Access to Finance and the Exchange Rate Sensitivity of Exports *

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Abstract

The recent empirical literature estimating the elasticity of exports to exchange-rate fluctuations has shown that, while devaluations have in general a positive effect on exports, the size of it varies significantly depending on firm, sector and country characteristics. In this paper we lend theoretical and empirical support to the view that the financial conditions of a firm have a relevant effect on the way in which exchange rate movements affect its export decisions. In particular, we show that exporting activities by more financially constrained firms are more sensitive to exchange rate fluctuations than those by firms with a better ability to raise external capital. This finding is detected at both the intensive and extensive margin of export. Consistent with the result on export quantities, we also document that the exchange rate pass-through to export prices denominated in the domestic currency is lower for firms facing stronger financial constraints. Moreover, we show that our results are robust to controlling for a variety of alternative features that may affect the firm-level elasticity of exports to exchange-rate, such as the intensity of use of imported inputs, labor productivity, the degree of price stickiness and firm size.
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1 Introduction

Measuring the elasticity of exports to exchange-rate fluctuations has a long tradition in international economics, and a large amount of empirical evidence is now available showing that, while devaluations have a positive effect on exports, the size of it varies significantly depending on firm, sector and country characteristics. A parallel and more recent strand of literature has provided convincing evidence that firm's higher ability to access external finance has a positive impact on export activities.

The purpose of our paper is to investigate if differences across firms in their financial conditions contribute to explain the heterogeneous impact of exchange rate fluctuations on firm exports. Our analysis builds on two well established sets of results in the international trade literature. The first one is that the responsiveness of a firm's exports to exchange rate shocks is shaped by some firm-specific features. For example, building on the seminal contribution of Melitz (2003), Berman et al. (2012) document that exports of more productive firms exhibit a lower response to exchange rate changes.[1] The second result is that financial market imperfections restrain the ability of a firm to participate in the export markets, affecting both its decision of entry (i.e., the extensive margin) and the volume of its exports (i.e., the intensive margin), as convincingly shown, for example, by Manova (2013), Muuls (2015) and Chaney (2016). Indeed, export activities impose specific costs on firms, that typically need to be paid upfront, increasing their working capital requirements. Some of these costs are fixed, such as those due to custom and regulatory compliance, to the expenses for gathering information on the potential destination markets, or to the effort of establishing a foreign distribution network. Other costs are variable, such as transportation costs, the costs of maintaining the foreign distribution network, or those related to cross-border payment services. Hence, exporting firms tend to depend more on external finance than those engaged only in domestic activities.

The different ability of firms to fund their activities may provide an additional channel through which exchange rate shocks affect their exporting activities. Several dimensions, however, may characterize this transmission channel and, in principle, it is not obvious in what direction a higher incidence of financial constraints affects the exchange rate sensitivity

[1] Their finding hinges on the lower price elasticity of demand for these firms that allows them to adjust the mark-ups more extensively in the wake of a currency swing. A similar result is found by Li et al. (2015) using data on exports of Chinese firms. Another mechanism deals with the role of imported intermediate inputs: Greenaway et al. (2010), for example, find that firms relying more heavily on imported intermediate inputs have a lower sensitivity of exports to exchange rate.

of exports. For example, the standard expansionary effect of exchange-rate depreciations on exports may induce an improvement in the firms' current and prospective cash flows, allowing them to pledge higher future earnings to their demand for external finance. In turn, this contributes to attenuate the financial constraints faced by the firm, increasing its ability to access foreign markets (see Dekle and Ryoo (2007)). Along similar lines, Chaney (2016) argues that an appreciation of the domestic currency increases the value of domestic assets in terms of foreign currency, inducing a relaxation of the firm's liquidity constraints. By contrast, as shown by Strasser (2013), borrowing constraints may affect the exchange rate pass-through on export prices and, thereby, the exchange rate elasticity of export volumes. In the wake of an exchange rate movement, credit constrained firms tend to vary the export prices denominated in the domestic currency only to a limited extent and this induces export volumes to react more strongly to exchange rate variations.

Against this backdrop, we analyze whether the heterogeneity across firms in the sensitivity of exports to exchange rate variations depends on their ability to access finance. In doing so, we control for the possible endogeneity of firms' financial conditions. To guide our empirical analysis, we first present a simple theoretical framework whose main prediction is that a higher incidence of financial constraints amplifies the responsiveness of a firm's export activities to exchange rate swings. Moreover, the model establishes that the more severe are the firm's financial constraints, the lower is the degree of exchange rate pass-through on its export prices (denominated in the domestic currency). We then test the model's predictions through an empirical analysis conducted on a large sample of Chinese firms. We believe that the Chinese economy provides an ideal environment for our investigation purposes, in light of three characteristics: a) the presence of credit constraints that limit the ability of firms to raise external finance; b) the high export propensity; and c) the fluctuations in the value of the Chinese currency in our sample period.[2]

Our empirical findings document that the exporting activities of more financially constrained firms are more sensitive to exchange rate oscillations and this holds true at both the intensive and extensive margins of exports. Importantly, the magnitude of the differential effects are relevant in economic terms: for example, the impact of exchange rate on export volumes for a firm at the 25th percentile of the distribution of one of our measures of availability of

[2] Song et al. (2011) presents a thorough discussion of the financial imperfections in China, showing that on average firms rely heavily on internal funds to finance their activities, but the pattern is very far from uniform. As for the central role of exports, the average annual growth of China's real exports has been about 14 per cent over the 1990-2014 period and total trade relative to GDP in real terms rose from 31 to 76 per cent between 1996 to 2007, remaining roughly stable since then (see Alessandria et al. (2017)).

internal funds is more than fifty per cent larger than that for a firm at the 75th percentile.

To decipher the mechanism underlying this result, and consistent with one of our model's predictions, we show that the degree of exchange rate pass-through to export prices denominated in the domestic currency is lower for firms facing higher financial constraints. Moreover, we augment our baseline empirical framework that focuses on access to finance and allow for a number of additional channels that may also affect the exchange rate sensitivity of exports. They include the intensity of the use of imported inputs, the productivity of labor, the degree of price stickiness and the size of the firm. We show that when our estimating framework is augmented to control for each of these features our findings continue to hold. While we do not question the relevance of these alternative channels, controlling for them contributes to strengthen our causal interpretation based on financial constraints.

We organize the remainder of the paper as follows. Section 2 briefly summarizes the literature relevant for our analysis. Section 3 presents a simple model that discloses the main channels through which a firm's financial conditions affect the dependence of its exports on exchange rate oscillations. Section 4 discusses our measures of financial constraints and describes the data used in the empirical analysis. Section 5 reports the estimation results for export performance from the baseline specification and those for export prices. Section 6 presents a sensitivity analysis allowing for a number of alternative transmission channels. The last section concludes.

2 Related literature

Our analysis builds on two strands of literature on the determinants of firm exports. The first focuses on the incomplete pass-through of exchange rate fluctuations on export prices due to pricing-to-market by exporting firms. Indeed, if exporters kept their export prices fixed in terms of the foreign currency, a depreciation of the exchange rate would have no impact on the volume of exports. In fact, the more recent literature has shown that the degree of exchange-rate pass-through is very heterogeneous across firms, depending on a number of idiosyncratic characteristics. In a largely cited paper, for example, Berman et al. (2012) show that high-productivity firms react to a depreciation by increasing significantly more their markup and by increasing less their export volume, due to the lower price elasticity of demand of their products, consistent with the theoretical framework of Melitz and Ottaviano (2008). Whilst this literature is growing fast, the main determinants of the heterogeneity in the pass-through of exchange rate fluctuations on prices are still an object of active research.

This leads us to the second strand of literature related to our analysis, that on financial conditions and exports. Building on the seminal contribution of Kletzer and Bardhan (1987), a number of authors have studied the link between finance and exports. From a theoretical perspective, the typical analytical framework is an extension of the Melitz (2003) model of international trade with heterogeneous firms, in which the degree of severity of financial constraints provides an additional source of firm's specificity. A common prediction of the models of Manova (2013), Feenstra et al. (2014) and Chaney (2016) is that financially constrained firms need to achieve a higher level of productivity than unconstrained firms to be able to export. This is because, in addition to cover the fixed and variable costs to access foreign markets, exporters must also bear the burden of the higher costs of the external finance that is necessary to pay ex ante such costs. From an empirical perspective, starting from the earlier contribution of Beck (2002), a large amount of evidence has been produced that confirms this theoretical prediction. In a seminal paper that follows the identification structure first proposed by Rajan and Zingales (1998), Manova (2013) shows that firms in sectors that are more dependent on external finance are more likely to export if they are based in countries with a higher level of financial development. Many papers use instead firm-level data from a single country (Greenaway et al. (2007), Feenstra et al. (2014), Manova et al. (2015) and Minetti and Zhu (2011)) or from more countries (Berman and Hericourt (2010)), reaching similar conclusions.

Against this background, a factor external to the firm, such as exchange rate swings, is likely to affect export decisions differentially across firms. While the available evidence points to a negative and significant effect of financial constraints on exports, not much has yet been said about how differences across firms in the ability to access finance shapes the responsiveness of export behavior to exchange rate movements.

