower prices. Age and operational profits do not play any statistically significant role. The results are confirmed when we control for selection and endogeneity bias. However, the estimates in column 3 reveal a downward bias in the FE results: the corrected coefficient on the FC dummy implies that constrained firms set export prices about 74% higher as compared to unconstrained firms.

Combined with the findings on reduced export activities emerged from the firm-level analysis of export margins, the observed pricing behavior of constrained firms is open to different interpretations.

[26] Estimated coefficient on IV^{FC} in the first stage of the 2SLS-IV is 1.321 with a standard error of 0.042.

[27] Moreover due to the too heavy computational power required by the amount of data, the estimates are obtained through the Procedure C.2 described in Appendix C.

Table 5: Financial constraints and price setting at transaction level

	$\ln UV_{fpct}$ FE (1)	$\ln UV_{fpct}$ Procedure 4.2* (2)	$\ln UV_{fpct}$ Procedure 4.2 (3)	$\ln UVImp_{fpct}$ FE (4)
$FC_{f,t-1}$	0.094***	0.102 ***	0.740 **	0.022
	(0.033)	(0.040)	(0.269)	(0.020)
$\ln Empl_{f,t-1}$	0.060***	0.062 ***	0.064 ***	0.039***
	(0.009)	(0.013)	(0.015)	(0.006)
$\ln Age_{f,t}$	-0.005	-0.005	0.019	0.010
	(0.009)	(0.014)	(0.019)	(0.006)
$\ln ASSETS_{f,t-1}$	-0.048***	-0.055 ***	-0.079 ***	0.009
	(0.009)	(0.013)	(0.016)	(0.006)
$\ln GOM_{f,t-1}$	-0.004	-0.004	0.018	-0.006**
	(0.003)	(0.004)	(0.011)	(0.003)
$\hat{\epsilon}_{2fpct}$		-0.010 ***	-0.010 ***	
		(0.003)	(0.003)	
$avg \ln UV_f$				0.182***
				(0.006)
Year FE	Yes	Yes	Yes	Yes
Country-Product FE	Yes	Yes	Yes	Yes
R-squared	0.684			0.740
N.Observations	4374164			806363
N.Firms	53103			29891
N.Product-country groups	271193			56222

Note: Table reports regression using data on 2001-2003. The dependent variable is reported at the top of each column. All the regressions include a constant term. Robust standard errors clustered at firm level are reported in parenthesis below the coefficients. estimates in columns 2-3 are computed with the Procedure C.2 with 100 replications (cfr. Appendix C for details). Asterisks denote significance levels (***:p<1%; **: p<5%; *: p<10%).Procedure 4.2* controls only selection by performing Procedure 4.2 without instrumenting $FC_{f,t-1}$.

Lower export values with higher prices are consistent with a pure efficiency sorting interpretation, where FC firms set higher prices because they operate at lower efficiency (i.e. at higher marginal cost). Also, the findings may be in line with a strategic pricing explanations, with constrained firms that raise prices in the attempt to offset the negative impact on revenues due to reduced export activity, at least partially exploiting demand rigidities. The results are instead difficult to reconcile with models of quality sorting in export, which would predict that constrained firms reduce both quantities and prices as compared to unconstrained firms. Since export prices only represent an indirect signal of quality, however, we also complement the analysis to check if firms that set higher export prices also purchase more costly inputs. While the price of inputs is not usually available in standard industrial data, we can exploit the transaction level prices of imports in intermediate goods, and use the latter to proxy for the overall input prices. We run the following regression

$$\ln UVImp_{fpct} = \gamma FC_{f,t-1} + \delta Avg \ln UV_{f,t} + \boldsymbol{\beta}\mathbf{Z}_{f,t-1} + FE_{pc} + \epsilon_{fpct} \tag{13}$$

where we consider the unit value of import in product p from origin country c, $UVImp$, only for those transactions in products that fall into the intermediate input category identified by CEPII-BACI classification system.[28] Since one cannot know which particular imported input is used to produce a specific exported product, the correlation with export prices is explored by the average unit value of exports across products and destinations, $Avg \ln UV$. This is similar to Manova and Zhang (2012), who however do not investigate the role of financing constraints and other firm-level characteristics,

