Heterogeneous Firms, Financial Constraints and Export Behavior:

A Firm-Level Investigation for China

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Abstract

We study the impact of access to finance on exports using Chinese firm level data. We distinguish two modes of external finance, namely bank loans and issuing stocks to shareholders. We not only consider the impact either of these has individually on export behavior, but also their interaction. We build the two external sources, as well as internal finance, into a heterogeneous firm type model which allows us to investigate the relationship between financial constraints and firms' exports. We examine the model's predictions empirically using a comprehensive longitudinal firm-level data set from China. Our empirical results are consistent with the theoretical predictions. Firms who have more interest expenditure or can issue stocks to their shareholders have higher propensity to export and export more. Moreover, the more financial options a firm has, the better a firm performs in terms of export volume and export propensity.

Key words Heterogeneous firms; financial Constraints; exports; China

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1 Introduction

The Chinese economy dominates the academic and public debate on many issues, two of which are exports and finance. China has, over the last three decades, shown unprecedented export growth which has made it the top exporting nation in the world in 2014, well ahead of the US and Germany.[1] At the same time, access to finance is known to be problematic for many firms, in particular privately owned small firms in China, leading to severe credit constraints.[2]

Several papers investigate the link between financial constraints and Chinese firms' exports.[3] Du and Girma (2007) show by using bank loans normalized by total assets that access to bank loans is associated with greater export market orientation. Li and Yu (2009) conclude that Chinese firms with fewer credit constraints export more, and foreign enterprises that enjoy lower credit constraints have higher exports than domestic companies. Manova et al. (2011) demonstrate that limited credit availability hinders firms entering more destination markets, using financial vulnerability measured at sector-level. Egger and Kesina (2013) approximate credit constraints by four internal financial variables, and find that the credit constrained firms are less likely to be exporters and have lower export quotas.

We study in this paper the impact of access to finance on exports using Chinese firm level data. We distinguish two modes of external finance, namely bank loans and issuing stocks to shareholders. We not only consider the impact either of these has individually on export behavior, but also their interaction. This allows us to investigate whether there are complementarities in the use of these sources of finance – is "the more, the better" true for exporting? We build the two external sources, as well as internal finance, into a heterogeneous firm type model which allows us to investigate the relationship between financial constraints and firms' exports. We examine the model's predictions empirically using a comprehensive longitudinal firm-level data set from China.

[1] http://www.statista.com/statistics/264623/leading-export-countries-worldwide/

[2] According to the Investment Climate Assessment surveys in 2002, China was among the group of countries that had the worst financing obstacles (Claessens and Tzioumis, 2006).

[3] A growing body of literature theoretically investigates the link between financial constraints and exporting activities (Chaney, 2005; Muuls, 2008; Li and Yu, 2009; Manova, 2010; Feenstra et al., 2011), and a growing number of empirical evidences spinning different countries and time span accordingly emerges (Bellone et al., 2009; Amiti and Weinstein, 2009; Besedes et al., 2011). Wagner (2013) provides an excellent survey. The vast majority of these theoretical and empirical studies agree that financial constraints will deteriorate firms' ability to enter into foreign markets. Greenaway et al. (2007) however, find that the probability of entry into exporting is not affected by financing problems using firm level data for the UK. Berman and Hericourt (2010) also discover that financing problems do not influence export values in a sample of nine developing countries.

As far as we are aware, this is the first paper to consider these different financial options in theory and empirics.

Our paper contributes to the current literature in several aspects. First, our theoretical model captures three different financial channels including internal liquidity endowment, external borrowing and issuing stocks. Second, Wagner (2013) points out that the reliability of relevant studies suffers from diverse proxy variables for financial constraints such as liquidity ratio, cash flow and other financial ratios. Unlike previous studies, we utilize information on interest expenditure and a dummy variable whether a firm can issue stocks or not to measure the financial constraints directly. Third, we further investigate the interrelationship between different financial options, which we find to be important but is overlooked by previous studies.

Theoretical predictions indicate that some firms are prevented from exporting due to financial constraints, and firms would be more likely to export and export more if they were less restricted by financial constraints. These constraints could be alleviated through better access to external financial resources or issuing stocks to shareholders. Our empirical results are strongly consistent with the theoretical predictions. Firms who have more interest expenditure or can issue stocks to their shareholders have higher propensities to export and export more. Moreover, the more financial options a firm have, the better a firm performs in terms of export volume and export propensity. Finally, the effects of the relaxation of financial constraints on export behavior are stronger for state-owned enterprises (SOEs), firms located in the Eastern region and large-scale firms, as these appear to be less financially constrained.

The remainder of the paper is organized as follows. Section 2 develops the theoretical model. Section 3 introduces the data, sets up the empirical model and introduces estimation approaches. Section 4 analyzes benchmark results, sub-sample results and robustness checks. The last section concludes.

2 The Model

In order to motivate the subsequent empirical analysis, we present a simple theoretical framework within which we can interpret our empirics. Our theoretical model follows Li and Yu (2000) and expands on the number of financing options available to a firm.

Consider two countries, home and foreign (henceforth foreign country is denoted with an asterisk $*$). Labor is the only factor of production and the size of the population is L at home. There are two sectors, where the first sector produces a single homogeneous good at constant returns to scale that is freely traded and chosen as the numeraire, and the price of the homogeneous good can be normalized to one. Each unit of labor in this sector produces a given number of units of the homogeneous good $q_0 = wl_0$, where l_0 is the labor input for q_0 units of the homogeneous good. We assume that wages in both countries are determined by the productivity in this sector. The second sector produces a continuum of differentiated goods under monopolistic competition.

2.1 Demand and Production

Consumers are endowed with one unit of labor. The utility function of the representative consumer is:

$$U = q_0^{1-u}\left(\int_{\omega\in\Omega} q(\omega)^{\frac{\sigma-1}{\sigma}}\, d\omega\right)^{\frac{\sigma}{\sigma-1}\mu} \tag{1}$$

where ω denotes each variety, Ω is the set of varieties available to the consumers, $\sigma > 1$ is a constant elasticity of substitution between each variety, and μ is the share of expenditure on the differentiated sector. The aggregate price index in the differentiated sector is:

$$P = \left(\int_{\omega\in\Omega} p(\omega)^{1-\sigma} d\omega\right)^{\frac{1}{1-\sigma}} \tag{2}$$

where $p(\omega)$ is the price of each variety. We can derive the demand function for a representative consumer for differentiated good ω as Melitz (2003):

$$q(\omega) = \mu wL\left(\frac{p(\omega)^{-\sigma}}{p^{1-\sigma}}\right) \tag{3}$$

And the revenue of each firm is

$$r(\omega) = \mu wL\left(\frac{p(\omega)}{p}\right)^{1-\sigma} \tag{4}$$

Where μwL is the total expenditure for the differentiated goods at home.

Assume that home and foreign are endowed with the same technology and there are constant marginal costs. Firms need to pay fixed costs C_d to enter into the domestic market equal to wC_d. In order to enter foreign markets via exporting, firms pay upfront entry costs w^*C_f and iceberg transportation costs. The productivity of each firm $x>0$ is subject to a random distribution. Therefore, the cost functions for the firm with productivity x of entering into domestic market and foreign markets separately are:

$$c_d = q_d \frac{w}{x} + wC_d \tag{5}$$

$$c_f(q_f) = q_f \frac{\tau w}{x} + w^*C_f \tag{6}$$

In monopolistic competition, firms charge a constant markup $\sigma/(\sigma-1)$ over the unit cost as the pricing rule at both domestic and foreign markets:

$$p_d(x) = \frac{\sigma}{\sigma-1}\frac{w}{x} \tag{7}$$

$$p_f = \frac{\sigma}{\sigma-1}\frac{\tau w}{x} \tag{8}$$

Therefore, the profits from domestic and foreign markets respectively are:

$$\pi_d(x) = \frac{r_d(x)}{\sigma} - wC_d = \frac{\mu}{\sigma} wL\left(\frac{\sigma}{\sigma-1}\frac{w}{xP}\right)^{1-\sigma} - wC_d \tag{9}$$

$$\pi_f(x) = \frac{r_f(x)}{\sigma} - w^*C_f = \frac{\mu}{\sigma} w^*L^*\left(\frac{\sigma}{\sigma-1}\frac{\tau w}{xP^*}\right)^{1-\sigma} - w^*C_f \tag{10}$$

So we can derive the cut-off productivity level of entering into the domestic and foreign markets using the zero profit condition as follows:

$$\overline{x_d} = \frac{\sigma}{\sigma-1}\frac{w}{P}\left(\frac{\sigma C_d}{\mu L}\right)^{\frac{1}{\sigma-1}} \tag{11}$$

$$\overline{x_f} = \frac{\sigma}{\sigma-1}\frac{\tau w}{P^*}\left(\frac{\sigma C_f}{\mu L^*}\right)^{\frac{1}{\sigma-1}} \tag{12}$$

The typical conclusions of the Melitz model apply in our theoretical framework. Firms will enter domestic or foreign markets through self-selection. Only the more productive firms whose productivity is higher than the cut-off productivity can make profits after covering entry costs and survive in the foreign markets. The less productive firms can only produce for the domestic market. The least productive firms exit from both markets.

