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Credit rationing and firm exports: evidence from developing countries

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Abstract

We study the relationship between credit constraints and export behavior using a large and heterogeneous sample of firms from 25 developing countries between 2003 and 2014, following an instrumental variable approach that uses firm-level instruments, and measuring credit constraints by means of each firm's self-assessment of whether it is credit rationed. We find robust evidence of a negative, statistically and economically significant effect of financial constraints on both the probability that a firm exports (the extensive margin of exports) and the share of exports over total sales (the intensive margin of exports).

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1. Introduction and related literature

Credit availability can have first order effects on firms' internationalization. To study this issue, we analyze the relationship between credit constraints and export behavior in a large sample of firms from 25 developing countries between 2003 and 2014. We find evidence of a negative effect of financial constraints on both the probability that a firm exports (i.e., the extensive margin of exports) and the share of exports over total sales (i.e., the intensive margin of exports).

The intuition behind the link between financial constraints and exports hinges on the fact that to sell their products abroad firms must pay relevant upfront costs. These costs can be of two types: sunk and fixed costs, such as those related to customs and regulatory compliance or those required for establishing a foreign distribution network (Chaney, 2013); and variable costs related to the fact that international transactions require a larger amount of time to execute, and the time span between the payment of upfront costs and the subsequent cash flows from selling products abroad is typically longer than that characterizing activities in the domestic market (Manova, 2012). In both cases, these costs must be paid upfront, increasing the working capital requirements of exporting firms with respect to those selling only in the domestic market, and in turn increasing their demand for external finance. As a result, better access to external finance increases the ability of firms to access export markets, affecting both the decision of entry (i.e. the extensive margin) and the volume of exports (i.e. the intensive margin).

Building on the seminal theoretical contributions of Manova (2012) and Chaney (2013), a growing body of empirical literature has analyzed the impact of financial conditions on exports. What is meant by financial conditions is rather heterogeneous: it ranges from a country's financial development (e.g., Manova, 2008), to firms' balance sheet characteristics (e.g., Greenaway et al., 2007), to self-assessments by firm on whether they are credit constrained (e.g., Minetti and Zhu, 2011, or Wang, 2016).

The available empirical literature can be broadly divided into three main strands, depending on the characteristics of the sample analyzed. The first group includes single-country, firm-level analyses. Starting from the seminal contribution by Greenaway et al. (2007), who study a large sample of UK manufacturing firms, many authors have replicated and extended their analysis, including: Feenstra et al. (2014), Manova et al. (2015), Egger and Kesina (2014)) for China; Bellone et al. (2010) and Stiebale (2011) for France; Buch et al. (2010) and Wagner (2014) for Germany; Minetti and Zhu (2011) and Secchi et al. (2014) for Italy. The second group comprises cross-country, industry-level analyses, such as Manova (2008 and 2012). Finally, the third group includes a few papers using cross-country, firm-level data: Berman and Hericourt (2010), who studies a sample of firms from 9 developing and emerging countries; Fauceglia (2015) who studies a larger sample of 18 developing countries; and Wang (2016), who studies a larger sample of 26 East European and Central Asian countries. This last set of studies uses data from the World Bank Enterprise Survey (WBES), that

provides firm-level information for many different countries, including a self-assessment by the firm on whether it is credit constrained.[1]

With some caveats, the overall picture that emerges from the past empirical literature confirms the predictions of the theoretical models of Chaney (2013) and Manova (2012), providing convincing evidence of a negative effect of the presence of financial constraints on a firm's propensity to export. This suggests that to improve their export performance, countries need to improve their financial environments.

An important issue that has been emphasized in this literature is that firms' financial constraints and their exports behavior are jointly determined. Indeed, theoretical models typically show that the relationship between internationalization and the availability of external finance does not go in a single direction, but it is bilateral. In fact, one of the first empirical analysis in this field of research, Greenaway et al. (2007), looks at whether firms' internationalization reduces their credit constraints, focusing on a causation that goes in the opposite direction with respect to most of the following literature.

To address potential endogeneity problems, a number of authors study the effect of firm-level credit constraints using an instrumental variable approach. For example, Wang (2016) uses country-level characteristics of the legal framework as instruments for firms' credit constraints. Similarly, Minetti and Zhu (2011) use characteristics of the local area where a firm operates as instruments for the probability that a firm declares to be credit constrained. Jinjarak and Wignraja (2016) use instead firm level characteristics as instruments for whether firms need bank loans to finance working capital and whether they have access to overdraft facilities. All these papers provide corroborating evidence of the existence of a financial constraint-export nexus. In a seminal contribution using matched customs and firm-level bank credit data from Peru, Paravisini et al. (2015) show that credit shocks that affected banks during the 2008 financial crisis influenced the intensive margin of exports, but have no significant impact on the product and destination market participation.

Our paper provides two original contributions to the literature. First, it studies a larger and more heterogeneous sample of firms from about 25 developing countries between 2003 and 2014 with respect to previous papers.

Second, it follows an instrumental variable approach using higher quality firm-level instruments. Our starting point is that firms that use internal funds to finance the working capital are more likely to be credit constrained by the bank. As pointed by Distinguin et al. (2016), SMEs depend heavily on internal funds or profits to finance their operations, especially in less developed economies. Provided that formal financial institutions rely on hard information such as financial statements in deciding loan approval, firms that use mainly internal funds might not have an established relationship with the banks, and for this reason they are more likely to be credit rationed. However, operating in a country with a high share of public or foreign banks reduces this risk. Clarke et al. (2006), for instance, argue that all enterprises, including small and medium-sized ones, report facing lower financing

[1] An exception is provided by Aristei and Franco (2014) investigating the role of credit constraints on export, import, and two-way trade activities of European manufacturing firms using the European Firms in a Global Economy (EFIGE) survey.

obstacles in countries having higher levels of foreign bank presence. This suggests that firms that have a lower share of working capital financed by internal funds and operate in countries with a stronger incidence of foreign banks are more likely to be credit constrained. An additional set of instruments is based on the circumstance that firms that are allowed to pay for purchases of material inputs or services after delivery are less likely to be credit constrained. Dinh et al. (2010), for instance, show that sales credit has a positive effect on firm's growth. Our attention to adequately address endogeneity issues adds to the fact that we measure credit constraints using a more reliable measure provided by each firm's self-assessment, rather than through balance sheet characteristics.

Our findings provide additional robust evidence that the impact of credit rationing of firms' exports, at both extensive and intensive margins, is statistically and economically significant.

The rest of the paper is organized as follows. Sections 2 and 3 describe the data used in the empirical analysis and the empirical methodology adopted, respectively. Baseline results of the econometric analysis are presented in Section 4; section 5 presents some additional results on subsamples. Section 6 concludes.

2. Data and summary statistics

To test the hypothesis stated in previous section, we adopt firm-level data drawn from the World Bank Enterprise Survey (WBES) and collect the available data for a sample of 25 developing countries, over the period 2003-2014.[2] We end up with about 12,674 observations on 12,544 firms. This means that the database includes only a small panel component of about 130 firms. Our analysis relies primarily on the pooled 2003-2014 data since it is hard to detect robust relationship with a small panel of heterogeneous firms, especially when using many control variables (Gorodnichenko and Schnitzer, 2013).[3]

The WBES survey includes the necessary information to construct the firms export performance, in terms of extensive and intensive margin, the credit rationing from financial institutions, the additional firm level control variables and the instrumental variables required to deal with the endogeneity of credit rationing.