[28]BACI is the World trade database developed by the CEPII at a high level of product disaggregation. Original data are provided by the United Nations Statistical Division (COMTRADE database). The classification of products by transformation level follows the Broad Economic Categories of the UN (Gaulier and Zignago, 2010).

and only include product fixed effects.[29] We instead include product-country fixed effects, which control for characteristics of each imported good that are common within each origin country. Identification comes therefore from variation across firms that purchase the same inputs from the same country.

The results (see column 4 in Table 5) show that quality may play a role in the data, as indeed we find a positive association between export and input prices. However, controlling for the correlation with export prices and other firm characteristics, the price of imported inputs does not have any significant association with financing constraints. This corroborates that pricing decisions of constrained firms do not reflect quality issues.

8 Conclusions

The present paper provides a comprehensive analysis of the role that financial constraints play in shaping firms' export performance. We use detailed firm-product-country data on the international activities of a sample of firms covering the vast majority of Italian exports. Exploiting information on access to credit measured via credit ratings provided by an independent institution, we extend the existing literature in a number of directions.

First, we find that financially constrained firms export less in value, conditional on entry, and that they serve fewer countries and ship a narrower range of products. Contraction in the intensive margin suggests that access to external credit is relevant in the financing of both fixed and variables costs of exporting. At the same time, reduced activity of constrained firms along product/country extensive margins hints at the existence of relevant country-specific and product-specific fixed costs, which indeed limit the scope of geographical and product diversification. These findings confirm previous evidence. However, by fully controlling for selection and possible endogeneity of financial constraints, we show that the effects of FCs are large, and in generally larger than what estimated when corrections are not taken into account.

Second, by taking a dynamic perspective, we are able to tackle the largely unexplored question whether financing constraints play a role in the dynamic adjustments in product/destination scope of multi-product/multi-destination firms over time. We find that financing constraints increase the probability to drop products or destinations, and decrease the probability to add new products or new destinations. More generally, therefore, financing constraints tend to hamper an effective reallocation of resources from (product or destination) markets that over time become less profitable to markets that becomes more profitable. As above, specific treatment of selection into export and possible endogeneity of the financing constraint proxy reveal that these effects are sizable.

Finally, this is the first paper documenting the interplay between firm-level credit conditions and export prices. We show that, once again controlling for selection and endogeneity, constrained firms set higher prices as compared to unconstrained firms which perform transactions in the same product to the same destination market. The finding is consistent with models of efficiency sorting, where constrained firms are predicted to sell at higher prices due to low efficiency, and also in line with the idea that prices are indeed a strategic variable that constrained firms adjust in the hope to keep operations and to sustain revenues. Our evidence seems instead to contrast with theories of quality sorting into export. Since quality is costly, one would expect that constrained firms reduce prices as compared to unconstrained firms, but we observe just the opposite.

[29] Following Manova and Zhang (2012) average unit value of export is computed as the average of the unit values of all the export (product-destination) transactions of a firm (in logs), de-meaned by their product specific averages (i.e. across firms and destinations) and weighted by the share of each transaction in the overall export revenues of a firm.

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A Appendix

COE

In compliance with the common framework defined by the European Union (EU), there are different requirements in order for a transaction to be recorded, depending on whether the importing country is an EU or NON-EU country, and on the value of the transaction. As far as outside EU transactions are concerned, there is a good deal of homogeneity among member states as well as over time. Since the adoption of the Euro, Italy set the threshold at 620 euro (or 1000 Kg), so that all transactions bigger than 620 euro (or 1000 Kg) are recorded.For all of these recorded extra-EU transactions, the COE data report complete information, that is, also information about the product quantity and value. Transactions within the EU are collected according to a different systems (Intrastat), where the threshold on annual value of transactions qualifying for complete record are less homogeneous across EU member states, with direct consequences on the type of information reported in the data. In 2003 (the last year covered in the analysis), there are two cut-offs. If a firm has more than 200,000 euro of exports (based on previous year report), then she must fill the Intrastat document monthly. This implies that complete information about product is also available. Instead, if previous year export value falls in between 40,000 and 200,000 euro, the quarterly Intrastat file has to be filled, implying that only the amount of export is recorded, while information on the product is not. Firms with previous year exports below 40,000 euro are not required to report any information on trade flows. Thus, firms which do not appear in COE are either of this type (i.e. marginal exporters) or do not export at all.