2.2 Export Decision under Financial Constraints

To start with, we assume that there are no liquidity or credit constraints for firms to finance their domestic production. We suppose that exporters can finance the upfront entry costs through three options: (i) internally retained earnings, (ii) external borrowing from financial institutions and (iii) issuing stocks.

Internal financing through retained earnings mainly consists of domestic profits $\pi_{\mathrm{d}}(x)$ and the liquidity endowment wA.[4] (A,x) are drawn from a joint distribution with c.d.f. $F(A,x)$ over $R^{+}\times R^{+}$ and $F_x(x)\equiv\lim_{A\to\infty}F(A,x)$ over R^{+}. For simplicity we assume there is no cost for this internal financial channel in case the export project fails, which means we do not take the opportunity costs into consideration.

Firms can also obtain financial support from external financial institutions. The costs of borrowing depend on the risks of the export project. Assume the success probability of an export project for firm x is $\lambda(x)\in[0,1]$, which is public information and increasing with productivity x. The investors will set up different interest rates and corresponding repayments $G_f(x)$ according to the success probability. Under normal circumstances, firms must offer tangible assets as collateral. Suppose firms can offer a fraction of domestic fixed costs as collateral which is twC_d. If firms are successful on foreign markets, the investors can recover costs and reap the benefits summing to $G_f(x)$. If the export project fails, however, investors are left with the collateral twC_d.

Firms have a third channel to finance their export project, which is issuing stocks internally and externally. They should pay dividends to their shareholders, which also depends on the success probability of the export project $\lambda(x)$. We assume firms finance a fraction of the upfront entry costs $\phi w^{*}C_f$ ($\phi<1$) through issuing stocks. If the export project is successful, the shareholders can acquire dividends which is proportional to the amount of finance through issuing stock

[4] The liquidity endowment A refers to the wealth belonging to a firm (except for profit) denominated in units of domestic labor.

$\eta w^* C_f$ ($\eta < \phi < 1$). If the export project fails, they do not distribute dividends to their shareholders.[5]

Firms will maximize their expected profit at foreign markets subject to constraints as follows:

$$E\left(\pi_f(x)\right) = \lambda\left(p_f(x)q_f(x) - \frac{q_f(x)\tau w}{x} - \left(1-k_f\right)w^*C_f - G_f(x) - \eta w^* C_f\right) - \left(1-\lambda\right)t\omega C_d \tag{13}$$

Subject to: $\lambda G_f(x) + \left(1-\lambda\right)twC_d = k_f w^* C_f$ (14)

$$p_f(x)q_f(x) - \frac{q_f(x)\tau w}{x} - \left(1-k_f\right)w^*C_f - \eta w^* C_f \geq G_f(x) \tag{15}$$

$$\pi_d(x) + wA + \phi w^* C_f = \left(1-k_f\right)w^* C_f \tag{16}$$

where $1-k_f$ is the proportion of finance through internal retained earnings and issuing stock, and k_f is the proportion of finance through external borrowing from different financial intermediaries. The first constraint demonstrates that investors receive zero profit because of perfect competition in the external financial market. The second constraint illustrates that firms must generate sufficient net revenue to pay the repayment $G_f(x)$ to the investors if the export project succeeds.[6] The third constraint stipulates the proportion of externally financed funds. In this equation, we can see that firms can finance their export project through the domestic profit $\pi_d(x)$, the liquidity endowment wA, issuing stocks $\phi w^* C_f$ and the external borrowing $k_f w^* C_f$.

From the first constraint, we have:

$$G_f(x) = twC_d + \frac{1}{\lambda}\left(k_f w^* C_f - twC_d\right) \tag{17}$$

Substitute (17) into (13), we can rewrite the expected profit of the exporters:

$$E\left(\pi_f(x)\right) = \lambda\left(p_f(x)q_f(x) - \frac{q_f(x)\tau w}{x} - w^* C_f\right) - \left(\frac{k_f + \lambda\eta - \lambda k_f}{k_f}\right)\left(\left(1-\phi\right)w^* C_f - \pi_d - wA\right) \tag{18}$$

[5] We just consider a short-term situation, in the long run, the revenue of buying stock for the shareholders includes the dividends and the available residual assets during liquidation when a firm goes bankrupt.

[6] Note that if export project is successful and firms obtain positive profit, this constraint will not be binding.

where $\left(p_f(x)q_f(x)-\frac{q_f(x)\tau w}{x}-w^*C_f\right)$ is the export profit $\pi_f(x)$ with no financial constraints.

From the above equation, we know that firms need higher profits to survive in foreign markets due to the extra costs caused by the financial constraints. These depend on the amount they borrow $k_f w^*C_f$ and the success probability of the export project $\lambda(x)$.

Utilizing the third constraint, the profit maximizing problem of the expected profit of the export project is given by:

$$\pi_f(x)-\left(\frac{k_f+\lambda\eta-\lambda k_f}{\lambda k_f}\right)\left((1-\phi)w^*C_f-\pi_d-wA\right) \quad (19)$$

Given the success probability of export project $\lambda(x)$, we can show that the right part of the above equation is a positive constant.[7] The profit maximizing problem for expected export profits is equivalent to maximizing the export profit $\pi_f(x)$ under no financial constraints since firm productivity, domestic profit and liquidity endowment are predetermined when they decide to export. Therefore, we have some Melitz-style results such as optimal export price (equation 8) and export profit (equation 10).

However, we cannot treat equation (12) as the cut-off productivity level of entering foreign markets with financial constraints. In fact, firms might or might not be bound by the financial constraints. Hence, we should consider different scenarios. If firms have sufficient domestic profit or liquidity endowment, they can internally finance the upfront entry costs for foreign markets, so that they are not subject to the external financial constraints. In this case, the amount firms would borrow from financial intermediaries $\left((1-\phi)w^*C_f-\pi_d-wA\right)$ is zero, and the cut-off productivity level of entering foreign markets is the same as in equation (12).

Firms that do not have sufficient internal funds to finance the upfront entry costs are potentially restricted by financial constraints. They should borrow $w^*C_f-\pi_d(x)-wA$ from external investors or raise it from shareholders. So the cut-off productivity level of entering foreign markets with financial constraints is determined by:

[7] Note that $\left((1-\phi)w^*C_f-\pi_d-wA\right)$ is the amount firms should borrow from financial intermediaries, which is no less than zero.

$$\pi_f\left(x_{cf}\right)-\left(\frac{k_f+\lambda\eta\text{-}\lambda k_f}{\lambda k_f}\right)\left(\left(1-\phi\right)w^*C_f-\pi_d\left(x_{cf}\right)-wA\right)=0 \tag{20}$$

We find from equation (20) that the financial constraints will make it more difficult for firms to break even and raise the cut-off productivity level of entering foreign markets, which means that it will be harder for firms to enter foreign markets. We can solve for the cut-off productivity level of entering foreign markets with financial constraints from equation (20):

$$\bar{x}_{cf}=\frac{\sigma}{\sigma-1}\left(\frac{\sigma}{\mu}\right)^{\frac{1}{\sigma-1}}\left(\frac{\left(k_f+\lambda\eta-\lambda k_f\right)\left(1-\phi\right)+\lambda k_f}{\lambda k_f}w^*C_f+\frac{\left(k_f+\lambda\eta-\lambda k_f\right)}{\lambda k_f}\left(wC_d-\omega A\right)\right)^{\frac{1}{\sigma-1}} \tag{21}$$
$$\times\left(w^*L^*\left(\frac{\tau w}{P^*}\right)^{1-\sigma}+\frac{\left(k_f+\lambda\eta-\lambda k_f\right)}{\lambda k_f}wL\left(\frac{\omega}{P}\right)^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$$

Firms whose productivities are below this cut-off productivity level of entering foreign markets $\overline{x_{cf}}$ will not be able to export due to financial constraints, even though some firms would be productive enough to export if there were no financial constraints.