The dependent variables are constructed from the percentage of total exports over the establishment's sales. The *extensive margin of exports* is defined by a dummy variable equal to 1 whether firm exports (directly or indirectly) at time *t* and zero otherwise, whereas the *intensive margin of exports* is the share of total exports over sales at time *t*.

WEBS collects information on self-reported measures of access to finance: "At this time, does this establishment have a line of credit or a loan from a financial institution?", "Did this establishment apply for any loans or line of credit?" and "What was the main reason why this establishment did not apply for any line of credit or loan in fiscal year? (application procedures for loans or line of credit are complex, interest rates are not favorable, collateral requirements are too high, size of loan and maturity are insufficient, did not think it would be approved, other)". These measures of financial

[2] The sample includes: Argentina, Bolivia, Botswana, Brazil, Burkina Faso, Chile, Colombia, Ecuador, Egypt, El Salvador, Ghana, Guatemala, Honduras, Kenya, Mali, Mexico, Nigeria, Pakistan, Panama, Paraguay, Peru, Senegal, South Africa, Uruguay, Venezuela.

[3] For simplicity, we use the term firms throughout the paper, though the analysis is based on establishment data.

constraints capture the constraints firm faces when trying to finance investment. The main explanatory variable is constructed based on this information. *Credit rationing* is, indeed, a binary variable that equals 1 if firm *i* faced credit rationing and 0 otherwise at time *t*: credit rationing incurs either whether (i) firm *i* applied for a loan, but did not receive it (*bank rationing*) or when (ii) firm *i* did not apply for a loan because of too stringent collateral, interest rate too high, expectation to be denied (*self rationing*).[4]

To address the endogeneity of credit rationing, we adopt three sets of instrumental variables, considering that the probability of being rationed is likely to be determined by the extent of credit risk of a firm, the supply side of the credit market, the shocks to cash flows, as well as other firm attributes. The credit risk is taken into account by introducing the proportion of the establishment's working capital financed from internal funds and/or retained earnings (*working capital financed by internal funds*).[5] The second set of instruments is motivated by the relevance of the supply side in the credit market and includes two interaction terms: *share of government banks*working capital financed by internal funds* and *share of foreign banks*working capital financed by internal funds*, the interactions between the share of public banks and foreign banks in a country, respectively, and the share of working capital financed by the firm's internal funds. The third set of instruments is motivated by information on shocks to firms' cash flow and internal funds, which may affect the probability of being financially constrained. The WBES collects information on whether or not firms are allowed to pay for purchases of material inputs or services after delivery, which is reported as a response to exogenous shocks in cash flow.[6] In particular, we create three dummies indicating the tercile of the distribution of this share and we use two dummies for the second and third tercile to instrument for credit rationing (*payment after delivery (second tercile)* and *payment after delivery (third tercile)*). In what follows, we provide evidence that these instruments are reliable and exogenous measures of financial constraints.

The paper also includes a set of control variables suggested by the literature (see, for example, Gorodnichenko and Schnitzer (2013)). WBES collects several firm level characteristics that are likely to affect export performance. First, we control for firm *size*, measured by the number of permanent full-time employees and managers. Large companies have more resource to invest in exports. The *labor productivity* is measured by the share of total annual sales over the number of employee and is largely accepted in the literature as a determinant of exports (Melitz, 2003). Another firm-level characteristic affecting export is *age*, measured by the number of years since firm foundation, capturing firm experience. The *share of temporary employees* is measured by the number of full-time temporary employees over the total employment. The *share of skilled workers* is the share of permanent full-time employees that were skilled production workers. *Competition in national market* is measured by a dummy variable equal to 1 whether the main market in which the firm sold its main

[4] This definition of credit rationing excludes firms that received a bank loan and firms that did not demand for a loan because of no need.

[5] The relative question in the WEBS is the following: "Over fiscal year, please estimate the proportion of this establishment's working capital that was financed from each of the following sources?" with an alternative answer "Internal funds/retained earnings (%)."

[6] The relative question is the following "What percentage, as a proportion of the value of total annual purchases of material inputs or services were paid for after delivery?".

product is the national one and zero in case it is local or international. *Capacity utilization* reflects the output produced as a proportion of the maximum output possible if using all facilities available.

In terms of export performances, about 34% of firms in our sample exports, directly or indirectly, to foreign markets, showing an average export share of about 12%. Credit rationed firms represent about 23% of our sample. About 61% of the working capital of firms is financed by internal funds of firms and about 55% of firms obtains payment after delivery on purchases.

Table 1 presents some descriptive statistics distinguishing between credit constrained and unconstrained firms. Constrained firms are less likely to export (24% vs. 37%) and they export a lower percentage of total sales (8% vs. 12%). As shown by the *t*-test, these performances are significantly different between the two groups of firms. Constrained firms are also smaller (48 vs 128 employees), slightly younger (21 vs 26 years), less likely to compete in national markets (4 percentage points less than unconstrained firms), with a lower capacity utilization (3 percentage points less than the unconstrained firms) and with a higher share of working capital financed by internal funds (66% vs 59%). Considering the second percentile of *payment after delivery*, we notice that the two subsamples show similar probability (31% vs 28%), while for very high percentage of credit purchases the probability is higher in the unconstrained group (29% vs 45%).

[Table 1]

Table 2 presents the bilateral correlations. As expected, margins of trade are highly and positively correlated (0.65). Moreover, both margins are positively correlated with the number of employees (0.2) and the firm experience (0.2 and 0.03, respectively) meaning that larger and older firms are more likely to export and to export a higher percentage of sales than small and younger firms. Labor productivity slightly correlates with export performance (about 0.02 in both cases), confirming also results reported in Table 1. Interestingly, the dummy variable for firms that are credit constrained shows a negative correlation with extensive and intensive margin of exports (-0.12 and -0.07), confirming our expectations that financially constrained firms export less. Credit rationing is also negatively correlated with firm size and age meaning that larger and younger firms are less likely of being credit constrained. Concerning our instrumental variables, the correlations show that the probability of credit rationing is lower for high percentages of purchases paid for after delivery and is higher for firms using internal funds for investment in working capital.

[Table 2]

While descriptive statistics and bilateral correlations provide some preliminary evidence consistent with the hypothesis that credit constrained firms face stronger impediments to their export activity, they may indeed be due to some spurious effects. For example, smaller firms are at the same time more likely to be credit constrained and have a lower degree of internationalization. To control for these effects, as it is customary we now move to a more rigorous econometric analysis.

3. Empirical methodology

3.1 The regression analysis

The empirical methodology adopted in this paper mirrors the one described in Minetti and Zhu (2011). We first examine the effect of credit constraints on the extensive margin of exports, that is, the probability of exporting. Under the assumption that ε_i is a normally distributed random error with zero mean and unit variance, the probability that firm *i* exports can be written as:

$$\begin{aligned}\Pr(Export_{ikct}=1) &= \Pr(\alpha_1+\beta_1 CR_{ikct}+\gamma_1 Z_{ikct}+\nu_k+\lambda_c+\eta_t+\varepsilon_{ikct}>0)\\ &= \Phi(\alpha_1+\beta_1 CR_{ikct}+\gamma_1 Z_{ikct}+\nu_k+\lambda_c+\eta_t)\end{aligned} \quad (1)$$

where *i* indexes for firm, *k* for sector of economic activity, *c* for country and *t* for year. In specification (1) the dependent variable $Export_{ikct}$ is equal to 1 if firm *i* exported at time *t* and zero otherwise. Our key explanatory variable, CR_{ikct} is a binary variable that equals 1 if firm *i* faced credit rationing and 0 otherwise at time *t*, as specified in previous section.