Representativeness

Table 6 shows that the representativeness of the dataset is quite high: although the dataset includes about 20% of all manufacturing in terms of number of firms, the data cover about 60% of exporting firms, and about 84% of the total value of exports.[30] This picture is explained by the well known abundance of micro and small firms in Italian manufacturing, together with the observation that the legal status of limited firm tend to be more spread across medium-bigger firms. Yet, despite relatively few in terms of number of active firms, one expects that medium-big firms account for the great bulk of overall export activities in the country. This would be in line with well established results across different countries. In agreement with this, Table 7 shows that the firms in our sample are slightly bigger and more productive, on average, than the population of manufacturing firms. At the same time, however, we do not observe big differences when we focus on exporting firms: the average size, productivity, export values, number of exported products and number of destinations served do not differ significantly between our sample and the population.

[30] We report 2003 data, but figures are comparable in the other years.

Table 6: Coverage of the dataset, Manufacturing: Number of firms, number of exporters and export value (2003)

	OVERALL			EXPORTERS			EXPORT VALUE		
Sector	ASIA-COE (Number)	Our dataset (Number)	Coverage %	ASIA-COE (Number)	Our dataset (Number)	Coverage %	ASIA-COE (billion)	Our dataset (billion)	Coverage %
15	71345	8882	12.45	4926	2875	58.36	12.1	9.4	77.77
17	27762	6408	23.08	5680	3447	60.69	12.5	10.8	86.70
18	41615	6134	14.74	5035	2655	52.73	9.7	8.1	83.56
19	21985	4495	20.45	5688	2644	46.48	10.8	8.8	81.62
20	46584	3550	7.62	2458	978	39.79	1.5	1.3	83.88
21	4566	1951	42.73	1328	884	66.57	4.0	3.8	95.28
22	27344	7801	28.53	2164	1239	57.26	1.7	1.6	91.25
23	443	333	75.17	84	73	86.90	3.8	3.7	99.25
24	6127	3529	57.60	2595	1988	76.61	22.6	16.3	71.80
25	13084	5575	42.61	4421	2970	67.18	10.4	8.9	85.72
26	27230	6218	22.84	4522	2176	48.12	7.2	6.2	86.18
27	3814	1893	49.63	1335	1016	76.10	9.9	8.7	88.21
28	99519	19551	19.65	10280	5774	56.17	12.6	11.2	89.26
29	42391	14710	34.70	12128	8193	67.55	43.3	38.0	87.61
30	1976	822	41.60	262	185	70.61	1.5	1.3	91.19
31	18316	5315	29.02	3214	2131	66.30	8.1	6.6	82.12
32	8671	1665	19.20	911	609	66.85	5.2	3.7	71.02
33	22399	3073	13.72	1920	1357	70.68	4.6	3.9	85.18
34	1962	1122	57.19	918	687	74.84	17.8	15.3	85.86
35	4684	1541	32.90	819	498	60.81	6.7	4.9	73.84
36	50018	7873	15.74	8663	4195	48.42	12.1	10.4	85.96
Total	541835	112441	20.75	79351	46574	58.69	218.1	183.0	83.93

Table 7: Descriptive Statistics: ASIA-COE vs Our dataset (2003)