2.3 Open Economy Equilibrium

Following Chaney (2005) and Muuls (2008), we study the open economy equilibrium in order to consider firm entry and exit and the effect of exchange rate variations. Assume that the price indices only rely on domestic firms' prices and that foreign firms do not face any financial constraints. Another assumption we make is that prices set by exporters for foreign markets have very little impact on the general price index domestically, which is a reasonable approximation in a relatively closed economy. Hence, the price index in equation (2) can be expressed as:

$$P\approx\left(\int_{x\geq\bar{x}_d}p_d\left(x\right)^{1-\sigma}LdF\left(x\right)\right)^{\frac{1}{1-\sigma}} \tag{22}$$

Let us define a function $h(\square)$ in the following way for convenience:

$$h(\square):\bar{x}^{\sigma-1}=\left(\frac{\sigma}{\mu}\int_{x\geq\bar{x}_d}x^{\sigma-1}dF\left(x\right)\right)\times C\Leftrightarrow\bar{x}=\mathrm{h}\left(C\right) \tag{23}$$

where $h'>0$. We suppose foreign firms have the same productivity distribution as domestic

firms, $F(x)=F^*(x)$. We can rewrite the different cut-off productivities using $h(\square)$:[8]

$$\bar{x}_d = h(C_d) \tag{24}$$

$$\bar{x}_f = \left(\frac{C_f}{C_d^*}\right)^{\frac{1}{\sigma-1}} \frac{\tau w}{w^*} h(C_d^*) \tag{25}$$

$$\bar{x}_{cf} = \left(\frac{\left(\left(k_f+\lambda\eta-\lambda k_f\right)(1-\phi)+\lambda k_f\right)\frac{w^*}{w}C_f+\left(k_f+\lambda\eta-\lambda k_f\right)\left(C_d-A\right)}{\lambda k_f \tau^{1-\sigma}\left(\frac{w^*}{w}\right)C_d^* h^{1-\sigma}\left(C_d^*\right)+\left(k_f+\lambda\eta-\lambda k_f\right)C_d h^{1-\sigma}\left(C_d\right)} \right)^{\frac{1}{\sigma-1}} \tag{26}$$

Firms with productivities above $\bar{x}_d$ serve the domestic market. Only those firms with a productivity above $Max\left(\bar{x}_f,\bar{x}_{cf}\right)$ are able to export because they are both productive enough and have sufficient liquidity to afford the fixed costs. While those firms whose productivities lie between $\left(\bar{x}_f,\bar{x}_{cf}\right)$ could potentially profitably export but are blocked by the financial constraints.

Equation (26) apparently reflects that $\bar{x}_{cf}$ is a decreasing function with respect to A, hereafter, we denote $\bar{x}_{cf}$ as $\bar{x}_{cf}(A,\phi)$. A low value of A will raise the cut-off productivity of entering foreign markets, which can be compensated with a high level of productivity in order to generate sufficient liquidity from domestic market and have a better access to external finance for the upfront entry costs. The reason why more productive firms can have better access to external finance is that they usually yield more net revenue and thus offer better repayment prospects to financial intermediaries. On the contrary, firms who are endowed with a large amount of exogenous liquidity (large A) can cover the upfront entry costs on their own and lower the threshold of entering foreign markets, they can export even when they face external financial constraints or have low productivities. Judging from the above analysis, we find that the firm's productivity and the financial constraints can make up for each other. The financial constraints adversely affect the exports of some firms rather than all firms.[9] In other words, there will be a set

[8] See appendix A.

[9] Formally, $\bar{x}_{cf}(0,\phi)$ is bounded, so that firms with a productivity above $\bar{x}_{cf}(0,\phi)$ do not need any exogenous liquidity. Thus, they are not affected by financial constraints.

of financially constrained exporters which is shown by the following proposition:

Proposition 1: ***If*** x ***and*** A ***are continuously distributed from*** $[0,+\infty]$***, and if***

$$\left((1-\phi)\frac{w^*}{w}\frac{C_d^*}{C_d}+\frac{C_d^*}{C_f}\right)^{\frac{1}{\sigma-1}}\left(\frac{h(C_d)}{h(C_d^*)}\right)>\frac{\tau w}{w^*}$$

then there is a non empty set of firms (denoted Ω) which are prevented from export due to financial constraints.

Proof. *See appendix B.*

Proposition 1 predicts that there must be some firms who could successfully export if they had sufficient funds to cover the entry costs, but they are prevented from exporting because they are actually financially constrained. Therefore, there is a negative relationship between firms' export and financial constraints.

We demonstrate Ω in Figure 1. The area between the straight line $\bar{x}_f$ and curve $\bar{x}_{cf}(A,\phi)$ are Ω, firms located in this area are willing to export, but they are prevented by the financial constraints. Firms locating in the dark area can successfully export.

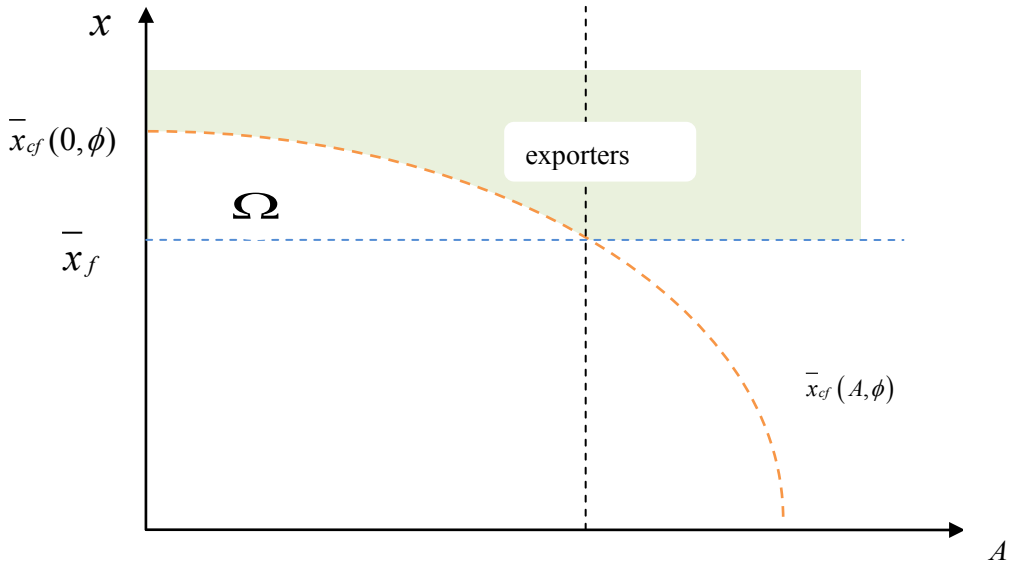

Figure1: Financially constrained exporters

We know from equation (26) that there are some other factors impacting firm export decisions.

First, we observe that the cut-off productivity of entering foreign markets $\bar{x}_{cf}\left(A,\phi\right)$ is a decreasing function with respect to the proportion of finance through issuing stock ϕ, which means an increase in ϕ lowers the threshold $\bar{x}_{cf}\left(A,\phi\right)$. Therefore, it is easier for firms to export and export more, if they can relax the financial constraints through issuing stock. Moreover, as shown in equation (19), $\left(\left(1-\phi\right)w^{*}C_{f}-\pi_{d}-wA\right)$ is the amount firms should borrow from financial intermediaries, thus we can treat $\left(k_{f}+\lambda\eta\text{-}\lambda k_{f}\right)/\lambda k_{f}-1$ as the interest rate firms should pay to the investors. Equation (26) indicates that the higher the interest rate $\left(k_{f}+\lambda\eta\text{-}\lambda k_{f}\right)/\lambda k_{f}-1$, the higher the curve $\bar{x}_{cf}\left(A,\phi\right)$. As a consequence, the higher cost of borrowing from financial intermediaries prevents more firms from exporting. Second, the more firms allocate dividends to their shareholders (large η), the higher the threshold of profitable exports, as dividends eat up firms' liquidity and accordingly lower their abilities to enter into foreign markets.