Dekle and Ryoo (2007) and Guillou and Schiavo (2014) make the hypothesis that an unexpected exchange rate depreciation not only increases the export competitiveness of a firm, but it can also affect its cash-flows, and therefore its ability to finance the productive activities. This singles out a channel through which firms' decisions are affected by exchange rate swings, whose sign depends on the assumed impact of a devaluation on the cash-flows. In particular, Dekle and Ryoo (2007) fit a structural model on data of Japanese firms and show that the export elasticities are larger in those industries in which an exchange rate depreciation increases the firms' cash-flows. Guillou and Schiavo (2014) focus instead on the impact of exchange rate fluctuations on profits and conduct an empirical analysis on a panel of French firms. They find that profit sensitivity to exchange rate fluctuations increases (decreases) with liquidity for firms in those industries where a depreciation induces an in-

crease (decrease) of liquidity. According to Chaney (2016), in the wake of an appreciation, financially constrained firms can more easily afford to pay the fixed costs associated to entry in the export market because the increase in the value of domestic assets in terms of foreign currency induces a mitigation of the firms' financial restraints.[3] Strasser (2013) focuses on a specific channel of transmission, studying how credit constraints affect the pass-through of exchange rate variations on price setting. He argues that credit constrained firms have fewer margins to adopt pricing-to-market strategies and absorb exchange rate swings into the mark-ups that they apply to their products. He provides some evidence that, as a result of an exchange rate fluctuation, these firms limit the variation of prices and experience a larger impact on export volumes.

3 A simple theoretical framework

In this section, we present a simple model based on Manova (2013) and Melitz and Ottaviano (2008) in which the impact of exchange rate fluctuations on exports depends on how the level of productivity and the financial structure of a firm affect its ability to pay ex ante the fixed and variable costs of exporting.

Following Melitz and Ottaviano (2008), we assume that each firm maximizes the profits that it obtains by selling abroad. However, as in Manova (2013), we also assume that some fixed and variable costs must be paid ex ante to export, and that firms with insufficient internal funds to pay these costs must find external sources of financing, that have higher costs than internally generated funds. Under these hypotheses, we show that each firm's exports depend on its expected revenues – that, in turn, are a function of its productivity and of the level of the exchange rate – and on its financial structure. As a result, the impact of exchange rate fluctuations on a firm's exports depends on both its financial structure and its productivity.

As in Melitz and Ottaviano (2008), we assume that each firm produces a differentiated product that it sells in a monopolistically competitive market. For simplicity, and to minimize on the notation, we make the hypothesis that the firm only produces for the export market,

[3] Along similar lines, Desai et al. (2008) argue that depreciations intensify financial constraints if firms have liabilities denominated in foreign currency, as is especially common in emerging markets. Moreover, they emphasize that liquidity constraints are often associated with short-term debt exposure and interest rates often rise after depreciations. Similarly, using country-level data Berman and Berthou (2009) document that the positive effect of a depreciation on exports tends to be weaker in a country where: a) the firms' propensity to borrow in foreign currencies is high and b) financial market imperfections are high.

but the results are confirmed if we assumed that firms also have the option of selling in the domestic market. The cost of producing one unit of output is ca, where c is the price of a cost-minimizing bundle of inputs and a is the inverse of the productivity level, $1/a$. Each firm is assumed to face an inverse linear demand function for its product:

$$p = d - fq \tag{1}$$

where q is the quantity, p is the price in the local currency of the market where the good is sold, and d and $f > 0$ are constants.

To sell its good in the foreign markets, the firm must also pay up-front a fixed cost F, and a variable cost, that takes the usual iceberg form $\tau \in [0, 1)$. The firm is assumed to have a total amount of liquid assets that can be used for this purpose, equal to L, which nonetheless is insufficient for paying these costs entirely. The remaining part of the up-front costs needs therefore to be financed with external finance, that entails a premium, $\phi > 0$, with respect to the cost of internal funds.

To be consistent with the empirical analysis, we define e as the nominal exchange rate expressed as the amount of domestic currency to purchase one unit of the foreign currency, so that an increase in e represents a depreciation. Under these assumptions, each firm maximizes the following profit function:

$$\Pi(e, p, q, F) = epq - q\tau ca - F - (q\tau ca + F - L)\phi, \tag{2}$$

subject to the constraint given by the linear demand function (1).

From the solution of the profit maximization problem, the equilibrium level of production can be expressed as a function of the exogenous parameters describing each firm's characteristics:

$$q = \frac{d}{2f} - \frac{\tau ca(1+\phi)}{2ef} \tag{3}$$

Eq. (3) is the relationship at the basis of our empirical investigation. Its first derivative with respect to the exchange rate, e, shows that, for an exporting firm, a depreciation always causes an increase in its levels of exports:

$$\frac{\partial q}{\partial e} = \frac{\tau ca(1+\phi)}{2e^2 f} > 0. \tag{4}$$

The second derivative of Eq. (3) with respect to the exchange rate, e, and the external finance premium, ϕ, shows that the impact of an exchange rate depreciation on the volume of exports is an increasing function of the external finance premium:

$$\frac{\partial^2 q}{\partial e \partial \phi} = \frac{\tau c a}{2e^2 f} > 0. \tag{5}$$

Since a higher external finance premium, *i.e.* a higher ϕ, causes the marginal costs to be higher, an exchange rate depreciation has a stronger impact on the volume of exports for firms facing worse financing conditions.

Before turning to the extensive margin of exports, we focus on the role of the firm's financial conditions in shaping the degree of exchange rate pass-through to export prices. To do so, we first insert the expression for q in Eq. (3) in the inverse demand (1) and obtain an expression for the price level, p (denominated in the foreign currency). After differentiating the latter with respect to exchange rate, e, the exchange rate pass-through elasticity of export price, $\eta_{p,e}$, is characterized as follows:

$$\eta_{p,e} = \frac{\partial p}{\partial e}\frac{p}{e} = -\frac{\tau c a(1+\phi)}{ed + \tau c a(1+\phi)} < 0, \tag{6}$$

so that the following result obtains:

$$\frac{\partial |\eta_{p,e}|}{\partial \phi} = \frac{\tau c a e d}{[ed + \tau c a(1+\phi)]^2} > 0. \tag{7}$$

This establishes that the higher is the excess cost of external finance, the higher is the (absolute value of the) exchange rate pass-through elasticity of export prices denominated in the foreign currency and, of course, the lower is the degree of pass-through to export prices expressed in the domestic currency.

The previous results focus on the marginal effect of exchange rate oscillations on exports for an exporting firm. However, for a firm to be exporting, two conditions need to be satisfied: (i) that the equilibrium level of production from Eq. (3) is positive, and (ii) that the associated level of profits from Eq. (2) is also positive. Following the logic of Melitz (2003), Melitz and Ottaviano (2008) and Manova (2013), these conditions can be studied by solving for the threshold value of the productivity level $1/a$ ensuring that the two previous conditions are satisfied. In the Appendix we show that whenever the level of productivity is sufficiently

high to guarantee positive profits (i.e., condition (ii) is satisfied), the firm produces a positive amount of its good (i.e., condition (i) is also satisfied).

By inserting in expression (2) the value of q from Eq. (3) that maximizes profits, the condition for positive profits can be written as:

$$\frac{[ed - \tau ca(1+\phi)]^2}{4ef} > (1+\phi)F - \phi L. \tag{8}$$

Solving this condition with respect to a, we obtain the maximum level of the inverse of productivity that is compatible with the firm making positive profits (i.e., the minimum level of productivity $1/a$):

$$a < \frac{ed - 2\sqrt{ef(1+\phi)F - ef\phi L}}{\tau c(1+\phi)}. \tag{9}$$

The first derivative of the right hand side of Eq. (9) with respect to the exchange rate, e, is:

$$\frac{\partial a}{\partial e} = \frac{ed - \sqrt{ef(1+\phi)F - ef\phi L}}{e\tau c(1+\phi)}. \tag{10}$$

Simple algebraic manipulations allow us to show that this expression is positive if:

$$F < \frac{\phi}{1+\phi}L + \frac{ed^2}{f(1+\phi)}. \tag{11}$$

For a sufficiently small amount of fixed costs, F, relative to the amount of liquidity, L (i.e., whenever condition (11) is satisfied), we obtain the parallel result of Eq. (4): an exchange rate depreciation leads to a reduction of the minimum level of productivity that is required for a firm to be an exporter.

Finally, in the Appendix we also show that, if $F > \frac{\phi}{1+\phi}L$, then there is an interval of values of F such that the impact of an exchange rate depreciation on the minimum required productivity is stronger for firms that face higher costs of external financing, ϕ, similarly to what Eq. (5) establishes for the intensive margin.[4]

[4]In addition, it is also clear from a simple inspection of Eq. (10) that the impact of an exchange rate devaluation on the minimum required productivity is stronger for firms that have a lower level of liquidity, L.

A number of testable implications are therefore drawn from our simple model. First, an exchange rate depreciation determines an increase in exports (the intensive margin). Second, the effect of the depreciation is an increasing function of the tightness of the financial conditions faced by the firm. Third and fourth, the same results apply for the extensive margin also. Moreover, the exchange rate pass-through on export price expressed in the domestic currency is shown to be lower for firms with a larger excess cost of external finance. All these theoretical predictions lend themselves to the empirical scrutiny to which we turn in the subsequent sections focusing on firm-level data.