	ASIA-COE			Our Dataset		
	Mean	Sd	Observations	Mean	Sd	Observations
Manufacturing firms						
$\ln Empl.$	1.12	1.14	541836	2.13	1.38	112441
$\ln TS/Empl.$	3.78	1.12	518839	4.65	1.09	110160
Manufacturing Exporters						
$\ln Empl.$	2.43	1.35	79352	2.85	1.32	46574
$\ln TS/Empl.$	11.74	0.94	77068	11.99	0.82	46073
$\ln Export$	4.71	2.74	79352	5.52	2.67	46574
$\#Countries$	8.77	12.92	79352	11.66	14.74	46574
$\#Products$	8.04	14.7	79352	10.36	17.15	46574

B Appendix

We present here descriptive evidence on the different exporting dimensions considered in this work, comparing NFC and FC firms. Results refer to 2003, but they remain stable over the sample period.

Figure 1 reports empirical densities of export values, number of exported products and number of destination countries per firm (all in logs), together with empirical densities of physical quantities and unit values per transaction. Visual differences between NFC and FC are statistically confirmed by a Fligner-Policello test of stochastic dominance.[31]

Table 8 provides number of observations together with mean and median values of the relevant export dimension, for the entire sample and the two FC classes, also distinguishing by age of the firms.

C Appendix

In order to estimate equation (8) according to Procedure 3.2 it is necessary to identify the basket of products potentially but not actually exported by each firms. This is indeed a required step to impute 'zeros' in the dataset and estimate the Tobit in Procedure 3.2. Since it is not reasonable to assume that each firm can in principle export any of the product present in the dataset we constrain their choices on the base of the HS classification. In order to do that we adopt the following procedure:

Procedure C.1

1. *we define product categories PC_i based on the HS4 classification;*
2. *we choose one category and we select all the firms F_{PC_i} that export at least one HS6 product inside PC_i;*
3. *we define a product list PL_{PC_i} containing all the different products exported by the firms in F_{PC_i};*
4. *we assign to each firm in F_{PC_i} the value of export of each product in PL_{PC_i} if it exists and 0 if not;*
5. *we repeat 2-4 for each category in PC_i and we merge all the data.*

After this procedure we obtain a dataset with 10,172,730 observations with about 13% of nonzero figures. Then we apply Procedure 3.2 to estimate equation (8).

In estimating equation (9) we do not have a similar problem: it is, indeed, rather reasonable to assume that a firm can in principle export in any of the available countries. In this case, however, a computational problem emerges generated by the high number of possible destinations. We decide to overcome the issue by ranking all the destination countries in terms of value of export and then simply cutting out the bottom 50% of the distribution. This seeming drastic cut in the data remove from the dataset less than 0.5% of the total value of the italian export.

Finally also in estimating equation (13) we face a computational problem due to the size of our dataset. Indeed, working at the transaction level one hasmore than 6 millions of observations even before inflating it with the zeros. This enourmous amount of data makes unfeasible the application, *sic et simpliciter*, of Procedure 4.2. To overcome this problem we implement the following

Procedure C.2

1. *draw a 10% panel random subsample from the original dataset;*
2. *inflate the subsample according to Procedure C.1 above;*
3. *apply Procedure 4.2 to the inflated subsample to estimate equation* (13).

Then using bootstrapping techniques we derive the point estimate of the parameters of insterest with the proper measure of error.

[31] The test is presented in Fligner and Policello (1981) and can be interpreted as a test of stochastic dominance in the case of asymmetric samples. The Test statistics and p-values are obtained using the open source software *gbutils* available at http://www.cafed.sssup.it/software/gbutils/gbutils.html.