To deal with the omitted variable issue, we include Z_{ikct}, which is a vector of controls for firm characteristics that may affect exports: size, productivity, age, share of temporary and skilled workers, competition in national market and productive capacity. In addition, we include three sets of fixed effects: ν_k captures differences in relative prices that may result from differing sectoral factor prices or demand conditions, λ_c captures time invariant country-level characteristics, η_t captures time shocks. ε_{ikct} captures the unobserved firm attributes and any other unknown factor that may also affect exports.

As predicted by the literature (Manova, 2012; Chaney, 2013), when a firm faces credit rationing it may not have enough liquidity to cover the cost of entering a foreign market and may be less likely to export: we expect $\beta_1<0$. However, when estimating equation (1), credit rationing may be endogenous. The endogeneity arises from the possible correlation between the unobserved determinants of firm's export participation decision and the unobserved determinants of credit rationing (Minetti and Zhu, 2011).

We aim to find that with the help of firm-specific instruments described in the previous section we can successfully identify the negative impact of financial constraints for firms in transition economies. Equation (1) is first estimated as a linear probability model (LPM) and then using a probit model with binary endogenous regressors. In general terms, in a LPM the probability of observing a 0 or 1 is treated as depending on one or more explanatory variables, whose coefficients are estimated using least squares. A drawback of this model is that the estimated coefficients can imply probabilities outside the interval [0;1]. However, the OLS estimation of the LPM is attractive because it consistently estimates the parameters in the linear projection of the dependent variable on the explanatory variables (Wooldridge (2010), p. 563). A probit model is instead a binary classification model estimated using a maximum likelihood function. To deal with the endogeneity issue, we adopt a LPM estimated by 2SLS as our preferred specification.

The impact of credit rationing on the intensive margin of exports is estimated by the following equation:

$$y_{ikct} = \alpha_1 + \beta_1 CR_{ikct} + \gamma_1 Z_{ikct} + \nu_k + \lambda_c + \eta_t + \varepsilon_{ikct} \quad (2)$$

where y_{ikct} is the share of direct and indirect exports over total sales and other variables are defined as above. Equation (2) is estimated as a linear model, using instrumental variables for credit rationing. Provided that the dependent variable in equation (2) is a doubly truncated random variable, its values vary between 0 and 1 by definition and this variable often takes the value of zero, a generally used approach to deal with the problem of censored samples is the Tobit model.[7] This model uses all the available information from the explanatory variables, including those for which the dependent variable is zero.

3.2 The propensity score matching

As explained in the previous section, the problem considered in this paper is the evaluation of the causal effect of credit rationing on export performance. This suggests that it is possible to use a propensity score matching procedure, where *CR* is the treatment indicator taking values 0 or 1, indicating whether firm *i* is credit rationed by the bank at time *t*. $Export^1_{ikct}$ is the dummy of exports associated to being credit rationed and $Export^0_{ikct}$ is the performance indicator associated to not being credit rationed. Similarly, y^1_{ikct} is the export share associated to credit rationing and y^0_{ikct} is the export performance for not credit rationed firm. The effect of credit rationing for firm *i* at time *t* is, therefore, defined as: $Export^1_{ikct} - Export^0_{ikct}$, for the extensive margin of exports and $y^1_{ikct} - y^0_{ikct}$, for the intensive margin of exports.

Therefore, the average effect of credit rationing is defined as:

$$E\{Export^1_{ickt} - Export^0_{ickt} | CR = 1\} = E\{Export^1_{ickt} | CR = 1\} - E\{Export^0_{ickt} | CR = 1\} \quad (3)$$

$$E\{y^1_{ickt} - y^0_{ickt} | CR = 1\} = E\{y^1_{ickt} | CR = 1\} - E\{y^0_{ickt} | CR = 1\} \quad (4)$$

Although the first term of equation (3) is identified in the data by $E\{Export_{ickt} | CR = 1\}$, the last term $E\{Export^0_{ickt} | CR = 1\}$, i.e. the export performance that credit rationed firms would have experienced, on average, if they would have not been credit rationed, needs to be identified. A similar reasoning applies to equation (4), considering the intensive margin as an outcome.

An important feature in the construction of the average unobserved counterfactual is the selection of a valid control group (Girma et al., 2003). In this context, the conditional independence assumption (CIA) postulates that given a set of observed characteristics, the (counterfactual) distribution of $Export^0_{ickt}$ for firms being credit rationed is the same as the (observed) distribution of $Export^0_{ickt}$ for firms not credit rationed (Sianesi, 2004). In so doing, we can use the (observed) mean outcome of the non-treated to estimate the mean (counterfactual) outcome of the treated. Matching techniques allow to pair each constrained firm with a firm that is not constrained based on some observable variables. In this paper, we adopt the propensity score-matching (Rosenbaum and Rubin, 1983), which uses the

[7] To deal with the fractional response variable bounded between zero and one and to account for the nature of the export to sales ratio, we adopt the Generalized Linear Model (GLM) developed by Papke and Wooldridge (1996). The share of exports in total sales is therefore estimated using a maximum likelihood with Bernoulli distribution and a logit link function, following Jinjiarak and Wignaraja (2016). Reassuringly, our results (available on request) are robust to this methodology.

probability of credit rationing conditional on the characteristics of firms to match the firms.[8] Matching is then performed based on a single index that captures all the information from the (observable) characteristics of the firm. Accordingly, we first identify the probability of credit rationing (or 'propensity score') using the probit model of a binary variable indicating if a firm experienced a shortage on loan demand in time *t* on relevant plant level characteristics. Then, we employ different matching techniques that allow to select comparison groups as similar as possible to the treatment group, in term of their observable characteristics.[9] In particular, we adopt the 1-to-1 matching and, following Sianesi (2004), the nearest neighbour method with replacement (without caliper and with caliper at 0.5%). Both methods require to associate to the outcome ($Export_i$ or y_i) of treated unit *i* a matched outcome given by the outcome of the most observably similar control unit.

4. Baseline results

4.1 The extensive margin of exports and credit rationing

The results obtained estimating equation (1) on the extensive margin of exports are presented in Table 3. Our baseline sample includes 12,674 observations.

[Table 3]

Columns 1 and 2 report the results obtained estimating linear probability and probit models on the dummy for exports, including credit rationing and controlling for many firm-level characteristics. The R^2 in both specifications reveals that our explanatory variables account for about 24% of the variability of exporting probability, considering sector, country and year fixed effects. The coefficients obtained using both estimation methods show the same signs and significance. Our variable of interest, *credit rationing*, has the expected negative coefficient in both specifications (-0.035 and -0.128, respectively) and is statistically significant at the 1% level. Consistent with the previous literature, we do find that credit rationing binds the decision of export in foreign markets at firm-level. In terms of economic significance, marginal effects reported in column 3 reveal that, other individual characteristics being equal (for instance, size, age, productivity), the probability that a credit constrained firm exports is about 4 percentage points lower than that of an unconstrained firm.