Finally, we see from equation (26) that an exchange rate appreciation (the higher w^{*}/w) raises the cut-off productivity,[10] which means an exchange rate appreciation impedes firms' exports through the following two effects. On the one hand, the appreciation leads to higher price of domestic products denominated in foreign currencies, which make incumbent exporters less competitive and reduce their exports. On the other hand, the nominal value of the upfront entry costs increases due to the exchange rate appreciation, making it more difficult for exporters break even. We summarize the above findings in Proposition 2.

Proposition 2: ***Ceteris paribus, firms find it easier to export to foreign markets if they (1) can raise funds through issuing stocks; (2) allocate less dividends to shareholders; (3) can borrow money from external investors at lower interest rates; (4) have more liquidity endowments; (5) are confronted with an exchange rate depreciation.***

Proposition 2 predicts that firms who experience less financial constraints through issuing stocks to shareholders, borrowing from external investors and acquiring more liquidity endowments are

[10] Here we use direct quotation method to measure RMB exchange rate.

more likely to export and export more.

3 Data，Specification and Methodology

3.1 Data

Based on this theoretical motivation we move to the empirical analysis of the relationship between access to finance and exports. In this section, we firstly proceed to describe the dataset, then construct the empirical model and discuss estimation methods.

To investigate the relation between financial constraints and firms' exports we use a longitudinal firm-level dataset from the Annual Surveys of Industrial Production (ASIP) between 2005 and 2009 conducted by the Chinese Government's National Bureau of Statistics (NBS).[11] The firm-level dataset is a census of all non-state firms with more than 5 million RMB in sales (about $600,000) plus all state-owned firms, which covers 301,961 firms in 2006. The dataset provides, inter alia, information on output, wages, employment, value added, export value, profits, fixed-assets as well as information on interest expenditure and whether the firm can issue stocks.

We drop observations with negative values for output and number of employees. Moreover, following Feenstra et al. (2013), we drop observations violating accounting standards as follows:

(1) liquid assets are greater than total assets;

(2) total fixed assets are greater than total assets;

(3) the net value of fixed assets is greater than total assets,

(4) the firm's identification number is missing.

We also drop firms with less than 8 employees.[12] After this cleaning, we obtain a sample with 1,649,163 observations, which accounts for about 60% of the original dataset.[13] The remaining sample is described in Table 1:

[11] The dataset contains information from 1998 to 2009, but many critical information is missing in 2004, such as export delivery value, added value etc. Therefore, we only use data over the period of 2005-2009.

[12] According to the China's company law, the number of employees for a company must be more than 8, otherwise it only can be considered as a small private business rather than a company.

[13] Observations with missing values for the variables used in the specification here, are dropped automatically by our econometric software Stata. We also drop duplication observations.

Table 1: Descriptions of the filtered data

	2005	2006	2007	2008	2009
Number of firms	264714	294397	330981	370395	389216
Number of exporting firms	74764	78511	78412	80848	77150
Proportion of exporting firms	28.2%	26.7%	23.7%	21.8%	20%
Average exporting value	63653	76891	93422	91154	87094

Note: the unit of average exporting value is 1000RMB.

3.2 Specification

As predicted in our theoretical model, financial constraints are expected to have a negative impact on firms' export. Firms who have better access to finance through issuing stocks to shareholders, borrowing from external investors and acquiring more liquidity endowments are more likely to export and export more. In order to test these predictions and investigate the relationship between access to different financial channels and export activity empirically, we consider the following specification:

$$\ln Exp_{it} = \beta_0 + \beta_1 \ln\text{interest}_{it} + \beta_2 stock_{it} + \beta_3 \text{Exp}_{it-1} + \beta_4 \ln TFP_{it} + \beta_5 \ln\text{Profit}_{it-1} + \beta_6 \ln Size_{it} + \beta_7 \ln\text{REER}_t + \beta_8 FIE_i + \beta_9 East_i + \beta_{10} \ln\text{interest}_{it} \times stock_{it} + \zeta_i + \xi_{it}$$

where the dependent variable Exp_{it}, denotes firms' exports measured in two alternative ways: the first is an export dummy equal to 1 if a firm exports in time t. This variable is used to model the decision to export. The second approach is to use the log export volume as dependent variable.

On the right hand side of the equation we have firstly two alternative measures of access to external finance: we first measure firms' external financing ability with the interest expenditures ($\ln\text{interest}_{it}$) as in Li and Yu (2013).[14] The rationale is that the scale of interest expenditure

[14] We must admit that there is no perfect measure for external finance. Previous literature tries to measure to what extent firms are financially constrained, which is very difficult because the firm's difficulty to access finance is not directly observable in the data. Most existing studies propose several indirect measures using information of firms' balance sheet such as leverage ratio, liquidity ratio or cash flow (Hadlock and Pierce,2010), but Farre-Mensa and

identifies the firms' capacity to borrow:[15] The more a firm spends on interest, the higher may be the borrowing and, hence, the less a firm is bound by financial constraints.

The second is a dummy variable whether a firm is a stock corporation or not ($stock_{it}$). If a firm can issue stocks to their shareholders, then the dummy variable is equal to 1, otherwise, it is 0. We judge if a firm is a stock corporation from its registration type.[16] We also include the interaction term between interest expenditure and stock dummy. We may hypothesize that a firm which has access to both finance options simultaneously can perform better in terms of export activity. The theoretical model predicts that firms may find it easier to export to foreign markets if they are less restricted by the financial constraints, which can be realized through borrowing from financial intermediaries or issuing stocks to their shareholders. We thus expect positive coefficients on interest expenditure, stock dummy and their interaction term.

The vector of control variables includes other firm level characteristics that have been identified in the literature as important for explaining export activity. We include Exp_{it-1} which is the one-year lagged indicator of firms' exports. This proxies for the firm's exporting experience (Roberts and Tybout, 1996, Alvarez and Lopez, 2013). In order to measure firm performance, we include total factor productivity, firm profits and firm size. The latter is measured using total fixed assets (Liu and Zhang, 2008). Furthermore, the vector contains dummies for whether a firm is foreign owned or not, and whether it is located in Eastern China.[17] Our theoretical model also highlights the impact of the real exchange rate. To capture this, we include the RMB exchange rate in year t, measured as the real effective exchange rate (REER).

There are two components in the error term: ς_i are a set of industry dummies capturing industry-specific fixed effects,[18] ξ_{it} consists of a firm specific time invariant fixed effect and the

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Ljungqvist (2016) argue that all five popular indirect measures of financial constraints widely employed by the financial literature fail to identify properly the firms that are financially constrained.

[15] The scale of interest expenditures can also attribute to higher interest rate, rather than the ability of borrowing. In fact, the dataset collects "above-scale" firms with more than 5 million RMB in sales, the main channel is to borrow from state-owned banks, because it is illegal to borrow money through private channels with higher interest rates, the interest rate of borrowing from banks is fixed by the people's Bank of China, so the scale of interest expenditures can represent the ability of borrowing.

[16] Registration type includes the information whether a firm is a stock company.

[17] The eastern region consists of Shanghai, Jiangsu, Zhejiang, Fujian, Beijing, Tianjin, Guangdong. The majority of the exporters agglomerate in the most developed eastern China.

[18] There are 30 sectors in the manufacturing industry, we divide them into labor intensity sectors and technology intensity sectors.

idiosyncratic remaining error term which is robust to heteroscedasticity. We report basic statistical information of key variables in Table 2.

Table 2: Descriptive statistics of key variables

		2005	2006	2007	2008	2009
Non-exporters	Total sales	65780	73578	85772	85047	101451
	Interest expenditure	780	817	956	1063	1082
	Fixed-assets	68593	72124	76640	75124	98211
	Employees	187	175	170	176	158
	Profit	3916	4722	6005	5336	6535
	TFP	3.91	4.03	4.19	4.31	4.48
	Stock	0.0822	0.0737	0.0757	0.0613	0.0619
Exporters	Total Sales	166905	196976	237190	231988	254297
	Interest expenditure	1430	1685	2103	2287	2155
	Fixed-assets	146826	165913	197598	185014	234816
	Employees	437	441	454	427	424
	Profit	9911	11830	15269	13366	15555
	Stock	0.0600	0.0516	0.0436	0.0433	0.0444

Note: The statistics are averages. Negative value of interest expenditure means the interest income.