4 The Empirical Framework

4.1 Measuring Financial Constraints

A first critical issue in our empirical investigation is that of measuring the extent of financial constraints. The firm's ability to access external finance is not directly observable and a great deal of effort has been exerted in the empirical literature to propose indirect measures at the firm level. To approximate the intrinsically unobservable degree of financial constraints faced by a firm, we rely on information drawn from firms' balance sheet and cash flow statement items. Although this measurement approach is widely used in both the international economics and corporate finance literature, we are aware of its shortcomings in measuring the true dependence on external financing.[5]

In light of this, we rely on a variety of alternative time-varying indicators, each capturing a different dimension of the firm's ability to access finance. These indicators are: a) the ratio of cash holdings to total assets, b) the ratio of net liquid to total assets, and c) a measure of leverage obtained as the ratio of debt to total assets. Cash holdings are computed as: current assets net minus inventories and accounts receivable (see Love (2003)), while, following Manova and Yu (2016), the amount of net liquid assets is computed as current assets minus current liabilities. High levels of the cash holdings and the net liquidity ratios suggest that the firm has sufficient margins for mobilizing internal funds to finance exporting

[5]Starting from the seminal contribution of Fazzari et al. (1988), a number of indexes of financial constraints have been constructed using linear combinations of observable firms' features which are likely to reflect their ability to raise capital, such as such as the payment of dividends, a credit rating or balance sheet's information pertaining to the financial conditions and characteristics of the firm (i.e., the extent of non-equity leverage, cash flow, intangible assets and cash holdings). Notable examples are the indexes of Kaplan and Zingales (1997), Whited and Wu (2006) and, more recently, the index developed by Hadlock and Pierce (2010).

activities. On the other hand, a relatively high exposure of the firm on the debt side suggests that the firm is likely to face some difficulties in further increasing its reliance on external funds. In particular, as argued convincingly by Berman and Hericourt (2010), a high ratio of debt over total assets is likely to indicate both the firm's lack of collateral and a discrepancy between the firm's demand for borrowing and the current capacity to borrow. For clarity of exposition, in the econometric analysis we take the inverse of the ratio of total debt over total assets to ensure that an increase in each of our indicators represent a decrease, a relaxation of financing constraints.

4.2 The Data

The microeconomic data used in this paper is panel information at the firm level referring to the Chinese economy. The source of firm data is the Annual Survey of Manufacturing Firms conducted by the National Bureau of Statistics of China from 2000 to 2006. The survey covers all State-owned enterprises (SOE) and those non State-owned enterprises with annual sales of five million Renmimbi (that is, about 650,000 US dollars) or more. The dataset includes information from balance sheets, firms' profit and loss statements and cash flow statements. Overall, data on about 100 variables are collected, providing detailed information on, for example, domestic revenue and exports, employment and capital stock and type of ownership. The firms included in the Surveys cover approximately 98 per cent of total Chinese manufacturing exports as recorded in the aggregate trade data.

Following Feenstra et al. (2014) closely, we clean the data for mis-measuring and drop observations that report missing or negative values for any of the following variables: total sales, total employment, fixed capital, export value, intermediate inputs. We also drop observations if the export value exceeds that of total sales or if the share of foreign assets over total assets exceeds one. We include firms with at least eight employees.

We also supplement this firm-level information with transaction-level customs data collected and maintained by China's General Administration of Customs. The data we consider refers to the years from 2000 through 2006 and contain transaction-level information on the quantity and value of trade flows for each firm's trading partners. These custom data are recorded monthly but we aggregate them at the annual level to allow for their merge with the firm level data of the Annual Manufacturing Surveys. We use the customs data for two purposes: first, to construct a firm-level indicator of import intensity using the value of imports reported in the customs data; this allows us to disentangle the impact of financial

constraints and that of imported intermediate inputs on the sensitivity of exports to exchange rates. Second, we use the export price information reported in the customs data to examine the degree of exchange rate pass-through to export prices for firms with a different ability to have access to finance.

In general, in the estimation we use all firms in the manufacturing surveys. However, in those regressions where information from both the manufacturing surveys and the customs data is needed, we rely on the sample of firms included in both datasets. Merging the two datasets is not an obvious task, as each of them employs different firm identifiers: a nine digit ID in the Manufacturing Survey and an eleven digit ID in the customs data, with no elements in common. We merge the two datasets using information on the firm's name, telephone number and zip code.[6] The resulting sample comprises about 100,000 firms with export values accounting for 54 per cent of the total export value recorded for the firms of the manufacturing Survey.

Nominal bilateral exchange rates are drawn from the International Financial Statistics (IFS), and the price indexes to construct the real effective exchange rates at the 4-digit industry level are the consumer price index data available in Penn World Tables. In particular, following Dai and Xu (2013), the real effective exchange rate is constructed as an index that takes the value of one in 2000, our base-year.[7]

Table 1 summarizes the key variables. A non negligible variability across firms is detected for both exports and the indexes of access to finance. As it is customary with firm-level data, the distribution of total exports is characterized by a high degree of skewness, as shown by the large difference between the mean and the value at the 95th percentile: not surprisingly, few very large firms account for a large share of Chinese exports. Accordingly, also the value of the standard deviation is high, implying a coefficient of variation of more than 250. Since our sample includes firms with total sales worth as small as 5 millions of Renmimbi (about 600,000 US dollars in year 2000), the share of exporters is just above 15 per cent. This provides strong motivation for broadening the analysis to the extensive margin of exports.

[6] See Dai and Xu (2017) for a detailed description of the merging process.

[7] More precisely, the real effective exchange rate at the industry level is defined as $REER_{CN,s} = \prod_{j=1}^{n} (RER_{CN,js})^{\frac{trade_{CN,js}}{\sum_{j=1}^{n} trade_{CN,js}}} = \prod_{j=1}^{n} \left(\frac{XRAT_{CN,j}}{XRAT_{CN,j,2000}} \frac{P_{CN,s}}{P_{j,s}} \right)^{\frac{trade_{CN,js}}{\sum_{j=1}^{n} trade_{CN,js}}}$, where $REER_{CN,s}$ is the real effective exchange rate for industry s in China, $trade_{CN,js}$ is the value of bilateral trade for industry s between China and country j, $RER_{CN,js}$ is the bilateral real exchange rate of industry s between China and country j, $XRAT_{CN,j}$ is the bilateral nominal exchange rate between China and country j, $XRAT_{CN,j,2000}$ is the nominal exchange rate between China and country j in 2000, our base year, and $P_{CN,s}$ and $P_{j,s}$ are the price levels of industry s in China and country j, respectively.

Exchange rate variability is also significant, both through time and across industries. Indeed, while the Renmimbi mainly pegged to the US dollar in the first part of our sample period, the value of the dollar fluctuated extensively against the currencies of other countries with which China had relevant trade relationships. Since the real effective exchange rate is normalized to be one in the base year, the coefficient of variation is very similar to the standard deviation, whose overall value is 16 per cent. Taking the average across industries, the standard error is about 9 per cent, mainly due to consecutive depreciations during $2001 - 2005$, followed by a slight appreciation during $2005 - 2006$. Taking the average across years, the variation across industries is about 28 per cent. Moreover, real exchange rates exhibited a higher degree of variability through time in some specific industries. For example, machinery and paper manufacturing experienced an appreciation of around 10 per cent, while industries like transport equipment experienced a strong depreciation of 15 per cent (Dai and Xu (2013)). Finally, all the three indexes of access to finance show a high level of variability, as shown by the high values of their standard deviation. For each indicator, the small difference between the mean and the median suggests that the distribution of these characteristics does not exhibit a high degree of skewness.

Net liquidity and cash are shown to be positively correlated with each other, and are negatively correlated with Leverage, as expected. However, the relatively low values of some bilateral correlations, – notably with cash – suggest that the three indexes are likely to capture complementary aspects of access to finance.

Finally, consistent with the existing literature, Panel (a) of Figure 1 indicates that, no matter which indicator is used, firms with better access to finance are more likely to export. Similarly, Panel (b) shows that firms with relatively low levels of net liquidity and cash and high leverage tend to export more.

4.3 The Baseline Specification and the Estimation Method

In our empirical framework the baseline equation features as dependent variable either the volume of firm's exports (the intensive margin) or the decision to participate to exporting activities (the extensive margin). In particular, the specification for estimating the differential impact of exchange rates fluctuations on exports depending on the firm's ability to have access to finance is the following:

$$\begin{aligned}\ln(Export\ volume_{it}) &= \beta_0 + \beta_1 \ln(Exchange\ rate_{jt}) + \beta_2(Access\ to\ Finance_{it-1}) \\ &\quad +\beta_3 \ln(Exchange\ rate_{jt}) \times (Access\ to\ Finance_{it-1}) \\ &\quad +\beta_4 \ln(Labor\ productivity_{it-1}) + \gamma' Z_{it} + \lambda_i + \psi_t + u_{it}, \qquad (12)\end{aligned}$$

where $Export\ volume_{it}$ is the value of exports at constant prices of firm i in year t and $Exchange\ rate_{jt}$ is the industry-specific real effective exchange rate at time t, with j being the industry to which firm i belongs to. An increase of this variable indicates a depreciation of the Chinese currency. $Access\ to\ Finance_{it-1}$ is an indicator of the firm's ability to have access to external finance and measures the intensity of financial constraints faced by firm i in year $t-1$. As discussed in the previous section, for measuring this variable, we rely on a variety of alternative indicators drawn from the firms' balance sheet and cash flow statement. These are: 1) the ratio of cash holdings to total assets, 2) the ratio of net liquid to total assets, 3) the ratio of total assets to debt. For the latter ratio, we take the inverse of the more traditional measure of leverage to ensure that, in all three cases, a higher value of the variable $Access\ to\ Finance_{it-1}$ reflects a lower degree of financial constraints. These variables enter the specification with a one-period lag to mitigate the problems arising from their possible endogeneity.