Some interesting additional findings are given by the control variables, revealing that larger, more productive and firm with a higher share of temporary workers are more likely to export. Looking at their marginal effect, the most influential characteristic is firm size, that helps to increase the export probability by about 13 percentage points. These results are consistent with most part of the literature showing that larger firms have more resources to face international activities. On the other hand, firms whose main market of competition is the national one and those with a high share of skilled workers do not affect their probability of exporting. Firm experience and capacity utilization are irrelevant for the decision of exporting.

As argued by in the literature, the results reported above may suffer from the endogeneity of the *credit rationing* measure. For this reason, we have performed an augmented regression test (Durbin-Wu-Hausman test), by including the residuals of the endogenous right-hand side variable (*credit*

[8] Sianesi (2001) provides the Stata programme to perform the propensity score matching.
[9] In other words, we select from the non-treated pool a control group in which the distribution of observed variables is as similar as possible to the distribution in the treated group (Sianesi, 2001).

rationing), as a function of all exogenous variables, in a regression of the original model (with export performance as dependent variables). Since the residuals proved to be statistically significant, both probit and the OLS estimators are inconsistent. For this reason, our next step is to present the results obtained estimating equation (1) by the 2SLS. As already discussed above, we use a variable indicating the share of working capital financed by internal funds, its interaction with the shares of government and foreign banks at the country level and two dummies indicating the percentile of the distribution of the percentage of purchases paid for after delivery as instruments to *credit rationing*. In the first stage, we report the coefficients of our instruments on the endogenous variable, including other firm-level characteristics. In the second stage, we report the coefficient of our endogenous variable, instrumented in the first stage, again controlling for individual characteristics. These results are reported in columns 4-5.

The first stage of the linear model (columns 5) reveals that a higher share of working capital financed by internal funds exerts a positive impact on the probability of being credit constrained. Conversely, we get negative impacts of this variable interacted with government and foreign banks and of the dummy for very high shares of payment after delivery on credit constraints.[10] Looking at the second stages results (columns 4), we get negative coefficients for credit rationing (-0.698 for 2SLS) significant at the 1% level. This evidence confirms that a credit rationed firm is less likely to export than a firm that can rely on external resources to finance exporting activities. Testing for the validity of the instruments, we find: that (i) the Hansen test of overidentifying restrictions cannot reject the joint null hypothesis that the instruments are valid instruments, i.e., uncorrelated with the error term, and that the 'excluded instruments' are correctly excluded from the estimated equation; and (ii) that the *F*-statistic for the first stage of the instrumental variable linear model is 30.27 with a *p*-value equal to 0.000, testing the null hypothesis that variables have jointly zero coefficients in the first stage regression. This means that our variables are good instruments. As a further test on our instruments, we report the Cragg-Donald *F*-statistics on the null hypothesis that the equation is weakly identified. The results indicate that our specification does not suffer from a weak instruments problem since the value of the *F*-statistic is near 10, the threshold suggested to test whether the 'excluded instruments' are correlated with the endogenous regressor, but only weakly.

4.2 The intensive margin of exports and credit rationing

The results obtained estimating equation (2) on the intensive margin of exports are in Table 4. Our baseline sample includes 12,674 observations.

Column 1 reports the results obtained estimating the OLS model where the dependent variable is the share of exports over total sales, and the set of regressors including the dummy for credit rationing and several firm-level characteristics as controls. The coefficient of credit rationing is negative (-0.013) and significantly different from zero at the 10% level, confirming a negative effect of credit constraints also on the intensive margin of exports. Consistent with the trade literature and previous results on extensive margin, we find that larger and more productive are more likely to export, whereas firm experience and competition in national markets have negative effects on export intensity. Firms with a higher share of skilled workers export a lower percentage of sales. Similar to the extensive margin, the share of temporary workers positively affects the export decision. These

[10] The impact of the second tercile on credit rationing of sales credit is not statistically significant.

results are broadly confirmed by the Tobit model in columns 2 and 3, that considers the fact that the dependent variable is censored between zero and 1. In terms of marginal effects, credit rationing reduces the share of exports by 5 percentage points.[11]

[Table 4]

As in the analysis of the extensive margin, there are reasons to believe that credit rationing is endogenous with respect to the share of exports over total sales. In columns 4 and 5 we report therefore the results of the 2SLS estimates obtained instrumenting credit rationing by firm-level characteristics discussed above. The specification presented in columns 4 and 5 includes the level of each single instrument. The sign of the coefficient of the credit rationing dummy is negative and the impact is statistically significant. In addition, the coefficients of all other control variables are broadly unchanged. Finally, the *F*-statistic for the first stage regression and the Hansen test of overidentifying restrictions (30.27 and 3.29, respectively) confirm also in this case that our empirical model is correctly specified.

4.3 The propensity score matching results

Table 5 reports several indicators of covariate balancing, before and after the matching, as well as the average treatment effects on treated (ATT) for both the probability of exporting and the intensive margin of exports, adopting different matching methods.

[Table 5]

Column (1) reports the Pseudo-R^2 from probit estimation of the conditional joining probability, giving an indication of how well regressors explain the probability of experiencing a shortage in credit supply. Results show that individual characteristics explains about 12% of variability in credit rationing. Columns (2) and (3) are post-matching indicators based on different matching methods. Column (2) reports the Pseudo-R^2 from probit estimation of the conditional joining probability on the matched sample. The methods based on the nearest neighbour with replacement provide the highest R^2. Column (3) reports the *p*-value of the likelihood ratio test after matching: the joint significance of the regressors is always rejected.

A comparison of export performance reveals a causal effect of being credit rationed on the probability of exporting and the share of exports over total sales (columns 4 and 5). Reassuringly, both effects are negative confirming our results described in the previous sections and the ATT is very similar to the marginal effect reported in Table 3.

Table 6 provides the comparisons of credit rationed firms and the non-rationed firms in terms of all individual characteristics. Specifically, it compares the mean values of several individual characteristics for rationed and non-rationed establishments. As expected, for the matched sample there were no significant difference in the characteristics of the rationed firms and the matched non-

[11] To deal with the fractional response variable bounded between zero and one and to account for the nature of the export to sales ratio, we adopt the Generalized Linear Model (GLM) developed by Papke and Wooldridge (1996). The share of exports in total sales is therefore estimated using a maximum likelihood with Bernoulli distribution and a logit link function, following Jinjiarak and Wignaraja (2016). Reassuringly, our results (available on request) are robust to this methodology.

rationed ones. In general, these results show that the matching procedure was successful since there are no significant differences in the matched sample.

[Table 6]

5. Additional results: sample splits

Tables 7-9 present the results of some sample splits. Table 7 presents the results of the impact of credit rationing on firms' export performance, distinguishing between small-medium and large firms, depending on the level of sales.

Credit constraints have a significant impact on the probability of exporting (columns 1-4) in the case of both small-medium firms (-0.411) and large firms (-0.571). On the contrary, in the case of the intensive margin, the coefficients of small-medium firms are much larger than that of large firms, although the latter is estimated with less precision. These results are partly consistent with the issue that financing obstacles are more growth-constraining for small firms and they prevent all firms from reaching their optimal size. Small firms indeed finance a smaller share of their investment and working capital with formal financial sources than large firms (Beck and Demirguc-Kunt, 2006). Dihn et al. (2010), for instance, find evidence that a low level of financial sector development affects the firm size distribution and therefore contributes to the phenomenon of the "missing middle" in developing countries. In other words, financing constraints play a significant part in explaining the failure of small firms in developing countries to grow into medium-size or large firms.