3.3 Methodology

In any firm level analysis of export activity, endogeneity of the key regressors caused by either reverse causality or omitted variables need to be discussed. This is potentially also a problem for our analysis. However, we feel that in our particular case two arguments supporting the exogeneity of our financial variables can be made. Firstly, whether a firm is a stock company is a dummy variable defined by the initial firm registration type. As this decision was made when the firm was established, it is unlikely to be influenced by current export activity or any unobserved contemporaneous firm effects. Secondly, we measure interest payments which are paid after the borrowing decision. In other words, it reflects a borrowing decision made in the past which is again unlikely to be correlated with contemporaneous exports or other firm characteristics. Still, a possible endogeneity of regressors, which we cannot completely rule out, should be kept in mind when interpreting the results.

As we have two different types of dependent variables, we also employ different estimation techniques established in the literature. When we exploit the export dummy variable we adopt a random effect probit model (REPM) which allows for a firm specific effect and that was implemented by Bernard and Jensen (2004) to model the export decision of US firms conditional on a lagged dependent variable. When measuring exports in terms of export volume, we employ system GMM estimation (Arrelano and Bover, 1995; Blundell and Bond, 1998), which is also implemented by Bernard and Jensen (2004). This is a more appropriate estimator in the presence of a continuous dependent variable with a lagged dependent variable on the right hand side.

3.4 Measure of firm productivity

We adopt the Olley-Pakes (OP) method to estimate firm productivity using value added to measure production as in Melitz and Polanec (2015).[19] We use fixed assets and the number of employees as measures of capital and labor. We utilize the perpetual inventory method to calculate capital stocks assuming a 15% depreciation rate.[20] Given the OP method requires the real terms of firm's input and output, we use different price deflators for inputs and outputs. The value added is deflated with sector-level Producer Price Indices and the fixed assets are deflated with province-level Price Indices of Investment in Fixed Assets. [21]

4 Empirical Results

4.1 Baseline estimations

We first look at how a firm's decision to export is affected by financial access. Table 5 reports the estimation results based on a random effects probit model (REPM). The likelihood-ratio tests reject the null hypothesis of no random effects. Table 3 reports the estimation results using the interest expenditure to measure the financial constraints (column1), adopting the stock dummy (column 2), including interest expenditure, stock dummy and their interaction (column 3), including year dummies rather than exchange rate movements (column 4) and using standardized

[19] The command opreg can be used to implement the production function estimator of OP.
[20] Some papers adopt other lower depreciation rates, such as 10% or 5%. The choice of different depreciation rates does not affect our qualitative results.
[21] All price indices are from China Statistical Yearbook.

volume variables rather than logarithm (column 5) respectively.[22]

Table 3: The estimation results of financial constraints on export decision

	(1)	(2)	(3)	(4)	(5)
$Interest_{it}$	0.021***		0.047***	0.073***	0.0683***
	(5.281)		(11.00)	(7.736)	(7.736)
$Stock_{it}$		0.046***	0.036***	0.0493***	0.0511***
		(-6.787)	(4.841)	(10.99)	(10.99)
$Interest_{it} * Stock_{it}$			0.0481***	0.034***	0.709***
			(4.223)	(62.13)	(62.13)
Exp_{it-1}	0.310***	0.297***	0.266***	0.257***	0.168***
	(62.49)	(78.99)	(11.56)	(12.58)	(12.58)
TFP_{it}	0.290***	0.257***	0.321***	0.161***	0.161***
	(15.29)	(-17.80)	(66.11)	(2.630)	(2.630)
Pro_{it-1}	0.184***	0.213***	0.319***	0.757***	0.785***
	(22.97)	(35.46)	(-16.49)	(16.28)	(16.28)
$SIZE_{it}$	0.587***	0.702***	0.676***	0.578*	0.503*
	(-30.08)	(40.28)	(-15.58)	(1.651)	(1.651)
$REER_t$	-0.114***	-0.108***	-0.155***		
	(-26.37)	(-33.99)	(0.959)		
FIE	0.484***	0.499***	0.126***	0.803***	0.715***
	(24.79)	(34.97)	(34.19)	(32.71)	(32.71)
East	0.629***	0.574***	0.266***	0.262***	0.166***
	(41.75)	(49.55)	(9.043)	(8.355)	(8.355)
Industry-fixed effects	YES	YES	YES	YES	YES
Year-fixed effects	NO	NO	NO	YES	YES
Wald test	557.67(0.000)	390.21(0.000)	443.67(0.000)	477.32(0.000)	477.32(0.000)
Log likelihood	-402.45	-678.87	-518.97	-433.65	-433.65
Likelihood-ratio test	46.17(0.000)	88.68(0.000)	101.23(0.000)	85.42(0.000)	85.42(0.000)
Observations	117,261	190,556	117,261	117,261	117,261

Note: t-values are in the parentheses after coefficients. P-values in the parentheses after tests. Significant at *10%, **5% and ***1%.

As can be seen in Table 3, the signs of the estimated coefficients for all explanatory variables are generally in line with expectations. The coefficients of the financial variables are positive and statistically significant in all specifications, indicating that firms with more borrowing and the ability to issue stocks are more likely to export to foreign markets. Moreover, we find that the

[22] These volume variables including export volume, interest expenditure, firm size and profit are standardized. The standardized coefficient can be interpreted as the amount of change of standard deviation in dependent variable caused by a 1 standard deviation change in independent variable.

coefficients on the interaction term between interest expenditure and stock dummy are positive and statistically significant, which suggests a stronger effect of interest expenditure on the export decision for firms which can issue stocks. This indicates that the two alternative means of financing reinforce each other. In short, our findings strongly support the prediction that firms who are less restricted by financial constraints (through borrowing or issuing stocks) have a higher propensity to export and firms who have access to both financial options are more likely to export.

Furthermore, we find that an appreciation in the real exchange rate is associated with a lower probability of exporting, conditional on other covariates. Other controls include exporting experience, firm productivity, firm size, profits, foreign firm dummy and east dummy for which we obtain positive coefficients with high significance.

We continue to investigate the relationship between financial access and export ability in Table 4, where we report results from specifications using (the log of) export volume as dependent variable.[23] As before, Column 1 uses the interest expenditure to measure the financial constraints. Column 2 includes the stock dummy. Column 3 includes interest expenditure, stock dummy and their interaction. Column 4 excludes year dummies and includes exchange rate movements. The standardized coefficients are reported in Column 5. Looking at the specification tests, we find that the AR (1) and AR (2) tests indicate that there is first-order serial correlation but no second-order serial correlation in the residuals, which validates our specifications. Furthermore, the Hansen-J test of over-identifying restrictions cannot reject the null hypothesis at any conventional level of significance.[24]

[23] As we take logs, observations with zero export volume are dropped. Hence, the results are conditional on being an exporter. This should be kept in mind for the interpretation.

[24] Bond (2002) finds that the pooled OLS estimator is biased downwards and the fixed effects (within) estimator is biased upwards, thus these two estimators provide the lower and upper bound for the autoregressive coefficient of export volume. In order to test this informative argument and validate our results, we report the pooled OLS estimator, fixed effect OLS estimator and system GMM estimator in Appendix C. we find that the coefficients of one-year lagged export in all specifications lies between OLS and FE estimates, which supports our results.