In the estimating equations, in addition to including among the regressors the real exchange rate and the measure of financial constraints in isolation, we also insert the interaction among these two terms. This allows us to ascertain the differential effect of exchange rate on exports due to differences across firms in access to external finance. The lagged log-level of labor productivity is also inserted in the specification.

Finally, we control for Z_{it}, a vector of firm-specific variables, including dummy variables for the size of the firm, as measured by the number of employees, and dummy variables for the type of ownership (distinguishing, among others, between domestic private and state-owned enterprises; see e.g. Song et al. (2011)); ψ_t is a time effect captured by the inclusion of year dummy variables while λ_i is a firm-specific fixed effect. The error term, u_{it}, is assumed to have finite moments with $\mathrm{E}(u_{it})=\mathrm{E}(u_{it}u_{is})=0$, for all $t \neq s$. Standard errors are clustered at the level of the province in which the firm is located.

A parallel specification can be devised for addressing the same issues along the extensive margin of exports. In this case the equation reads as follows:

$$
\begin{aligned}
DEX_{it} \;=\; & \beta_0 + \beta_1 \ln(Exchange\ rate_{jt}) + \beta_2 (Access\ to\ Finance_{it-1}) \\
& + \beta_3 \ln(Exchange\ rate_{jt}) \times (Access\ to\ Finance_{it-1}) \\
& + \beta_4 \ln(Labor\ productivity_{it-1}) + \gamma' Z_{it} + \lambda_i + \psi_t + u_{it}, \qquad (13)
\end{aligned}
$$

where the dependent variable, DEX_{it}, is set equal to one if the firm exports in period t and to zero otherwise. All other variables are as defined as above.

In estimating the previous empirical models, along both the intensive and extensive margins (Eqs. 12 and 13), the existing literature points to a priori, well-established results exclusively as to what pertains the sign of the effects of exchange rates and of access to finance taken in isolation. That is, the estimated coefficient β_1 is expected to be negative in both equations for the standard competitiveness effect: a depreciation increases foreign demand and participation to the export markets. Similarly, the estimated coefficient β_2 in both equations is expected to be positive, as a higher ability to have access to finance, that is a lower incidence of liquidity constraints, is conducive to higher export volumes and a higher probability of being exporter. The intuition is that if two firms are identical except for, say, the ratio of cash holdings to total assets, then the firm with the higher ratio is expected to be better able to meet the working capital requirements associated to exporting activities.

However, in light of the interaction term included in the two equations above, the overall effect of an exchange rate shock on exporting activities depends on the estimated coefficient β_2 plus another term: the estimated parameter β_3 times the value of the indicator of the firm's access to finance. The key prediction of the theoretical model presented in Section 3 is that the standard competitiveness effect of exchange rate on exports is magnified when a firm faces more severe financial constraints.

As for the estimation methodology, in order to account for possible endogeneity of the regressors, we rely on the system generalized method of moments (GMM) estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) for panel data by augmenting the approach originally developed by Arellano and Bond (1991). The GMM methodology for panel data is efficient within the class of instrumental variable estimators, as it optimally exploits all the linear moment restrictions that originate from the assumptions made on the error terms. In our estimation we utilize as instruments the lagged values of the access to finance variables and, in order to appraise the validity of the instruments, we consider the Hansen test of over-identifying restrictions, which verifies the absence of correlation between the errors and the instruments.

5 The Estimation Results

5.1 Results from the Baseline Specification

5.1.1 The Intensive Margin

In investigating how exchange rate affects exports differentially across firms depending on their financial constraints, we first focus on the intensive margin. In Table 2 we report the estimation results of the baseline equation in which the log of the volume of exports is the dependent variable. The estimation results are reported for the three alternative measures of financial constraints. The estimated coefficient of the exchange rate in isolation is always positive and statistically significant. This reflects the standard competitiveness effect, that is a currency depreciation drives up the firm's exported volumes. The variable denoting the extent of firm's access to external finance enters both in isolation and interacted with the exchange rate variable. The estimated coefficient associated to the variable in isolation is positive and statistically different from zero in each of the three specifications, suggesting that a firm facing more severe financing constraints (i.e., a lower degree of the "Access to finance" indicator) tends to have lower export volumes, consistent with available empirical evidence in the literature. For example, by looking at the liquidity-to-assets ratio as a proxy of the firm's access to finance (first column), the estimated coefficient is 0.295 with a standard error of 0.107. Importantly, the estimated coefficient of the interaction term is always negative and statistically significant: in the first column, for example, it amounts to -1.552 with a standard error of 0.529. Our empirical findings therefore confirm that, along the intensive margin of exports, a currency depreciation induces a rise of the firm's exports and this effect is stronger the more a firm faces financing constraints.

As for the level of firm's productivity, not surprisingly its estimated effect on exports is positive (and statistically significant) in all the three equations. For example, if the (inverse of the) debt-to-assets ratio is considered (column 3), then the estimated effect is 0.115 with a standard error of 0.028. Regarding the Hansen test of over-identifying restrictions, their corresponding p-values indicate that they are lower than the critical values and this confirms the validity of the empirical specification.

In order to gauge on quantitative grounds how the response of exports to exchange rate differs depending on the firm's degree of financial constraints, we compare the marginal effect of exchange rate on exports evaluated at the firm in the 25th percentile of the distribution of the "Access to finance" variable with the marginal effect for the firm in the 75th percentile

of the distribution. The results are reported in the bottom panel of Table 2. For example, the firm at the 75th percentile of the distribution of the Assets-to-debt ratio (that is, a firm with relatively low financing constraints) features an estimated effect of exchange rate depreciation on exports of 1.503 (with a standard error of 0.266), a much lower value (by 40 per cent) than that uncovered for the firm at the 25th percentile of the distribution for that variable: 1.898 (with a standard error of 0.328).

5.1.2 The Extensive Margin

In Table 3 we report estimation results for the extensive margin of exports. In particular, the dependent variable is a dummy variable reflecting the firm's export status: it is equal to one if the firm is an exporter in a given year and zero otherwise. The estimation approach for deriving the results reported in Table 3 is that of the linear probability model (LPM) and the GMM panel estimation methodology is employed. The results provide a similar picture to that emerged for the intensive margin. In particular, on the one side, the standard competitiveness effect is confirmed, suggesting that an exchange rate depreciation increases the probability for a firm to be an exporter. On the other, a higher ability for a firm to have access to finance also increases the probability of being exporter. Moreover, our findings show that the firm's participation to export markets is more responsive to exchange rate shocks the more the firm is financially constrained. For example, by focusing on the net liquid-to-total assets as proxy for access to finance, the estimated coefficient of the exchange rate variable in isolation is 0.197 (with a standard error of 0.033). The coefficient on the interaction term between the exchange rate and the access to finance indicator is negative and statistically significant (-0.102 with a standard error of 0.043), suggesting that if the firm's access to finance is relatively high, then the sensitivity of export participation to exchange rates is attenuated. We also report the marginal effects of the exchange rate on the probability of exporting for two different firms: the one at the 25th percentile of the distribution of the access to finance variable and the one at the 75th percentile. For all indicators of the ability to have access to finance, we find that the more a firm is liquidity constrained, the stronger is the marginal effect.

To investigate the sensitivity of export participation to exchange rate depending on the degree of firms' financial constraints, we also experimented with the probit estimation approach with instrumental variables (IV). From a qualitative point of view, the empirical results obtained with this approach are similar to those obtained with the LPM model. As documented in Table 4, we find that no matter which indicator of access to finance we use,

the marginal effect of exchange on the probability of exporting is higher for the firms with a lower ability to have access to external finance. For example, when the Assets-to-debt ratio is considered, the estimated marginal effect is 0.225 (with a standard error of 0.006) for the firm at the 25th percentile of the distribution for that variable, while it is 0.156 (with a standard error of 0.007) for the firm at the 75th percentile (the one with lower financing constraints).

To sum up, by using our baseline empirical framework and using a variety of measures for the firms' financial conditions, we provide the following findings. First, we confirm that financial constraints hamper both the volumes of exports and the decision to participate to exporting activities. Second, we show that a depreciation, by inducing a higher competitiveness, does increase the export volumes and rise the probability of exporting. Moreover, we establish that for a firm facing financial restraints the expansionary effect of an exchange rate depreciation on exporting activities is magnified and this holds true at both the intensive and extensive margin of exports and for all our alternative measures of access to finance. Building on these findings, in the rest of the paper we do the following. First, we try to shed light on the mechanisms through which these effects arise. Second, we investigate whether the incidence of financial constraints continues to shape the sensitivity of firms' exports to exchange rate shocks even when other transmission channels are explicitly allowed for.

5.2 Deciphering the Mechanism: Exchange Rate Pass-through

As argued above and as emerged in the theoretical framework, a key mechanism through which financial constraints affect the responsiveness of firm's exporting activities to exchange rate is the degree of exchange rate pass-through to export prices. As argued by Strasser (2013), more financially constrained firms might tend to pass-through exchange rate shocks to export prices denominated in the foreign currency by more than what the less constrained firms do, causing stronger swings in export volumes. This is because borrowing constraints force firms to keep pricing-to-market decisions to a minimum as they have not enough margin to absorb an exchange rate shock on their mark-up. Hence, the exchange rate pass-through on export prices denominated in the domestic currency is low for these firms and export volumes respond to a larger extent. Our data allow us to investigate the empirical relevance of this transmission channel of an exchange rate shock. In particular, we can rely on firm-level, time-varying information on the export prices of Chinese firms denominated in the domestic currency.