[Table 7]

In Table 8 we distinguish between different reasons of credit rationing. As argued in section 2, the WEBS collects information on self-reported measures of access to finance, distinguishing between firms that applied for a loan, but did not receive it (*bank rationing*) and firms that did not apply for a loan because of too stringent collateral, interest rate too high, expectation to be denied (*self rationing*). Indeed, the results presented in Table 6 confirm that that credit constraints exert a significant impact on export performance only if they depend on individual reasons.

[Table 8]

Finally, in Table 9 we split the sample depending on the level of country's financial development. We adopt two different variables to split the sample: (*i*) the ratio between the deposit money bank assets over GDP and the stock market capitalization over GDP (*Panel A*) and (*ii*) the deposit money bank assets over GDP (*Panel B*). The first variable is used to distinguish those countries for which the share of deposit money bank assets is higher than the stock market capitalization. The second variable is used to distinguish low financially developed countries, with a share of deposit money bank assets lower than the median level (i.e. 32% of GDP), from high financially developed ones. The results for high and for low developed countries are confirmed on both margins of exports.

[Table 9]

6. Conclusions

We have analyzed the relationship between credit constraints and export behavior in a large sample of firms from about 25 countries, finding evidence of a negative effect of financial constraints on both the probability that a firm exports (i.e., the extensive margin of exports) and the share of exports over total sales (i.e., the intensive margin of exports).

Our analysis provides additional support to the literature, with two additional contributions. First, it studies a larger and more heterogeneous sample of firms than previous analyses. Second, it follows an instrumental variable approach using firm-level instruments. In addition, our evidence is based on a reliable measure of credit constraints provided by each firm's self assessment of its conditions.

The results of our multi-country firm level analysis show that credit constraints have a significant and sizeable effect on firms' export performance, even controlling for other firms characteristics and possible reverse causality. This confirms the results of influential country level analyses (e.g., Minetti and Zhu, 2011, and Feenstra et al., 2014), confirming that sound economic policies helping firm's access to credit can provide an important contribution to a country's export performance.

Table 1 – Descriptive statistics

	CR = 1				CR = 0					
Variable	**mean**	**sd**	**min**	**max**	**mean**	**sd**	**min**	**max**	**ttest**	
dummy export	0.237	0.425	0	1	0.375	0.484	0	1	14.892	***
export share	0.083	0.215	0	1	0.125	0.251	0	1	8.752	***
employees	48	140	0	3,000	128	426	0	16,000	15.950	***
labor productivity	68	2,160	0	96,100	179	10,500	0	943,000	0.980	
age	21	17	1	146	26	20	1	210	12.110	***
share of temporary workers	0.119	0.226	0	1	0.119	0.209	0	1	-0.062	
competition in national market	0.399	0.490	0	1	0.439	0.496	0	1	3.861	***
capacity utilization	0.695	0.224	0	1	0.731	0.207	0	1.05	7.703	***
share of skilled workers	0.511	0.285	0	1	0.430	0.276	0	1	-13.542	***
w.c. financed by internal funds	0.658	0.358	0	1	0.595	0.378	0	1	-8.230	***
share of government banks*w.c. financed by internal funds	0.126	0.181	0	0.65	0.107	0.176	0	0.65	-4.847	***
share of foreing banks*w.c. financed by internal funds	0.260	0.245	0	1	0.227	0.244	0	1	-6.414	***
payment after delivery (second tercile)	0.310	0.462	0	1	0.280	0.449	0	1	-3.031	**
payment after delivery (third tercile)	0.287	0.452	0	1	0.453	0.498	0	1	17.057	***

Notes: labor productivity is in millions. *t*-test indicates the value of the mean-difference test where H_0 is either mean (*CR = 1*) - mean (*CR = 0*) = 0 or mean (*CR = 0*) - mean (*CR = 1*) = 0. The approximate degrees of freedom for the *t*-test are obtained from Welch's formula (1947). * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

Table 2 – Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) dummy export	1														
(2) export share	0.654	1													
(3) employees	0.218	0.170	1												
(4) labor productivity	0.016	0.020	0.013	1											
(5) age	0.168	0.031	0.201	0.021	1										
(6) share of temporary workers	0.028	0.040	-0.032	0.011	-0.029	1									
(7) competition in national market	0.058	-0.150	0.063	0.007	0.094	-0.033	1								
(8) capacity utilization	0.043	0.023	0.070	-0.004	-0.020	-0.046	0.035	1							
(9) share of skilled workers	-0.069	0.018	-0.004	0.003	-0.066	-0.051	-0.025	0.049	1						
(10) credit rationing (CR)	-0.123	-0.071	-0.089	-0.005	-0.098	0.001	-0.034	-0.071	0.121	1					
(11) w.c. financed by internal funds	-0.127	-0.069	-0.035	0.013	-0.015	-0.085	-0.025	0.077	0.102	0.071	1				
(12) share of government banks*w.c. financed by internal funds	-0.063	-0.028	-0.008	0.002	0.021	-0.099	0.081	0.033	0.073	0.044	0.427	1			
(13) share of foreing banks*w.c. financed by internal funds	-0.102	-0.083	-0.004	-0.006	-0.016	-0.093	-0.042	0.069	0.125	0.057	0.583	-0.082	1		
(14) payment after delivery (second tercile)	0.005	-0.002	-0.009	0.000	-0.021	0.021	0.040	-0.003	-0.004	0.027	-0.051	0.011	-0.036	1	
(15) payment after delivery (third tercile)	0.141	0.049	0.062	0.007	0.123	-0.019	0.041	0.005	-0.118	-0.143	-0.208	-0.190	-0.052	-0.535	1

Table 3 – Extensive margin of exports and credit rationing

The table reports estimate of equation (1). Fixed effects for sector, country and year are included in all regressions. Robust standard errors are clustered by sector adopting the ISIC classification at 2-digits. *First stage F-stat. (p-value)* is the value of the *F* statistic (and *p*-value) for the hypothesis that instruments have jointly zero coefficients in the first stage regression. *Overidentifying restrictions Hansen stat (p-value)* is the value of the Hansen statistic (and *p*-value) for the overidentifying restriction test that excluded instruments are correctly excluded from the estimated equation. *Weak identification Cragg-Donald F*-stat testing whether the excluded instruments are correlated with the endogenous estimators, but only weakly. ***, **, * denote significance at 0.01, 0.05 and 0.10 levels.