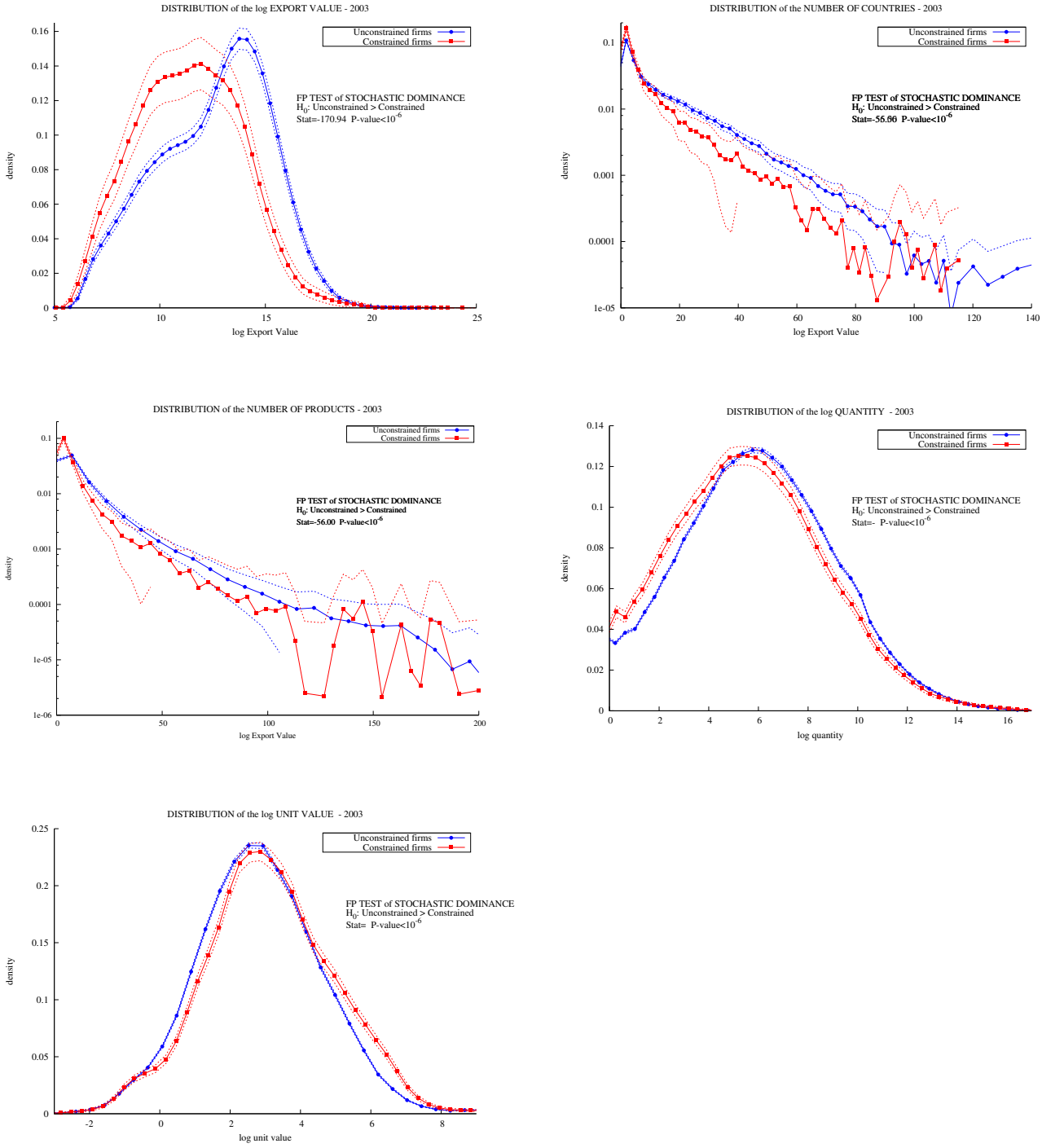

Figure 1: Figures report kernel density estimates of export value, number of destinations and number of exported products at firm level, and physical quantity and unit values at transaction level, comparing financially constrained vs. unconstrained firms – year 2003. Solid lines represent kernel density estimates, with 1% confidence band in dashed. Kernel is the standard Epanenchnikov for continuous variables, and a compact rectangular kernel for the discrete variables. The bandwidth is set according to the optimal rule presented in Silverman (1986).