Although we borrow the intuition from Strasser (2013), our analysis differs for three notable reasons. First, while the data in Strasser (2013) are entirely qualitative in nature and, concerning exports, they are based on a firm's self-assessment on a three-level scale of the direction of its exports over the subsequent months (e.g., increase, remain the same, and decrease), we rely instead on firm-level panel information on the actual export volumes and prices and a number of other continuous variables. Second, in our empirical analysis we do allow and control for other firm-level factors, different from financial constraints, that may also impinge on the relationship between exchange rate and export performance. Third, we have direct information on export prices, while Strasser (2013) infers the exchange rate pass-through on export prices from estimates based on information on domestic price expectations (see also Gopinath (2013)).

For this pass-through analysis we employ the logarithm of firm-level, time-varying export prices of Chinese firms denominated in the domestic currency as the dependent variable in a regression equation otherwise identical to Eqs. (12) and (13).

The estimation results are reported in Table 5 and confirm the empirical relevance of the channel based on a different degree of exchange rate pass-through to export prices. In particular, we find that an exchange rate depreciation increases the export prices denominated in the firm's domestic currency (the renminbi). Moreover, the higher is the firm's access to finance the stronger is the effect of a currency depreciation on the export price denominated in the domestic currency and, of course, the lower is (the absolute value of) the effect on export prices denominated in the foreign currency. In particular, we find that the estimated coefficient on the interaction term between the log of the exchange rate and the indicator of access to finance is positive and statistically significant. For example, if the Cash-to-total assets ratio is used (column 2), then the marginal effect of (the log of the) exchange rate on the log of Export prices in renminbi is 0.84 (with a standard error of 0.295) for the firm at the 25th percentile of the distribution of the access to finance variable. By contrast, the marginal effect is equal to 1.118 (with a standard error of 0.237) for the firm at the 75th percentile of the distribution. These regressions include the lagged log-level of labor productivity and, interestingly enough, its estimated effect on the export prices denominated in the domestic currency is in general negative and statistically significant.

6 Extensions: Allowing for Alternative Channels

A critic might argue that our results on the importance of access to finance in shaping the exchange rate sensitivity of exports is a figment of other factors. Indeed, several firm-level, time-varying features, in addition to financial constraints, may affect the responsiveness of exports to exchange rate and controlling for them is crucial to strengthen our causal interpretation based on financial constraints. Hence, in this section we investigate whether our findings continue to hold once we augment the baseline specification to allow for alternative transmission mechanisms. In particular, we consider, each at a time, the role of imported intermediate input, labor productivity, price stickiness, and size.

6.1 Import Dependence

The first mechanism that we consider deals with the firm's reliance on imported intermediate inputs. While an exchange rate depreciation makes the domestic products more competitive abroad as their foreign export prices become cheaper, it also makes the firm's imported inputs more expensive. This offsetting effect of exchange rate shocks through imported inputs is likely to be more pronounced the higher is the firm's dependence on imported intermediate inputs and may have implications for the overall effect on exports. Greenaway et al. (2010) provide evidence that the negative response on exports of an exchange rate appreciation is smaller in industries that import a higher share of intermediate inputs because of this offsetting effect on the cost side through the price of inputs. In a recent contribution, Amiti et al. (2014) show that the degree of exchange rate pass-through to export prices depends on the firm's import intensity and export market share. In particular, a key prediction of their theoretical model, which is also confirmed at the empirical level using Belgian microeconomic data, is that the exchange rate pass-through into destination-currency export prices is lower for more import-intensive firms (and for firms with higher export share in the destination market). Whilst Amiti et al. (2014) do not explicitly investigate the implications for export volumes of differences across firms in their reliance on imported inputs, their findings single out a channel through which the sensitivity of exports to exchange rate differs across firms. In particular, firms' heterogeneity in the intensity of imported intermediates does play a crucial role in their framework.

We construct a firm-level, time varying indicator of firm's net import dependence. This indicator is constructed as the share of imported intermediate inputs (net of exports) over total sales. In Table 6 we provide the results of estimating an equation where, in addition

to the channel based on the incidence of financing restraints, we also allow for the firm's net import dependence. This variable enters the specification both in isolation and as an interaction with the (log of the) exchange rate. To mitigate the possible endogeneity bias, the lag of net import dependence is inserted in the specification. Consistently with the results of Amiti et al. (2014) and Greenaway et al. (2010), we find that a higher degree of reliance on imported inputs lowers the sensitivity of exports to exchange rate: indeed, in all the three specifications documented in Table 6 the estimated coefficient on the interaction term is negative and statistically significant. Importantly for our purposes, however, the effect of exchange rate on exports channeled through the different ability of firms to have access to finance continues to be detected. The estimated coefficients on the interaction term between the indicator of access to finance and the exchange rate is negative and statistically significant no matter which indicator is used: for example, if the assets to debt ratio is considered, then the estimated coefficient on the interaction term is -2.097 (with a standard error of 1.068). The marginal effects of the log of exchange rate on the log of export volumes are indeed different across firms depending on their position within the distribution of the access to finance variables (see the figures on Table 6 for a comparison between firms at the 25th and 75th percentile of the distribution).

As in all previous equations presented thus far, the log of labor productivity is included in the specifications whose results are reported in Table 6. Not surprisingly, the estimated effect of it continues to be positive and statistically significant and in the next section we delve more deeply into the role of productivity.

6.2 Firm's Productivity

The second alternative mechanism that we consider deals with the role of productivity. As mentioned above, in investigating the export decision at the firm level a prominent role is assigned in the literature to the observed cross-sectional heterogeneity in productivity. The latter originates from several sources, including for example: a) a continuous development of new products and new production techniques, which generate very differentiated outcomes in terms of efficiency gains; b) differences in entrepreneurial and managerial ability; c) an uneven diffusion of information and knowledge, which may favor some firms over others. More productive firms are shown to be better able to pay the fixed, start-up costs associated with export participation and, in general, higher levels of firm's productivity are associated with larger export flows (see Melitz (2003) and Bernard et al. (2007) for a survey).

In their important contribution, Berman et al. (2012) show that firms with higher productivity exhibit a lower elasticity of exchange rate pass-through into export prices (denominated in the currency of the destination country) because they tend to absorb more exchange rate movements in their mark-ups and this implies a lower responsiveness of their export volumes to exchange rate. Hence, in their analysis differences across firms in the sensitivity of exports to exchange rate originate from heterogeneity across firms in their productivity (see Li et al. (2015) for a similar analysis on Chinese data). To allow for this additional channel, we therefore augment our baseline specification to include the interaction between the log level of the exchange rate and the log level of lagged labor productivity. As before, labor productivity in isolation is also inserted in the estimating equations.

The results are reported in Table 7. We confirm the main finding of Berman et al. (2012), as the interaction between exchange rate and productivity is negative throughout the three specifications (although it is not statistically significant when the liquid-to-total assets ratio is considered). For example, when the assets-to-debt ratio is used, the estimated coefficient on the interaction term is -0.211 (with a standard error of 0.072). However, the mechanism through which financial constraints affects the response of export to exchange rate continues to be relevant in our estimates. Indeed, the estimated coefficient associated to the interaction term between the exchange rate and the indicator of access to finance is negative and statistically significant across all indicators of (the lack of) financial restraints. By focusing on the marginal effects of exchange rate on exports for firms at the 25th and 75th percentile in the distribution of, say, the liquidity-to-assets ratio, their estimates are, respectively, 2.101 (with a standard error of 0.396) and 1.616 (with a standard error of 0.321). Our results indicate that, even allowing for the channel based on productivity, the higher are the financial constraints the larger the sensitivity of exports to exchange rate tends to be.[8]

6.3 Price Stickiness

An additional channel that may contribute to shape the elasticity of exports to exchange rate changes deals with nominal rigidities. As argued by Gopinath and Itskhoki (2010), if

[8]Financial constraints and productivity have also been shown to interact with each other in determining export behavior. Berman and Hericourt (2010), for example, show that the level of productivity becomes increasingly relevant for exporting activity when financial constraints are relatively low, while it does not affect export decisions when access to finance is limited. They argue that, as the correlation between productivity and access to finance might be imperfect, a disconnection can arise between exports on one side and productivity and access to finance on the other if the latter two variables are not jointly considered.

the prices in the local currency of the destination market are sticky then the sensitivity of export volumes to exchange rate tends to be low. Indeed, if in the short run firms do not adjust the local currency export prices, then the exchange rate pass-through on export prices denominated in the domestic currency is high and limited would be the response of export volumes (see also Gopinath and Rigobon (2008)).