	(1)	(2)	(3)	(4)	(5)
	LPM	Probit		IV linear model	
		Coeff.	ME	Second stage	First stage
credit rationing (CR)	-0.035 ***	-0.128 ***	-0.036 ***	-0.698 ***	
	(0.01)	(0.04)	(0.01)	(0.14)	
employees (log)	0.142 ***	0.459 ***	0.130 ***	0.114 ***	-0.040 ***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)
labor productivity (log)	0.029 ***	0.100 ***	0.028 ***	0.017 ***	-0.017 ***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.00)
age (log)	0.000	-0.005	-0.001	-0.012	-0.018 ***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
share of temporary workers	0.121 ***	0.443 ***	0.125 ***	0.117 ***	-0.006
	(0.04)	(0.15)	(0.04)	(0.04)	(0.02)
competition in national market	-0.029 **	-0.070	-0.020	-0.031 **	-0.003
	(0.01)	(0.05)	(0.01)	(0.01)	(0.01)
capacity utilization	0.000	-0.017	-0.005	-0.085 **	-0.132 ***
	(0.02)	(0.07)	(0.02)	(0.03)	(0.02)
share of skilled workers	-0.009	-0.058	-0.017	0.048 ***	0.084 ***
	(0.02)	(0.06)	(0.02)	(0.01)	(0.01)
w.c. financed by internal funds					0.091 ***
					(0.00)
share of government banks*w.c. financed by internal funds					-0.249 ***
					(0.00)
share of foreign banks*w.c. financed by internal funds					-0.129 ***
					(0.00)
payment after delivery (second tercile)					-0.005
					(0.01)
payment after delivery (third tercile)					-0.043 ***
					(0.01)
First stage *F*-stat (*p*-value)				30.27 (0.00)	
Overidentifying restrictions Hansen stat *(p*-value)				7.32 (0.12)	
Weak identification Cragg-Donald *F*-stat				9.27	
Observations	12,674	12,674		12,674	

Table 4 – Intensive margin of exports and credit rationing

The table reports estimate of equation (2). Fixed effects for sector, country and year are included in all regressions. Robust standard errors are clustered by sector adopting the ISIC classification at 2-digits. *First stage F-stat. (p-value)* is the value of the *F* statistic (and *p*-value) for the hypothesis that instruments have jointly zero coefficients in the first stage regression. *Overidentifying restrictions Hansen stat (p-value)* is the value of the Hansen statistic (and *p*-value) for the overidentifying restriction test that excluded instruments are correctly excluded from the estimated equation. *Weak identification Cragg-Donald F*-stat testing whether the excluded instruments are correlated with the endogenous estimators, but only weakly. ***, **, * denote significance at 0.01, 0.05 and 0.10 levels.

	(1)		(2)		(3)		(4)		(5)	
	OLS		Tobit				IV linear model			
			Coeff.		ME		Second stage		First stage	
credit rationing (CR)	-0.013	*	-0.050	**	-0.050	**	-0.309	***		
	(0.01)		(0.02)		(0.02)		(0.07)			
employees (log)	0.062	***	0.186	***	0.186	***	0.049	***	-0.040	***
	(0.01)		(0.02)		(0.02)		(0.01)		(0.00)	
labor productivity (log)	0.010	***	0.041	***	0.041	***	0.005	**	-0.017	***
	(0.00)		(0.01)		(0.01)		(0.00)		(0.00)	
age (log)	-0.026	***	-0.045	***	-0.045	***	-0.031	***	-0.018	***
	(0.00)		(0.01)		(0.01)		(0.01)		(0.01)	
share of temporary workers	0.057	*	0.196	**	0.196	**	0.056	**	-0.006	
	(0.03)		(0.09)		(0.09)		(0.03)		(0.02)	
competition in national market	-0.101	***	-0.162	***	-0.162	***	-0.102	***	-0.003	
	(0.01)		(0.02)		(0.02)		(0.01)		(0.01)	
capacity utilization	-0.009		-0.024		-0.024		-0.047	***	-0.132	***
	(0.01)		(0.03)		(0.03)		(0.02)		(0.02)	
share of skilled workers	0.035	***	0.022		0.022		0.060	***	0.084	***
	(0.01)		(0.03)		(0.03)		(0.01)		(0.01)	
w.c. financed by internal funds									0.091	***
									(0.00)	
share of government banks*w.c. financed by internal funds									-0.249	***
									(0.00)	
share of foreing banks*w.c. financed by internal funds									-0.129	***
									(0.00)	
payment after delivery (second tercile)									-0.005	
									(0.01)	
payment after delivery (third tercile)									-0.043	***
									(0.01)	
First stage *F*-stat (*p*-value)							30.27 (0.00)			
Overidentifying restrictions Hansen stat (*p*-value)							3.29 (0.51)			
Weak identification Cragg-Donald *F*-stat							9.27			
Observations	12,674		12,674				12,674			

Table 5 – Propensity score matching: indicators of covariate balancing, before and after matching

(1): Pseudo-R^2 from probit estimation of the conditional joining probability.
(2): Pseudo-R^2 from a probit of *CR* on *X* on the matched samples.
(3): *P*-value of the likelihood ratio test after matching.
(4) and (5): average treatment effects on treated calculated as the difference between the control and the treated group.

Method	(1) **Probit PS R^2 before**	(2) **Probit PS R^2 after**	(3) **Pr > χ^2 after**	(4) **ATT on the extensive margin**	(5) **ATT on the intensive margin**
Nearest neighbour with replacement (without caliper)	0.115	0.008	0.414	-0.038	-0.014
Nearest neighbour with replacement (0.5% caliper)	0.115	0.007	0.687	-0.037	-0.013
1-to-1 matching	0.115	0.001	1.000	-0.041	-0.017

Table 6 – Propensity score matching: comparison of rationed and not-rationed firms

This table reports the *t*-tests for equality of means in the two samples of treated and control. *t*-tests are based on a regression of the variables on the treatment indicator (*CR*).

	Nearest neighbour with replacement without caliper	Nearest neighbour with replacement with caliper at 0.005	1-to-1 matching
employees (log)	0.648	0.576	0.767
labor productivity (log)	0.055	0.089	0.838
age (log)	0.167	0.219	0.831
share of temporary workers	0.504	0.607	0.744
compete in national market	0.749	0.789	0.829
capacity utilization	0.352	0.265	0.622
share of skilled workers	0.210	0.386	0.499
w.c. financed by internal funds	0.650	0.745	0.956
share of governemnt banks*w.c. financed by internal funds	0.357	0.338	0.845
share of foreing banks*w.c. financed by internal funds	0.522	0.594	0.964
payment after delivery (second tercile)	0.040	0.075	0.850
payment after delivery (third tercile)	0.855	0.908	0.972