Table 4: The estimation results of financial constraints on export volume

	(1)	(2)	(3)	(4)	(5)
$Interest_{it}$	0.044***		0.025***	0.049***	0.053***
	(5.90)		(6.569)	(3.916)	(3.916)
$Stock_{it}$		0.029***	0.132**	0.069***	0.089***
		(-3.3)	(2.009)	(26.89)	(26.89)
$Interest_{it} * Stock_{it}$			0.0492***	0.012***	0.104***
			(-5.050)	(10.78)	(10.78)
Exp_{it-1}	0.716***	0.676***	0.355***	0.255***	0.311***
	(35.78)	(73.74)	(10.45)	(20.62)	(20.62)
TFP_{it}	0.118***	0.380***	0.526***	0.229***	0.218***
	(3.41)	(33.99)	(8.280)	(7.171)	(7.171)
Pro_{it-1}	0.162***	0.010***	0.833***	0.264***	0.328***
	(3.19)	(4.16)	(13.70)	(9.101)	(9.101)
$SIZE_{it}$	0.07**	0.149***	0.313***	0.131***	0.342***
	(2.30)	(42.33)	(9.947)	(8.22)	(8.22)
REER_{t}	-1.842***	-1.511***	-2.380***		
	(-27.60)	(40.79)	(-30.14)		
FIE_{i}	0.144***	0.152***	0.212***	0.181***	0.167***
	(10.50)	(14.37)	(11.87)	(11.10)	(11.10)
$East_{i}$	0.042***	0.045*	0.0386**	0.0566	0.0452
	(3.09)	(1.76)	(2.552)	(0.540)	(0.540)
Industry-fixed effects	YES	YES	YES	YES	YES
Year-fixed effects	NO	NO	NO	YES	YES
AR(1)	-19.21（0.000）	-18.11(0.000)	-24.50(0.000)	-20.66(0.000)	-20.66(0.000)
AR(2)	2.01（0.044）	1.71(0.087)	1.34(0.181)	0.78(0.324)	0.78(0.324)
Hansen	16.43(0.142)	12.28(0.158)	14.80(0.128)	15.88(0.133)	15.88(0.133)
Observations	92,075	146,413	100,520	100,520	100,520

Note: Robust t-values in parentheses after coefficients. P-values in the parentheses after tests. *** p<0.01, ** p<0.05, * p<0.1.

As indicated in Table 4, the signs of all estimated coefficients from different specifications meet our expectations and are in line with those obtained in Table 3. The results in column (1) suggest that a 10 percent increase in interest expenditure lead to a 0.44 percent growth of export volume, ceteris paribus. We also find that the ability to issue stocks is associated with higher export volume. The statistically significant and positive interaction term indicates that the more financial channels a firm has, the better a firm performs in terms of export volume.

Regarding other controls, we still find that exchange rate appreciations are associated with lower export volumes. Furthermore, the positive and significant coefficients found for other controls show that exporting experience, firm productivity, firm size, profit scale, foreign firm dummy and

east dummy positively relate to firms' export ability.

4.2 Investigations for sub-samples

The connection between finance access and firms' exports may differ with firm heterogeneities. For example, access to finance may be different for state-owned compared to private firms, or firms with foreign ownership. This may also be reflected in differences across firm sizes, or different locations with different financial markets. In this section we look at differences across types of firms, which allows us to gain more detailed policy implications. We investigate the effect of financial constraints on firms' exports according to firm ownership, firm locations and firm sizes.

4.3.1 Different firm ownerships

In China, state-owned enterprises (SOEs) receive more fiscal subsidies, tax mitigation and financial supports because of their relationship with government (Zhang et al., 2003; Guariglia et al., 2010). By contrast, private-owned enterprises (POEs) find it more difficult to obtain loans from financial institutions due to their small scale, poor guarantee capacities and low repayment abilities. In this sub-section, we investigate the impact of financial constraints on firms' exports for firms of different ownerships.[25] Table 6 reports the marginal effects derived from the estimation results for the export decision using random effect probit, [26]while the two step system GMM estimation results for export volume are shown in Table 7.

[25] Five kinds of enterprises are distinguished in China: state-owned enterprises (SOEs), collective-owned enterprises (COEs), private-owned enterprises (POEs), Hong Kong-Macao-Taiwan -invested enterprises (HIEs) and Foreign –invested enterprises (FIEs).

[26] The marginal effects are reported in the estimation results of firms' decision to export of Table 8 and Table 9.

Table 6: The estimation results for firms with different types of ownership (export decision)

	(1) SOEs	(2) COEs	(3) POEs	(4) HIEs	(5) FIEs
$Interest_{it}$	0.073***	0.069***	0.017***	0.026*	0.025*
	(6.12)	(3.46)	(11.96)	(1.95)	(1.68)
$Stock_{it}$	0.145	0.112*	0.015***	0.299***	0.445
	(-0.33)	(-5.04)	(-0.10)	(2.86)	(0.75)
$Interest_{it} * Stock_{it}$	0.199***	0.073***	0.004***	0.116***	0.071
	(7.49)	(4.16)	(6.17)	(2.96)	(0.91)
Exp_{it-1}	0.253***	0.251***	0.325***	0.365***	0.383***
	(7.63)	(11.48)	(46.95)	(18.60)	(18.74)
TFP_{it}	0.115	0.251***	0.424***	0.461***	0.205***
	(0.97)	(2.67)	(14.46)	(6.43)	(3.04)
Pro_{it-1}	0.024***	0.067***	0.099***	0.038**	0.089***
	(5.84)	(3.05)	(15.20)	(2.55)	(5.42)
$SIZE_{it}$	0.025***	0.056*	0.021**	0.069***	0.013
	(6.58)	(1.95)	(2.35)	(3.53)	(0.62)
$REER_t$	-0.184***	-0.947***	-0.616***	-0.859***	-0.631***
	(-4.17)	(-7.92)	(-26.50)	(-9.60)	(-12.74)
$East_i$	0.053	0.083	0.338***	0.114**	0.066
	(-0.30)	(-0.66)	(11.00)	(2.19)	(1.02)
Industry-fixed effects	YES	YES	YES	YES	YES
Wald test	100.47(0.000)	306.08(0.000)	390.1(0.000)	370.20(0.000)	36.95(0.000)
Log likelihood	-80.43	-109.69	-200.54	-44.45	-52.74
Likelihood-ratio test	9.97(0.000)	10.02(0.000)	181.56(0.000)	75.65(0.000)	52.74(0.000)
Observations	2,112	2,024	51,254	19,008	23,599

Note: Robust z-values in parentheses. P-values are in the parentheses after tests. *** p<0.01, ** p<0.05, * p<0.1. The marginal effects are reported in this table.

As illustrated in Table 6, the large coefficient on interest expenditure for SOEs suggests the strongest effect of interest expenditure on the exporting probability for the SOEs due to their lower financial constraints.[27] Meanwhile, we find that the effect of interest expenditure is weakest for the POEs, which means that access to this channel of finance does not matter much for export activity of POEs. This may indicate that they are facing financial constraints when it comes to obtaining finance from external financial institutions. With regard to the stock dummy, we see that the coefficients for POEs and HIEs are statistically significant, indicating that for these groups of firms issuing stocks is importantly associated with export activity. This does not seem to be the case, however, for SOEs or firms with investments from non-Chinese investors (FIEs). The

[27] This finding may reflect the fact that SOES can borrow more easily froom banks.

possible reason for this result for SOEs lies in that they have more financial options so that they do not rely on issuing stocks to finance their exports.

Lastly, we find the coefficients on the interaction term between interest expenditure and stock dummy to be positive and significant for all types of firms (with the exception of FIEs). This suggests, that the more financial options a firm has, the more likely a firm is to export. The statistically insignificant coefficients on all financial variables for FIEs indicates that these firms do not rely on access to finance in China to finance their operations. They may be more reliant on finance from the parent company or generally the home country.