In order to allow for this additional channel, we follow Berman et al. (2012) and use the standard deviation of the absolute value of log changes in the unit values of exports (in the home currency) as an admittedly imperfect proxy for the frequency of price revisions. In particular, we insert in the baseline specification two additional terms: a) the standard deviation in isolation and b) its interaction with the exchange rate. The results are documented in Table 8. As expected, a higher variability over time in the log change of the unit values denominated in the domestic currency – which reflects a lower frequency of adjustment in the buyer currency prices – implies a lower effect of exchange rate on exports. For example, in the equation where the liquid-to-total assets ratio is used as indicator of access to finance, the interaction term between the exchange rate and the proxy for price rigidity has a coefficient which is estimated to be negative and statistically significant (-2.153 with a standard error of 0.519). Against this backdrop, however, our main results remain unchanged as the sensitivity of exports to exchange rate continues to vary depending on the firm's ability to have access to finance.

6.4 Employment Size

Finally, the last channel that we investigate deals with firm size. As mentioned before, our empirical specifications include different dummy variables to control for the firm's employment size. In this section we verify whether financial constraints continue to play an independent and statistically significant role in shaping the exchange rate elasticity of exports once the number of employees is introduced in the regression both in isolation and as an interaction with the exchange rate. Controlling also for size is necessary in order to rule out that the influence of financial constraints is simply a figment of other firm-level factors. In particular, firm size can be thought as being isomorphic to other firm level features, such as financial strength, and is also often used in empirical analyses to approximate the firm's propensity to hedge against exchange rate risk.[9]

[9] Hericourt and Poncet (2013) document a non-linear effect of exchange rate volatility on firm-level export performance depending on the extent of financial constraints. They show that, because well-developed financial markets allow firms to hedge exchange rate risk, the negative impact of exchange rate volatility on

In the context of our investigation, the higher is the reliance on foreign exchange hedging activities the lower would be the responsiveness of exports to exchange rate shocks. Since we do not have comprehensive hedging data at the firm level, we use data on employment size and extend our baseline specification accordingly. The results are reported in Table 9. As expected, the estimated coefficient on the interaction term between (the log of the) exchange rate and the log of lagged employment is negative and statistically significant no matter which indicator of access to finance is used. For example, when the cash-to-assets ratio is used, the estimated coefficient of the interaction term is -5.724 (with a standard error of 1.390). Importantly, however, exchange rate continues to affect export volumes differentially across firms depending on their degree of access to finance. For example, if a firm has a liquid-to-total assets ratio at the 25th percentile of the distribution then the marginal effect of exchange rate on exports is 2.432 (with a standard error of 0.686). Conversely, for the firm at the 75th percentile of that distribution (a firm with lower financial constraints) the marginal effect is 1.369 (with a standard error of 0.788).

Hence, overall these results confirm that several factors contribute to explain firm's heterogeneity in the response of exports to exchange rate. However, even controlling for each of them, we have shown that differences across firms in the ability to have access to external finance introduce a statistically significant degree of specificity in the response of their exports to exchange rate.

7 Concluding Remarks

In this paper, we investigate on microeconomic data how the reaction of exporting activities to exchange rate movements varies across firms depending on the degree of financial constraints that they face. Consistent with the testable implications of our simple theoretical framework, we find that exporting activities by firms with more financial restraints tend to more sensitive to exchange rate than those undertaken by firms with a higher access to external finance. This finding is detected at both the intensive and extensive margins of exports. We delve into the mechanism underlying this result and provide evidence that the degree of exchange rate pass-through to export prices denominated in the domestic currency is indeed lower for the firms facing more financial constraints. This is consistent with the view that only firms with enough financial strength are able to pursue pricing-to-market

exports is amplified for financially vulnerable firms and attenuated if the level of financial development is high.

strategies and absorb in their mark ups any exchange rate shock.

Moreover, we control for a variety of other firm level factors, apart from financial constraints, which may also contribute to shape the response of exports to exchange rate. These are the intensity of use of imported inputs, labor productivity, price stickiness and employment size. Each of this channel is found to play a role on empirical grounds and we therefore do not rule out their relevance. However, we show that, even controlling for these parallel channels, the heterogeneity across firms in their ability to have access to finance significantly affects the size of the reaction of exports to exchange rate. Although in this paper we focus solely on microeconomic data, we believe, however, that the firm's heterogeneity uncovered here for the exchange rate elasticity of exports is relevant for the understanding of the low values of this elasticity typically detected in aggregate data.

8 Appendix

We first prove that whenever the condition for positive profits (8) is satisfied, the condition for positive production is also satisfied. From Eq. (3), positive production requires that $a < \frac{de}{\tau c(1+\phi)}$. From Eq. (8), simple algebraic manipulations allow us to show that this condition is satisfied as long as:

$$a < \frac{ed}{\tau c(1+\phi)} - \frac{2\sqrt{ef(1+\phi)F - f\phi L}}{\tau c(1+\phi)}, \tag{14}$$

that is a more stringent condition than that required for positive production.

Next, we show that, for $F \geq \frac{\phi}{1+\phi}L$, there is an interval of values of F such that the impact of an exchange rate depreciation on the minimum required productivity is stronger for firms that face higher costs of external financing, ϕ. This requires studying the derivative of $\frac{\partial a}{\partial e}$ in Eq. (10) with respect to ϕ, that is:

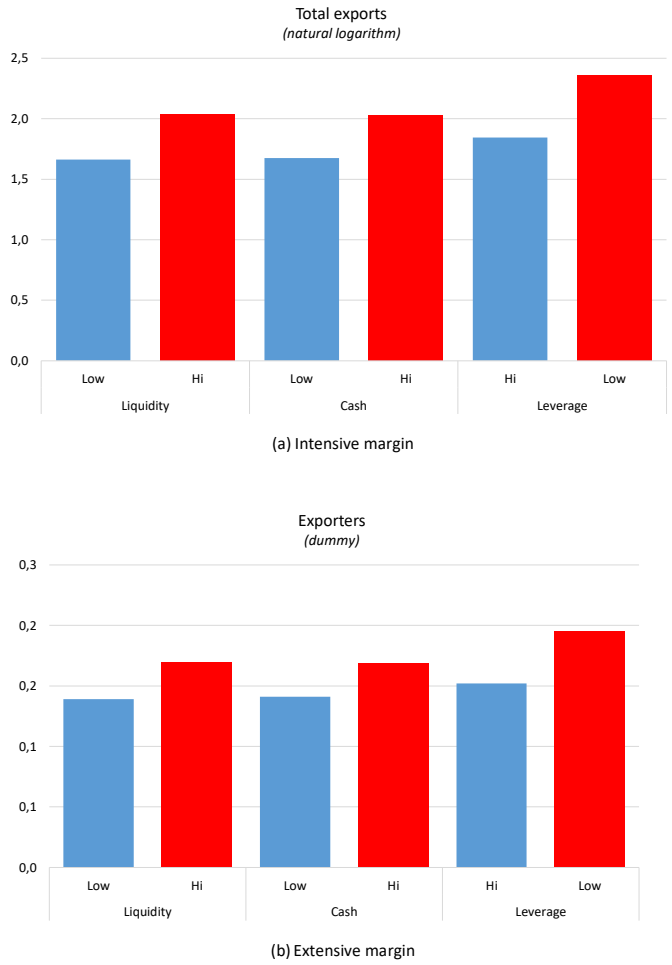
$$\frac{\partial^2 a}{\partial e \partial \phi} = \frac{-1/2[ef(1+\phi)F - ef\phi L]^{-(1/2)}(fF - fL)\tau c(1+\phi) - \tau c(d - e^{-(1/2)}\sqrt{f(1+\phi)F - f\phi L}}{[\tau c(1+\phi)]^2}. \tag{15}$$

The condition for this expression to be positive is the following:

$$f[(1+\phi)F - \phi L)] > -fL + 2d\sqrt{ef(1+\phi)F - ef\phi L}. \tag{16}$$

To be defined, this condition requires that the argument of the square root in the right hand side of the expression is non-negative, that is $F \geq \frac{\phi}{1+\phi}L$. Consider the case when this condition is satisfied as an equality: $F = \frac{\phi}{1+\phi}L$. In this case, the left hand side of the expression above is zero, while the right hand side is equal to $-fL < 0$. The condition for the above expression to be positive is therefore satisfied. For small increases of F, leaving L unchanged, the condition will also be satisfied, which proves our statement.

Figure 1: Financial constraints and exports



Notes: Panel A presents the averages of log of total exports distinguishing (separately for each indicator of access to finance) between firms with a level of access to finance above and below the sample median. Panel B presents the average of the dummy variable taking the value of one if the firm is an exporter and zero otherwise, again distinguishing between firms on the basis of the value of the indicator of access to finance (below and above the median).

Table 1: Descriptive statistics

variable	mean	median	s.d.	5th percentile	95th percentile
Total exports	6.70e+07	0	1.75e+10	0	1.80e+5
Exporter (dummy)	0.155	0	0.362	0	1
Exchange rates (total)	1.008	1	0.158	0.831	1.210
Exchange rates (by year)	1.023	1	0.090	0.946	1.155
Exchange rates (by industry)	1.022	1	0.279	0.856	1.164
Net liquidity over total assets	0.053	0.058	0.296	-0.465	0.541
Cash over total assets	0.209	0.163	0.172	0.013	0.564
Leverage	0.598	0.600	4.234	0.102	0.999

Correlations			
	Liquidity ratio	Cash ratio	Leverage
Liquidity ratio	1.0000		
Cash ratio	0.2938	1.0000	
Leverage	-0.6203	-0.0367	1.0000

Notes: Total exports are measured at constant prices of 2000 and are expressed in renmimbi; the dummy variable Exporter takes the value of one for firms that are exporting in year t and zero otherwise; Exchange rates are the real effective exchange rates of the renmimbi calculated at the sector level, and statistics by year and industry are computed on year and industry averages, respectively; Net liquidity over total assets is the ratio of current assets minus current liabilities over total assets; Cash is computed as current assets minus inventories and accounts receivable and its value over that of total assets is considered; Leverage is the ratio of debt over total assets.