Table 8: EXPORT PERFORMANCE and FINANCIAL CONSTRAINTS BY AGE CLASSES - 2003

	Whole Sample						Non Financially Constrained						Financially Constrained					
Firm's age (years)	Obs.	Exp. value: mean (median)	Products: mean (median)	Countries: mean (median)	log Q: mean (median)	log UV: mean (median)	Obs. (%)	Exp. value: mean (median)	Products: mean (median)	Countries: mean (median)	log Q: mean (median)	log UV: mean (median)	Obs. (%)	Exp. value: mean (median)	Products: mean (median)	Countries: mean (median)	log Q: mean (median)	log UV: mean (median)
0-4	5,325	1,218.79	7.02	6.90	5.74	2.94	4,302	1,321.30	7.31	7.19	5.78	2.92	1,023	787.71	5.79	5.68	5.53	3.10
		(104.22)	(3.00)	(3.00)	(5.70)	(2.90)	(80.8)	(118.05)	(3.00)	(3.00)	(5.73)	(2.86)	(19.2)	(64.00)	(3.00)	(2.00)	(5.44)	(3.16)
5-10	8,529	2,074.65	8.15	8.73	5.80	2.93	7,672	2,192.11	8.37	9.02	5.82	2.92	857	1,023.07	6.24	6.16	5.45	3.01
		(192.00)	(4.00)	(4.00)	(5.76)	(2.86)	(90.0)	(215.95)	(4.00)	(4.00)	(5.78)	(2.86)	(10.0)	(69.01)	(3.00)	(2.00)	(5.42)	(2.91)
11-20	13,100	3,398,35	10.73	11.95	5.88	2.91	12,340	3,507.76	10.95	12.26	5.90	2.90	760	1,621.87	7.17	6.86	5.30	3.39
		(412,19)	(5.00)	(6.00)	(5.83)	(2.84)	(94.2)	(445.22)	(5.00)	(6.00)	(5.86)	(2.83)	(5.8)	(97.73)	(3.00)	(3.00)	(5.19)	(3.19)
21-30	9,029	4,624.59	12.62	15.05	5.99	2.82	8,705	4,690.40	12.78	15.28	6.00	2.82	324	2,856.26	8.40	8.87	5.47	3.19
		(774.57)	(7.00)	(9.00)	(5.97)	(2.77)	(96.4)	(815,52)	(7.00)	(9.00)	(5.98)	(2.76)	(3.6)	(163,62)	(4.00)	(4.00)	(5.35)	(3.14)
30-∞*	5,838	9,762.80	15.31	18.08	6.21	2.75	5,661	9,887.17	15.50	18.33	6.20	2.75	177	5,785.01	9.47	10.12	6.51	2.70
		(1,247.18)	(8.00)	(12.00)	(6.10)	(2.73)	(97.00)	(1,315.28)	(8.00)	(12.00)	(6.10)	(2.73)	(3.0)	(209.43)	(3.00)	(4.00)	(6.37)	(2.61)
Total*	41,821	4,004.06	10.78	12.18	5.97	2.85	38,680	4,203.69	11.11	12.62	5.98	2.84	3,141	1,548.74	6.72	6.68	5.54	3.13
		(403.73)	(5.00)	(6.00)	(5.91)	(2.80)	(92.5)	(458.88)	(5.00)	(6.00)	(5.93)	(2.79)	(7.5)	(82.46)	(3.00)	(3.00)	(5.44)	(3.05)

Export values in thousands of euro, quantities in (log) Kg and UV in (log) euro/Kg.

**Statistics in these lines are computed removing one very large firm in the FC class. Including this observation, mean values of export, number of products, number of countries, (log) quantity and (log) unit value are 10,735, 15.35, 18.10, 5.97 and 2.86 for the whole sample and 37,719.60, 10.87, 10.61, 5.59 and 3.12 for the FC firms older than 30 years (cfr. line '30-∞'). If we pool together different age class (cfr. line 'Total') for the whole sample we get 4,140.19, 10.79, 12.18, 5.97 and 2.86 while for FC firms 3,359.24, 6.80, 6.70, 5.59 and 3.12.*