Table 7: The results for firms with different types of ownership (export volume)

	(1) SOEs	(2) COEs	(3) POEs	(4) HIEs	(5) FIEs
$Interest_{it}$	0.058**	0.004*	0.035***	0.050***	0.055***
	(2.43)	(2.19)	(8.63)	(8.74)	(9.82)
$Stock_{it}$	0.114***	0.112***	0.109***	0.103***	0.101***
	(3.92)	(3.09)	(5.05)	(6.13)	(5.96)
$Interest_{it} * Stock_{it}$	0.108***	0.101**	0.007***	0.019***	0.033***
	(3.92)	(2.36)	(4.53)	(4.53)	(3.34)
Exp_{it-1}	0.713***	0.946***	0.645***	0.519***	0.613***
	(10.81)	(14.47)	(30.86)	(15.05)	(24.76)
TFP_{it}	-0.045	0.226*	0.369***	0.428***	0.295***
	(-0.36)	(1.84)	(15.93)	(11.68)	(10.48)
Pro_{it-1}	0.135***	0.065*	0.025***	0.039***	0.020***
	(4.75)	(1.86)	(4.58)	(4.64)	(3.03)
$SIZE_{it}$	0.033***	0.005***	0.111***	0.186***	0.154***
	(7.72)	(7.12)	(16.74)	(15.74)	(15.27)
$REER_t$	-3.276***	-1.247**	-1.244***	-1.282***	-1.564***
	(-7.16)	(-2.17)	(-15.20)	(-12.10)	(-15.98)
$East_i$	0.228**	0.137*	0.069***	0.077***	0.027
	(2.15)	(1.86)	(-3.96)	(-3.80)	(1.35)
Industry-fixed effects	YES	YES	YES	YES	YES
AR(1)	-4.52（0.000）	-2.43（0.025）	-14.61（0.000）	-4.05(0.000)	-10.25(0.000)
AR(2)	0.71（0.477）	-1.34（0.180）	0.61（0.544）	0.60 (0.550)	0.70(0.486)
Hansen	20.00（0.130）	15.03(0.142)	15.78（0.126）	12.07 (0.167)	18.71(0.132)
Observations	1,574	1,288	39,361	15,552	19,357

Note: Robust t-values in parentheses. P-values in the parentheses after tests, *** p<0.01, ** p<0.05, * p<0.1.

Table 7 shows a somewhat different picture for the export volume of exporting firms. We find that the coefficients on the financial variables are statistically significant and positive for all firm types,

including FIEs. There also do not seem to be any strong differences in coefficient sizes across firm types (with the exception of COEs). This suggests that the financial options matter differently for firms to decide whether or not to export (Table 6), but that this is not the case for firms deciding on the export volume once they have entered the export market. This is in line with the idea that access to finance is important to overcome the sunk costs of exporting (which determine export decision) rather than the variable costs.

4.3.2 Different firm locations

The level of financial development varies widely across China. Eastern China is the most financially developed region. Firms situated in eastern China gain better access to financial support at lower costs, therefore they may be less restricted by financial constraints (Li and Hu, 2014). We divide China into the east region and the rest region in order to investigate the relation between the financial constraints and firms' exports. Table 8 presents the estimation results for firms situated in different regions.

Table 8: The estimation results for firms in different locations

Dependant variable	Export volume		Export decision	
	East	Rest	East	Rest
	(1)	(2)	(3)	(4)
$Interest_{it}$	0.534**	0.456***	0.0781***	0.0361***
	(2.308)	(3.229)	(8.579)	(7.074)
$Stock_{it}$	0.074***	0.0681***	0.0562***	0.0481***
	(2.835)	(4.816)	(2.714)	(5.485)
$Interest_{it} * Stock_{it}$	0.468**	0.010***	0.0544**	0.0745***
	(2.522)	(4.078)	(2.038)	(5.707)
Exp_{it-1}	0.215**	0.480***	0.419***	0.312***
	(2.491)	(4.016)	(38.21)	(54.05)
TFP_{it}	0.506***	0.413*	0.399***	0.379***
	(4.918)	(1.669)	(9.776)	(15.96)
Pro_{it-1}	0.872***	0.587***	0.107***	0.0776***
	(6.410)	(2.654)	(-11.66)	(-14.64)
$SIZE_{it}$	0.434***	0.344**	0.0275**	0.0107
	(7.315)	(2.379)	(2.022)	(1.539)
$REER_t$	-2.181***	-3.190***	-5.290***	-3.486***
	(-12.28)	(-6.934)	(-22.96)	(-23.46)
FIE_i	0.0766**	0.187	0.351***	0.574***
	(2.727)	(0.565)	(9.397)	(23.51)
Industry-fixed effects	YES	YES	YES	YES
AR(1)or Wald test	-6.10（0.000）	-4.51（0.000）	153.7（0.000）	363.65(0.000)
AR(2)or Log likelihood	-2.09（0.036）	0.08（0.935）	-168.13	-232.19
Hansen or LR test	14.61（0.120）	16.23(0.106)	548.78（0.000）	150.48(0.000)
Observations	57,173	43,347	62,988	54,273

Note: Robust t-values in parentheses. P-values in the parentheses after tests. *** p<0.01, ** p<0.05, * p<0.1. Column 1-2 are estimated by xtabond2. Column3-4 are estimated by xtprobit. Column 3-4 report the marginal effects.

From Table 8, we find that the coefficients on the two financial variables appear larger for firms from the eastern regions in terms of both export volume and export propensity. This finding suggests a stronger effect of the relaxation of financial constraints on firms' export for exporters from eastern China, because they have better access to financial supports in the most financially developed regions.

4.3.3 Different firm sizes

The possibility to borrow from financial institutions relates to firm size. Large-scale firms are more likely to acquire financial supports because they normally enjoy more revenue and are able to provide more collateral than small firms.[28] We divide exporters into large and small firms using the average value of the fixed-assets as the threshold. Table 9 displays the estimation results.

Table 9: The estimation results for firms of different size

Dependant variable	Export volume		Export decision	
	Large	Small	Large	Small
	(1)	(2)	(3)	(4)
$Interest_{it}$	0.746**	0.237***	0.047***	0.054***
	(2.07)	(2.66)	(5.25)	(10.21)
$Stock_{it}$	0.089**	0.067	0.047***	-0.145
	(2.31)	(0.90)	(2.79)	(-1.35)
$Interest_{it} * Stock_{it}$	0.477**	0.813***	0.065***	0.019
	(2.25)	(3.26)	(3.02)	(0.97)
Exp_{it-1}	0.292	0.699***	0.332***	0.301***
	(1.41)	(15.65)	(31.57)	(51.85)
TFP_{it}	0.227	0.036	0.281***	0.355***
	(1.32)	(0.58)	(6.92)	(15.28)
Pro_{it-1}	0.300***	0.148***	0.057***	0.092***
	(3.16)	(4.48)	(6.25)	(17.30)
$SIZE_{it}$	0.252	0.035	0.024*	0.044***
	(-1.50)	(-1.64)	(1.88)	(6.00)
$REER_t$	-1.647***	-2.284***	-3.771***	-4.347***
	(-2.73)	(-11.53)	(-15.59)	(-29.73)
FIE_i	-0.226	-1.082**	0.227***	0.437***
	(-0.20)	(-2.31)	(4.97)	(13.75)
$East_i$	0.349*	0.106*	0.126***	0.301***
	(1.68)	(1.85)	(3.29)	(12.63)
Industry-fixed effects	YES	YES	YES	YES
AR(1)or Wald test	-3.36（0.000）	-4.98（0.000）	125.9（0.000）	39.72(0.000)
AR(2)or Log likelihood	-1.25（0.212）	1.68（0.094）	-115.85	-275.59
Hansen or LR test	10.72（0.097）	13.05(0.118)	204.43（0.000）	227.50(0.000)
Observations	37,984	54,091	45,312	71,949

Note: Robust t-values in parentheses. P-values in the parentheses after tests. *** p<0.01, ** p<0.05, * p<0.1. Column 1-2 are estimated by xtabond2. Column3-4 are estimated by xtprobit. Column 3-4 report the marginal effects.

[28] According to our data, the average profit earned by the large-scale firms is RMB 47,814,000, it is RMB 1,987,000 for the small-scale firms. the average fixed-assets of the large-scale firms is RMB 731,310,000, it is RMB 21,041,000 for the small-scale firms.

As shown in Table 9, the estimated coefficients of interest expenditure for large firms appear somewhat larger than for small firms in both specifications of export volume and export decision. Additionally, concerning the results of the stock dummy, we discover significant coefficients for large firms but insignificant coefficients for small firms. What we find indicates that large firms which are less financially constrained benefit in terms of export propensity and volume, while small-scale firms are more vulnerable to financial constraints.

4.4 Robustness checks

In this section, we implement several robustness checks to check the reliability of our estimation results thus far. The first concern is endogeneity. Notwithstanding our discussion in Section 3.3 above, one may suspect that interest expenditure is endogenous. To address this issue, we perform an IV-GMM estimation using firm's weighted monetary supply as an instrumental variable as in Yu and Li (2009).[29]

[29] The assumption here is that money supply affects the financial position of a firm but that there is no direct effect of money supply exports, see Yu and Li (2009). The indicator of firm's weighted monetary supply is defined as $(y_{it}/MFG_t)/M_1$,where y_{it} firm i output in year t, whereas $M1_i$ is China's base monetary supply (M1) in year *t*. The nominator MFG_i is the China's manufacturing output in year t. Note that both are measured in monetary terms to avoid any unnecessary disturbance from inflation.