Table 7 – Sample split by firm size

Columns (1)-(4) report estimates of equation (1) and columns (5)-(8) report estimates of equation (2). All regressions are estimated using the IV linear model. Small-medium and large firms are defined depending on the level of sales: *small-medium firms* are those in the first and second tercile of the distribution; *large firms* are those in the third tercile. Fixed effects for sector, country and year are included in all regressions. Robust standard errors are clustered by sector adopting the ISIC classification at 2-digits. *First stage F-stat. (p-*value*)* is the value of the *F* statistic (and *p*-value) for the hypothesis that instruments have jointly zero coefficients in the first stage regression. *Overidentifying restrictions Hansen stat (p-*value*)* is the value of the Hansen statistic (and *p*-value) for the overidentifying restriction test that excluded instruments are correctly excluded from the estimated equation. *Weak identification Cragg-Donald F-stat* testing whether the excluded instruments are correlated with the endogenous estimators, but only weakly. ***, **, * denote significance at 0.01, 0.05 and 0.10 levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	extensive margin				**intensive margin**			
	small-medium firms		**large firms**		**small-medium firms**		**large firms**	
	Second stage	First stage	Second stage	First stage	Second stage	First stage	Second stage	First stage
credit rationing (CR)	-0.411 **		-0.571 ***		-0.246 ***		-0.123 *	
	(0.20)		(0.11)		(0.07)		(0.07)	
employees (log)	0.113 ***	-0.038 ***	0.125 ***	-0.032 ***	0.050 ***	-0.038 ***	0.054 ***	-0.032 ***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
labor productivity (log)	0.022 ***	-0.017 ***	0.046 ***	-0.006	0.007 **	-0.017 ***	0.017 ***	-0.006
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
age (log)	-0.007	-0.025 **	-0.006	-0.008	-0.024 ***	-0.025 ***	-0.036 ***	-0.008
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
share of temporary workers	0.107 **	-0.020	0.146 ***	0.029	0.058 **	-0.020	0.056	0.029
	(0.05)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.04)	(0.02)
competition in national market	-0.048 ***	0.002	-0.011	-0.013	-0.086 ***	0.002	-0.131 ***	-0.013
	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
capacity utilization	-0.064 *	-0.133 ***	-0.048	-0.132 ***	-0.050 ***	-0.133 ***	-0.008	-0.132 ***
	(0.03)	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
share of skilled workers	0.032	0.095 ***	0.012	0.057 ***	0.059 ***	0.095 ***	0.045 ***	0.057 ***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)
w.c. financed by internal funds		0.083 **		0.086 **		0.083 **		0.086 **
		(0.00)		(0.00)		(0.00)		(0.00)
share of government banks*w.c. financed by internal funds		-0.320 ***		-0.020		-0.320 ***		-0.020
		(0.00)		(0.00)		(0.00)		(0.00)
share of foreing banks*w.c. financed by internal funds		-0.136 **		-0.118 ***		-0.136 **		-0.118 ***
		(0.00)		(0.00)		(0.00)		(0.00)
payment after delivery (second tercile)		0.010		-0.050 ***		0.010		-0.050 ***
		(0.02)		(0.02)		(0.02)		(0.02)
payment after delivery (third tercile)		-0.032 **		-0.075 ***		-0.032 **		-0.075 ***
		(0.01)		(0.02)		(0.01)		(0.02)
First stage *F*-stat (*p*-value)	7.62 (0.00)		10.80 (0.00)		7.62 (0.00)		10.80 (0.00)	
Overidentifying restrictions Hansen stat (*p*-value)	8.94 (0.06)		3.78 (0.44)		4.90 (0.30)		3.63 (0.46)	
Weak identification Cragg-Donald *F*-stat	6.82		8.34		6.82		8.34	
Observations	8,070		4,604		8,070		4,604	

Table 8 – Sample split by reason of credit rationing

Columns (1)-(4) report estimates of equation (1) and columns (5)-(8) report estimates of equation (2). All regressions are estimated using the IV linear model. *Bank rationing* includes the sub-sample of firms that applied for a loan, but did not receive it, while *self-rationing* includes firms that did not apply for a loan because of too stringent collateral, interest rate too high, expectation to be denied. Fixed effects for sector, country and year are included in all regressions. Interactions of fixed effects are not included. Robust standard errors are clustered by sector adopting the ISIC classification at 2-digits. *First stage F-stat. (p-value)* is the value of the *F* statistic (and *p*-value) for the hypothesis that instruments have jointly zero coefficients in the first stage regression. *Overidentifying restrictions Hansen stat (p-value)* is the value of the Hansen statistic (and *p*-value) for the overidentifying restriction test that excluded instruments are correctly excluded from the estimated equation. *Weak identification Cragg-Donald F-stat* testing whether the excluded instruments are correlated with the endogenous estimators, but only weakly. ***, **, * denote significance at 0.01, 0.05 and 0.10 levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	extensive margin				**intensive margin**			
	bank reasons		**self reasons**		**bank reasons**		**self reasons**	
	Second stage	First stage	Second stage	First stage	Second stage	First stage	Second stage	First stage
credit rationing (CR)	0.162		-0.965 ***		0.012		-0.417 ***	
	(0.58)		(0.19)		(0.42)		(0.09)	
employees (log)	0.144 ***	-0.004 **	0.106 ***	-0.036 ***	0.063 ***	-0.004 **	0.047 ***	-0.036 ***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
labor productivity (log)	0.030 ***	0.000	0.013 ***	-0.016 ***	0.011 ***	0.000	0.003	-0.016 ***
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
age (log)	0.001	-0.006 **	-0.011	-0.012 **	-0.026 ***	-0.006 **	-0.031 ***	-0.012 **
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
share of temporary workers	0.119 ***	0.010	0.105 ***	-0.016 **	0.057 **	0.010	0.050 *	-0.016 **
	(0.04)	(0.01)	(0.04)	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)
competition in national market	-0.029 **	0.000	-0.033 **	-0.003	-0.101 ***	0.000	-0.103 ***	-0.003
	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
capacity utilization	0.009	-0.024 *	-0.096 **	-0.109 ***	-0.007	-0.024 *	-0.051 ***	-0.109 ***
	(0.03)	(0.01)	(0.04)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
share of skilled workers	-0.012	0.001	0.070 ***	0.083 ***	0.034 ***	0.001	0.069 ***	0.083 ***
	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
w.c. financed by internal funds		-0.003		0.094 ***		-0.003		0.094 ***
		(0.00)		(0.00)		(0.00)		(0.00)
share of government banks*w.c. financed by internal funds		-0.022		-0.227 ***		-0.022		-0.227 ***
		(0.00)		(0.00)		(0.00)		(0.00)
share of foreing banks*w.c. financed by internal funds		-0.013		-0.115 ***		-0.013		-0.115 ***
		(0.00)		(0.00)		(0.00)		(0.00)
payment after delivery (second tercile)		-0.003		-0.002		-0.003		-0.002
		(0.01)		(0.01)		(0.01)		(0.01)
payment after delivery (third tercile)		-0.013 ***		-0.030 ***		-0.013 ***		-0.030 ***
		(0.00)		(0.01)		(0.00)		(0.01)
First stage *F*-stat (*p*-value)	10.67 (0.00)		12.50 (0.00)		10.67 (0.00)		12.50 (0.00)	
Overidentifying restrictions Hansen stat (*p*-value)	9.80 (0.04)		7.15 (0.13)		6.36 (0.17)		2.33 (0.67)	
Weak identification Cragg-Donald *F*-stat	1.88		8.27		1.88		8.27	
Observations	12,674		12,674		12,674		12,674	

Table 9 – Sample split by financial development

Columns (1)-(4) report estimates of equation (1) and columns (5)-(8) report estimates of equation (2). All regressions are estimated using the IV linear model. *Panel A* reports the sample split on the level of deposit money bank to GDP/stock market capitalization to GDP: *low FD* are countries with a share lower than 1; *high FD* include countries with a share higher than 1. *Panel B* reports the sample split on the level of deposit money bank to GDP: *low FD* are countries with a share lower than the median level (32%); *high FD* include countries with a share higher than the median level (32%). Fixed effects for sector, country and year are included in all regressions. Interactions of fixed effects are not included. Robust standard errors are clustered by sector adopting the ISIC classification at 2-digits. *First stage F-stat. (p-value)* is the value of the *F* statistic (and *p*-value) for the hypothesis that instruments have jointly zero coefficients in the first stage regression. *Overidentifying restrictions Hansen stat (p-value)* is the value of the Hansen statistic (and *p*-value) for the overidentifying restriction test that excluded instruments are correctly excluded from the estimated equation. *Weak identification Cragg-Donald F-stat* testing whether the excluded instruments are correlated with the endogenous estimators, but only weakly. ***, **, * denote significance at 0.01, 0.05 and 0.10 levels.