Table 2: The intensive margin of exports - GMM estimates

Dependent variable:	Measures of Financial constraints		
$\log(\text{Export volumes})_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
$\log(\text{Exchange rate})_{j,t}$	1.902^{***}	3.981^{***}	0.961^{***}
	(0.358)	(0.695)	(0.290)
$\text{Access to Finance}_{i,t-1}$	0.295^{***}	0.634^{***}	-0.361
	(0.107)	(0.183)	(0.797)
$\log(\text{Exch. rate})_{j,t} \cdot \text{Access to Finance}_{i,t-1}$	-1.552^{***}	-11.068^{***}	-1.652^{***}
	(0.529)	(3.187)	(0.587)
$\log(\text{Labor productivity})_{i,t-1}$	0.144^{***}	0.150^{***}	0.115^{***}
	(0.029)	(0.033)	(0.028)
Number of observations	688250	521937	861195
Hansen statistic (p-value)	20.7 (0.95)	14.7 (0.62)	16.4 (0.93)
Marginal effects (dy/dx) of :	Measures of Financial constraints		
$\log(\text{Exchange rate})_{j,t}$ on $\log(\text{Export volumes})_{i,t}$ evaluated at:	(1)	(2)	(3)
1) $\text{Access to Finance}_{i,t-1}(25th \text{ percentile})$	2.104^{***}	3.175^{***}	1.898^{***}
	(0.400)	(0.511)	(0.328)
2) $\text{Access to Finance}_{i,t-1}(75th \text{ percentile})$	1.577^{***}	1.089^{**}	1.503^{***}
	(0.311)	(0.436)	(0.266)

Notes: The dependent variable is the (log) of firm's exports at constant prices. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. Estimates are obtained using the system GMM panel estimator. Firms fixed effects are included. Firm size class dummies are constructed based on the year-specific deciles of the distribution of employment. We also include year and firm type dummies. Robust standard errors corrected for clustering are reported in parentheses. To deal with the possible endogeneity of the financial indicator, the instrument set of the GMM type includes lagged values of it dated *t-1* and earlier plus the lagged loan ratio at the province level. Hansen is a test of over-identifying restrictions and is asymptotically distributed as a χ^2. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

Table 3: The extensive margin of exports: Linear Probability Model - GMM estimates

Dependent variable:	Measures of Financial constraints		
Export status$_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
log(Exchange rate)$_{j,t}$	0.197***	0.271***	0.039***
	(0.033)	(0.037)	(0.017)
Access to Finance$_{i,t-1}$	0.030***	0.032**	0.085***
	(0.008)	(0.013)	(0.017)
log(Exch. rate)$_{j,t}$ · Access to Finance$_{i,t-1}$	−0.102**	−0.583***	−0.083**
	(0.043)	(0.067)	(0.042)
log(Labor productivity)$_{i,t-1}$	0.012***	0.086***	0.001
	(0.003)	(0.017)	(0.001)
Number of observations	591268	885245	886195
Hansen statistic (p-value)	13.6 (0.99)	14.7 (0.95)	15.6 (0.62)
Marginal effects (dy/dx) of :	Measures of Financial constraints		
log(Exchange rate)$_{j,t}$ on prob(Exporting)$_{i,t}$	(1)	(2)	(3)
evaluated at:			
1) Access to Finance$_{i,t-1}$(25th percentile)	0.209***	0.231***	0.086***
	(0.037)	(0.034)	(0.0157)
2) Access to Finance$_{i,t-1}$(75th percentile)	0.175***	0.122***	0.066***
	(0.027)	(0.027)	(0.011)

Notes: The dependent variable is the probability of being exporter. It is a dummy variable equal to one if, in a given year, the firm has exported and zero otherwise. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. Linear Probability Models are estimated here using the GMM panel estimator. Firms fixed effects are included. Firm size class dummies are constructed based on the year-specific deciles of the distribution of employment. We also include year and firm type dummies. Robust standard errors corrected for clustering are reported in parentheses. To deal with the possible endogeneity of the financial indicator, the instrument set of the GMM type includes lagged values of it dated *t-1* and earlier plus the lagged loan ratio at the province level. Hansen is a test of over-identifying restrictions and is asymptotically distributed as a χ^2. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

Table 4: The extensive margin of exports - Probit Estimates with IV

Dependent variable:	Measures of Financial constraints		
Export status$_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
log(Exchange rate)$_{j,t}$	0.500^{***}	0.374^{***}	0.407^{***}
	(0.018)	(0.024)	(0.019)
Access to Finance$_{i,t-1}$	0.264^{***}	5.532^{***}	0.167^{***}
	(0.011)	(0.131)	(0.058)
log(Exch. rate)$_{j,t}$ · Access to Finance$_{i,t-1}$	-0.534^{**}	-0.920^{***}	-1.460^{***}
	(0.048)	(0.106)	(0.119)
log(Labor productivity)$_{i,t-1}$	0.064^{***}	0.006^{*}	0.059^{***}
	(0.002)	(0.003)	(0.002)
Number of observations	537608	563695	504524
Marginal effects (dy/dx) of :	Measures of Financial constraints		
log(Exchange rate)$_{j,t}$ on prob(Exporting)$_{i,t}$	(1)	(2)	(3)
evaluated at:			
1) Access to Finance$_{i,t-1}$(25th percentile)	0.128^{***}	0.056^{***}	0.225^{***}
	(0.004)	(0.004)	(0.006)
2) Access to Finance$_{i,t-1}$(75th percentile)	0.092^{***}	0.048^{***}	0.156^{***}
	(0.005)	(0.008)	(0.007)

Notes: The dependent variable is the probability of being exporter. It is a dummy variable equal to one if, in a given year, the firm has exported and zero otherwise. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. Industry dummy variables are included. Firm size class dummies are constructed based on the year-specific deciles of the distribution of employment. We also include year and firm type dummies. The instrument set includes lagged values of the financial indicator and the lagged loan ratio at the province level. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

Table 5: Inspecting the mechanism: the pass-through channel (GMM)

Dependent variable:	Measures of Financial constraints		
$\log(\text{Export prices in domestic currency})_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
$\log(\text{Exchange rate})_{j,t}$	1.190^{***}	0.712^{**}	1.417^{***}
	(0.271)	(0.345)	(0.336)
$\text{Access to Finance}_{i,t-1}$	-0.273^{*}	-0.344	0.101^{***}
	(0.156)	(0.806)	(0.029)
$\log(\text{Exch. rate})_{j,t} \cdot \text{Access to Finance}_{i,t-1}$	0.618^{**}	1.499^{*}	0.948^{***}
	(0.293)	(0.886)	(0.364)
$\log(\text{Labor productivity})_{i,t-1}$	0.223	-0.058^{***}	-0.052^{***}
	(0.258)	(0.015)	(0.013)
Number of observations	133191	104164	119026
Hansen statistic (p-value)	12.1 (0.28)	13.7 (0.84)	11.42 (0.78)
Marginal effects (dy/dx) of :	Measures of Financial constraints		
$\log(\text{Exchange rate})_{j,t}$ on $\log(\text{Export prices})_{i,t}$ evaluated at:	(1)	(2)	(3)
1) $\text{Access to Finance}_{i,t-1}(25th \text{ percentile})$	1.144^{***}	0.840^{***}	0.906^{***}
	(0.263)	(0.295)	(0.209)
2) $\text{Access to Finance}_{i,t-1}(75th \text{ percentile})$	1.335^{***}	1.118^{***}	1.120^{***}
	(0.302)	(0.237)	(0.252)

Notes: The dependent variable is the (log) of firm's export prices denominated in domestic currency. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. Estimates are obtained using the system GMM panel estimator. Firms fixed effects are included. Firm size class dummies are constructed based on the year-specific deciles of the distribution of employment. We also include year and firm type dummies. Robust standard errors corrected for clustering are reported in parentheses. To deal with the possible endogeneity of the financial indicator, the instrument set of the GMM type includes lagged values of it dated *t-1* and earlier plus the lagged loan ratio at the province level. Hansen is a test of over-identifying restrictions and is asymptotically distributed as a χ^2. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

Table 6: Alternative explanations: Import dependence (GMM estimates)