Panel A

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	extensive margin								**intensive margin**							
	low FD				**high FD**				**low FD**				**high FD**			
	Second stage		First stage		Second stage		First stage		Second stage		First stage		Second stage		First stage	
credit rationing (CR)	-0.248	***			-1.135	***			-0.187	**			-0.578	***		
	(0.10)				(0.29)				(0.08)				(0.17)			
employees (log)	0.136	***	-0.034	***	0.071	***	-0.049	***	0.059	***	-0.034	***	0.015		-0.049	***
	(0.01)		(0.00)		(0.02)		(0.01)		(0.01)		(0.00)		(0.01)		(0.01)	
labor productivity (log)	0.034	***	-0.018	***	0.004		-0.016	***	0.010	***	-0.018	***	0.003		-0.016	***
	(0.01)		(0.00)		(0.01)		(0.01)		(0.00)		(0.00)		(0.01)		(0.01)	
age (log)	-0.005		-0.017	**	-0.016		-0.018		-0.029	***	-0.017	**	-0.023	***	-0.018	
	(0.01)		(0.01)		(0.02)		(0.02)		(0.00)		(0.01)		(0.01)		(0.02)	
share of temporary workers	0.070	*	-0.004		0.147	***	-0.034		0.038		-0.004		0.074	***	-0.034	
	(0.04)		(0.03)		(0.03)		(0.04)		(0.03)		(0.03)		(0.02)		(0.04)	
competition in national market	-0.005		0.011		-0.080	***	-0.014		-0.095	***	0.011		-0.120	***	-0.014	
	(0.02)		(0.02)		(0.01)		(0.01)		(0.01)		(0.02)		(0.01)		(0.01)	
capacity utilization	-0.029		-0.110	***	-0.204	***	-0.185	***	-0.027	*	-0.110	***	-0.114	***	-0.185	***
	(0.02)		(0.02)		(0.06)		(0.03)		(0.02)		(0.02)		(0.04)		(0.03)	
share of skilled workers	0.010		0.088	***	0.106	**	0.090	***	0.042	***	0.088	***	0.092	***	0.090	***
	(0.02)		(0.01)		(0.04)		(0.03)		(0.01)		(0.01)		(0.01)		(0.03)	
w.c. financed by internal funds			0.196	***			0.042				0.196	***			0.042	
			(0.04)				(0.05)				(0.04)				(0.05)	
share of government banks*w.c. financed by internal funds			-0.547	***			-0.131				-0.547	***			-0.131	
			(0.10)				(0.16)				(0.10)				(0.16)	
share of foreign banks*w.c. financed by internal funds			-0.317	***			0.119				-0.317	***			0.119	*
			(0.07)				(0.07)				(0.07)				(0.07)	
payment after delivery (second tercile)			-0.012				-0.016				-0.012				-0.016	
			(0.01)				(0.03)				(0.01)				(0.03)	
payment after delivery (third tercile)			-0.055	***			-0.045	***			-0.055	***			-0.045	***
			(0.01)				(0.02)				(0.01)				(0.02)	
First stage *F*-stat (*p*-value)	27.56 (0.00)				11.25 (0.00)				27.56 (0.00)				11.25 (0.00)			
Overidentifying restrictions Hansen stat (*p*-value)	8.36 (0.08)				7.00 (0.14)				6.16 (0.19)				7.86 (0.10)			
Weak identification Cragg-Donald *F*-stat	13.97				3.19				13.97				3.19			
Observations	7,562				3,927				7,562				3,927			

Panel B

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	extensive margin								**intensive margin**							
	low FD				**high FD**				**low FD**				**high FD**			
	Second stage		First stage		Second stage		First stage		Second stage		First stage		Second stage		First stage	
credit rationing (CR)	-0.484	***			-0.329	*			-0.364	***			-0.149	*		
	(0.15)				(0.17)				(0.11)				(0.09)			
employees (log)	0.117	***	-0.037	***	0.132	***	-0.041	***	0.050	***	-0.037	***	0.051	***	-0.041	***
	(0.01)		(0.00)		(0.01)		(0.00)		(0.01)		(0.00)		(0.01)		(0.00)	
labor productivity (log)	0.030	***	-0.030	***	0.027	***	-0.007	**	0.009		-0.030	***	0.010	***	-0.007	**
	(0.01)		(0.00)		(0.01)		(0.00)		(0.01)		(0.00)		(0.00)		(0.00)	
age (log)	-0.011	*	-0.016		-0.002		-0.022	***	-0.033	**	-0.016		-0.027	***	-0.022	***
	(0.01)		(0.01)		(0.01)		(0.01)		(0.01)		(0.01)		(0.01)		(0.01)	
share of temporary workers	0.110	*	-0.024		0.125	***	0.014		0.061	***	-0.024		0.051		0.014	
	(0.06)		(0.02)		(0.04)		(0.02)		(0.03)		(0.02)		(0.03)		(0.02)	
compete in national market	-0.055	***	-0.005		-0.016		0.000		-0.121	***	-0.005		-0.088	***	0.000	
	(0.01)		(0.01)		(0.02)		(0.02)		(0.01)		(0.01)		(0.01)		(0.02)	
capacity utilization	-0.042		-0.181	***	-0.055	**	-0.097	***	-0.046	**	-0.181	***	-0.042	**	-0.097	***
	(0.04)		(0.02)		(0.02)		(0.02)		(0.02)		(0.02)		(0.02)		(0.02)	
share of skilled workers	0.053	**	0.091	***	-0.005		0.074	***	0.075	***	0.091	***	0.036	***	0.074	***
	(0.02)		(0.02)		(0.02)		(0.02)		(0.01)		(0.02)		(0.01)		(0.02)	
w.c. financed by internal funds			0.108	***			0.036				0.108	***			0.036	
			(0.02)				(0.04)				(0.02)				(0.00)	
share of governemnt banks*w.c. financed by internal funds			0.018				-0.365	***			0.018				-0.365	***
			(0.11)				(0.11)				(0.11)				(0.00)	
share of foreing banks*w.c. financed by internal funds			-0.204	***			0.072				-0.204	***			0.072	
			(0.04)				(0.08)				(0.04)				(0.00)	
payment after delivery (second tercile)			-0.007				-0.009				-0.007				-0.009	
			(0.02)				(0.02)				(0.02)				(0.02)	
payment after delivery (third tercile)			-0.034	***			-0.054	***			-0.034	***			-0.054	***
			(0.01)				(0.01)				(0.01)				(0.01)	
First stage F-stat (*p*-value)	27.94 (0.00)				30.43 (0.00)				26.94 (0.00)				30.43 (0.00)			
Overidentifying restrictions Hansen stat (*p*-value)	7.14 (0.13)				8.53 (0.07)				4.80 (0.31)				6.76 (0.015)			
Weak identification Cragg-Donald *F*-stat	5.29				9.99				5.29				9.99			
Observations	6,148				6,527				6,148				6,527			

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