Dependent variable:	Measures of Financial constraints		
$\log(\text{Export volumes})_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
$\log(\text{Exchange rate})_{j,t}$	1.942^{***}	3.242^{***}	1.017^{***}
	(0.367)	(0.586)	(0.344)
$\text{Access to Finance}_{i,t-1}$	0.298^{***}	0.607^{***}	1.122^{*}
	(0.107)	(0.184)	(0.632)
$\log(\text{Exch. rate})_{j,t} \cdot \text{Access to Finance}_{i,t-1}$	-1.551^{***}	-8.404^{***}	-2.097^{**}
	(0.534)	(2.714)	(1.068)
$\text{Net Import Dependence}_{i,t-1}$	-0.0003^{*}	-0.0003^{**}	-0.0003^{**}
	(0.0001)	(0.0002)	(0.0001)
$\log(\text{Exch. rate})_{j,t} \cdot \text{Net Import Dependence}_{i,t-1}$	-0.002^{**}	-0.002^{**}	-0.002^{*}
	(0.001)	(0.001)	(0.001)
$\log(\text{Labor productivity})_{i,t-1}$	0.127^{***}	0.111^{***}	0.103^{***}
	(0.028)	(0.028)	(0.032)
Number of observations	680068	784226	638266
Hansen statistic (p-value)	11.1 (0.99)	13.9 (0.84)	14.9 (0.72)
Marginal effects (dy/dx) of :	Measures of Financial constraints		
$\log(\text{Exchange rate})_{j,t}$ on $\log(\text{Export volumes})_{i,t}$ evaluated at:	(1)	(2)	(3)
1) $\text{Access to Finance}_{i,t-1}(25th \text{ percentile})$	2.146^{***}	2.657^{***}	2.203^{***}
	(0.410)	(0.436)	(0.436)
2) $\text{Access to Finance}_{i,t-1}(75th \text{ percentile})$	1.617^{***}	1.069^{***}	1.719^{***}
	(0.319)	(0.371)	(0.270)

Notes: The dependent variable is the (log) of firm's exports at constant prices. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. Net Import Dependence is defined in the text. Estimates are obtained using the system GMM panel estimator. Firms fixed effects are included. Firm size class dummies are constructed based on the year-specific deciles of the distribution of employment. We also include year and firm type dummies. Robust standard errors corrected for clustering are reported in parentheses. To deal with the possible endogeneity of the financial indicator, the instrument set of the GMM type includes lagged values of it dated *t-1* and earlier plus the lagged loan ratio at the province level. Hansen is a test of over-identifying restrictions and is asymptotically distributed as a χ^2. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

Table 7: Alternative explanations: Productivity performance (GMM estimates)

Dependent variable:	Measures of Financial constraints		
$\log(\text{Export volumes})_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
$\log(\text{Exchange rate})_{j,t}$	2.467^{***}	4.639^{***}	1.761^{***}
	(0.599)	(0.950)	(0.433)
$\text{Access to Finance}_{i,t-1}$	0.295^{***}	0.630^{***}	0.721^{*}
	(0.107)	(0.181)	(0.434)
$\log(\text{Exch. rate})_{j,t} \cdot \text{Access to Finance}_{i,t-1}$	-1.428^{**}	-10.910^{***}	-1.609^{**}
	(0.566)	(3.172)	(0.779)
$\log(\text{Labor productivity})_{i,t-1}$	0.142^{***}	0.153^{***}	0.103^{***}
	(0.030)	(0.032)	(0.029)
$\log(\text{Exch. rate})_{j,t} \cdot \log(\text{Labor productivity})_{i,t-1}$	-0.151	-0.181^{*}	-0.211^{***}
	(0.105)	(0.097)	(0.072)
Number of observations	688250	521937	886195
Hansen statistic (p-value)	19.7 (0.97)	13.1 (0.73)	17.1 (0.58)
Marginal effects (dy/dx) of :	Measures of Financial constraints		
$\log(\text{Exchange rate})_{j,t}$ on $\log(\text{Export volumes})_{i,t}$ evaluated at:	(1)	(2)	(3)
1) $\text{Access to Finance}_{i,t-1}(25th$ percentile)	2.101^{***}	3.159^{***}	1.896^{***}
	(0.396)	(0.507)	(0.351)
2) $\text{Access to Finance}_{i,t-1}(75th$ percentile)	1.616^{***}	1.102^{**}	1.511^{***}
	(0.321)	(0.436)	(0.222)

Notes: The dependent variable is the (log) of firm's exports at constant prices. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. Estimates are obtained using the system GMM panel estimator. Firms fixed effects are included. Firm size class dummies are constructed based on the year-specific deciles of the distribution of employment. We also include year and firm type dummies. Robust standard errors corrected for clustering are reported in parentheses. To deal with the possible endogeneity of the financial indicator, the instrument set of the GMM type includes lagged values of it dated *t-1* and earlier plus the lagged loan ratio at the province level. Hansen is a test of over-identifying restrictions and is asymptotically distributed as a χ^2. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

Table 8: Alternative explanations: Price rigidity (GMM estimates)

Dependent variable:	Measures of Financial constraints		
$\log(\text{Export volumes})_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
$\log(\text{Exchange rate})_{j,t}$	2.765^{***}	4.163^{***}	1.840^{***}
	(0.448)	(0.547)	(0.695)
$\text{Access to Finance}_{i,t-1}$	0.430^{***}	1.113^{**}	-2.439^{**}
	(0.114)	(0.457)	(0.979)
$\log(\text{Exch. rate})_{j,t} \cdot \text{Access to Finance}_{i,t-1}$	-2.978^{***}	-6.983^{**}	-2.574^{**}
	(0.946)	(3.249)	(1.069)
$\log(\text{Exch. rate})_{j,t} \cdot \text{st.dev.}\mid \Delta Export\_prices_i \mid$	-2.153^{***}	-2.500^{***}	-2.256^{***}
	(0.519)	(0.542)	(0.451)
$\log(\text{Labor productivity})_{i,t-1}$	0.178^{***}	0.233^{***}	0.629^{***}
	(0.046)	(0.038)	(0.131)
Number of observations	147389	118718	178620
Hansen statistic (p-value)	11.23 (0.99)	12.9 (0.74)	13.6 (0.99)
Marginal effects (dy/dx) of :	Measures of Financial constraints		
$\log(\text{Exchange rate})_{j,t}$ on $\log(\text{Export volumes})_{i,t}$ evaluated at:	(1)	(2)	(3)
1) $\text{Access to Finance}_{i,t-1}(25th \text{ percentile})$	1.884^{***}	2.318^{***}	2.099^{***}
	(0.456)	(0.363)	(0.342)
2) $\text{Access to Finance}_{i,t-1}(75th \text{ percentile})$	0.961^{***}	1.016^{**}	1.514^{***}
	(0.272)	(0.463)	(0.359)

Notes: The dependent variable is the (log) of firm's exports at constant prices. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. The measure of price rigidity, the standard deviation of $\mid \Delta Export\_prices_i \mid$, is discussed in the text. Estimates are obtained using the system GMM panel estimator. Firms fixed effects are included. Firm size class dummies are constructed based on the year-specific deciles of the distribution of employment. We also include year and firm type dummies. Robust standard errors corrected for clustering are reported in parentheses. To deal with the possible endogeneity of the financial indicator, the instrument set of the GMM type includes lagged values of it dated *t-1* and earlier plus the lagged loan ratio at the province level. Hansen is a test of over-identifying restrictions and is asymptotically distributed as a χ^2. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

Table 9: Alternative explanations: Employment size (GMM estimates)

Dependent variable:	Measures of Financial constraints		
$\log(\text{Export volumes})_{i,t}$	(1) $\frac{Liquidity}{Assets}$	(2) $\frac{Cash}{Assets}$	(3) $\frac{Assets}{Debt}$
$\log(\text{Exchange rate})_{j,t}$	49.669^{***}	30.692^{***}	14.531^{***}
	(13.504)	(7.230)	(3.447)
$\text{Access to Finance}_{i,t-1}$	0.360^{***}	0.681^{***}	0.754^{**}
	(0.106)	(0.166)	(0.381)
$\log(\text{Exch. rate})_{j,t} \cdot \text{Access to Finance}_{i,t-1}$	-3.082^{***}	-6.398^{***}	-3.948^{***}
	(0.747)	(1.780)	(0.960)
$\log(\text{Employment size})_{i,t-1}$	0.925^{***}	0.805^{***}	0.871^{***}
	(0.199)	(0.146)	(0.137)
$\log(\text{Exch. rate})_{j,t} \cdot \log(\text{Employment size})_{i,t-1}$	-9.515^{***}	-5.724^{***}	-3.021^{***}
	(2.734)	(1.390)	(0.730)
Number of observations	716338	930391	926055
Hansen statistic (p-value)	17.6 (0.06)	21.9 (0.64)	17.1 (0.11)
Marginal effects (dy/dx) of :	Measures of Financial constraints		
$\log(\text{Exchange rate})_{j,t}$ on $\log(\text{Export volumes})_{i,t}$ evaluated at:	(1)	(2)	(3)
1) $\text{Access to Finance}_{i,t-1}(25th \text{ percentile})$	2.432^{***}	2.209	2.047^{***}
	(0.686)	(0.502)	(0.418)
2) $\text{Access to Finance}_{i,t-1}(75th \text{ percentile})$	1.369^{***}	1.010^{**}	1.103^{***}
	(0.788)	(0.412)	(0.273)

Notes: The dependent variable is the (log) of firm's exports at constant prices. Exchange rate is the (log) of real effective exchange rate computed at the industry level; j is the industry to which firm i belongs to. Financial constraints are approximated in different ways in columns (1) through (3) using alternative indicators of firm i's ability to have access to external finance. Estimates are obtained using the system GMM panel estimator. Firms fixed effects are included. We also include year and firm type dummies. Robust standard errors corrected for clustering are reported in parentheses. To deal with the possible endogeneity of the financial indicator, the instrument set of the GMM type includes lagged values of it dated *t-1* and earlier plus the lagged loan ratio at the province level. Hansen is a test of over-identifying restrictions and is asymptotically distributed as a χ^2. Sample period: 2000-2006. ***denotes significance at the 1% confidence level; **at the 5% confidence level and * at the 10% level.

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