Table 10: The estimation results of the robustness checks

Dependant variable	(1)	(2)
	Export volume	Export decision
$Interest_{it}$	0.676**	0.295***
	(2.105)	(7.574)
$Stock_{it}$	0.682*	0.804*
	(1.745)	(1.649)
$Interest_{it} * Stock_{it}$	0.265*	0.163*
	(-1.826)	(1.733)
Exp_{it-1}	0.0874***	0.0424***
	(5.629)	(6.525)
TFP_{it}	0.165***	0.758***
	(3.529)	(6.610)
Pro_{it-1}	0.0376***	0.0147***
	(7.332)	(6.286)
$SIZE_{it}$	0.0103	0.120*
	(0.126)	(1.670)
$REER_t$	-1.677***	-0.779***
	(-4.298)	(-5.067)
FIE_i	0.137	0.151***
	(1.476)	(2.652)
$East_i$	0.100*	0.133***
	(1.816)	(5.605)
Industry-fixed effects	YES	YES
Anderson canon. LM statistic or AR(1)	10.598(0.000)	12.28(0.000)
Cragg-Donald Wald F statistic or AR(2)	17.59	18.28
Sargan or Hasen	13.43(0.141)	10.15(0.927)
Observations	71,277	82,156
R-squared	0.399	0.641

Note: Robust t-statistics in parentheses. P-values in the parentheses after tests.*** p<0.01, ** p<0.05, * p<0.1. Column 1-2 are estimated by xtivereg2.

Columns 1–2 of Table 10 reports the results of IV-GMM estimation. Several tests were performed to justify the instruments. First, the Sargan statistics cannot reject the null hypothesis of validity of overidentification restrictions, indicating that the set of instruments are valid. Second, the Anderson canon. corr. LM statistics of under-identification reject the null hypothesis that the instruments are uncorrelated with the endogenous variable. Finally, the Cragg-Donald F-test of weak identification also rejects the null hypothesis, again indicating the instruments are relevant. After addressing

endogeneity, the coefficients of interest expenditure, stock dummy and the interaction term remain significantly positive, which is consistent with the baseline estimates and the theoretical predictions.

5 Concluding remarks

The goal of this paper is to shed light on the influence of access to finance on firms' exports. We set out a simple heterogeneous firm type model to motivate our empirical analysis, which looks at the effect of access to external finance as well as issuing stocks on firms' export behavior. We use firm-level data on Chinese manufacturing firms for 2005 to 2009.

Theoretical predictions suggest that some firms are prevented from exporting due to financial constraints, and firms would be more likely to export and export more if they were less restricted by such constraints. Financial constraints can be alleviated through better access to external financial resources (banks) or issuing stocks to their shareholders. Our empirical investigations are in line with the theoretical predictions. Firms who have more interest expenditure or can issue stocks to their shareholders have higher propensities to export and export more. Moreover, the more financial options a firm has, the better a firm performs in terms of export volume and export propensity. Finally, the effects of the relaxation of financial constraints on export behavior are stronger for SOEs, firms located in Eastern China, and large-scale firms as these are less financially constrained.

Our results are consistent with previous studies for China pointing to a positive and significant impact of the relaxation of financial constraints on both export volume and export propensity (Du and Girma, 2007; Li and Yu, 2009; Manova et al., 2011; Egger and Kesina, 2013). However, we expand on these studies by adding different forms of finance and investigating the possible interaction between these different financial resources.

More generally, the paper adds to the large body of work on the real effects of financial frictions. Many studies suggest that financial frictions have adverse effects on economic growth, investment, and economic volatility (Rajan and Zingales, 1998; Clementi and Hopenhayn, 2006; Aghion et al., 2010). Many other studies find that the financial frictions play a negative role for multinational firm activity and cross-border capital flows (Antras et al., 2009; Antras and Caballero, 2009; Chor

et al., 2012).

Cultivating financial markets are essential to the survival and development of exporters (Manova, 2008a). However, financial resources are rare and unevenly distributed in China. Private-owned firms, firms located in non-eastern regions, and small firms face stronger financial constraints.

Our study hence has many policy implications. First, the government could increase the availability of financial resources in order to stimulate more firms to enter export markets. This could be done through, e.g., loosening financial controls or encouraging financial innovations. Second, more financial resources could be distributed to POEs and small-scale firms through government interventions because they experience more financial constraints. The state-owned banks could be encouraged to lend to small firms with lower interest rates. Access to the stock exchange could be liberalized. In order to do this, a reform of the current listing system from current approval and sponsor system may be necessary in order to allow more firms to be listed on the stock market. Finally, preferential financial policies could be given to the under-developed regions in order to reduce the inequality of the financial development.

References

Aghion, P., Angeletos, G.-M., Banerjee, A. and K. Manova (2010), Volatility and Growth: Credit Constraints and the Composition of Investment, Journal of Monetary Economics,57: 246-65.

Alvarez, Roberto and Ricardo A. López (2013), Financial Development, Exporting and Firm Heterogeneity in Chile. Review of World Economics, 149 (1):183-207.

Amiti, Mary, David E. Weinstein (2009), Exports and Financial Shocks. NBER working paper no.15556.

Antras, P. and R. Caballero (2009), Trade and Capital Flows: A Financial Frictions Perspective. Journal of Political Economy, 117(4):.701-744.

Antras, Pol, Mihir Desai, and C. Fritz Foley (2009), FDI Flows and Multinational Firm Activity, Quarterly Journal of Economics, 124 (3): 1171-1219.

Arrelano, M. and Bond, S. (1991), Some tests of specification in panel data: Monte Carlo evidence and an application to employment equations, Review of Economics and Statistics, 58: 277-297.

Arrelano, M. and Bover, O. (1995), Another look at the instrumental variables estimation of error components models, Journal of Econometrics, 68: 29-51.

Bellone, Flora, Patrick Musso, Lionel Nesta and Stefano Schiavo (2010), Financial Constraints and Export Behaviour, The World Economy, 33(3).

Berman, Nicolas and Jérome Héricourt (2010), Financial factors and the margins of trade: Evidence from cross-country firm-level data. Journal of Development Economics, 93 (2): 206-217.

Bernard, A.B. and J.B. Jensen (2004), Why some firms export. *Review of Economics and Statistics*, 86, 2

Besedes, Tibor, Byung-Cheol Kim, Volodymyr Lugovskyy (2011), Export Growth and Credit Constraints, Georgia Institute of Technology working paper.

Blundell, R. and Bond, S. (1998), Initial conditions and moment restrictions in dynamic panel data models, Journal of Econometrics, 87: 11-143.

Bond, S.R. (2002), Dynamic panel data models: a guide to micro data methods and practice. Portuguese Economic Journal 1, 141–162.

Chaney, Thomas (2005), Liquidity constrained exporters, University of Chicago, Mimeo.

Chor, Davin and Kalina Manova (2012), Off the Cliffand Back? Credit Conditions and International Trade during the Global Financial Crisis. Journal of International Economics, 87 (1):117-133.

Clementi, Gian Luca and Hugo A. Hopenhayn (2006), A Theory of Financing Constraints and Firm Dynamics, Quarterly Journal of Economics, 121(1): 229-265.

Das, Sanghamitra, Mark J. Roberts, and James R. Tybout (2007), Market Entry Costs, Producer Heterogeneity, and Export Dynamics, Econometrica, 75(3): 837-873.

Du, Jun and Sourafel Girma (2007), Finance and Firm Export in China. Kyklos, 60 (1):37-54.

Egger, P. and M. Kesina (2013): Financial constraints and exports: Evidence from Chinese firms, CESifo Economic Studies, Working Paper No. 4

Farre-Mensa, Joan and Alexander Ljungqvist (2016), Do measures of financial constraints measure financial constraints? Review of Financial Studies, 29(2): 271-308.

Feenstra, R., Li, Z. and M. Yu (2011). Exports and Credit Constraints under Incomplete Information: Theory and Evidence from China. NBER Working Paper 16940.

Feenstra, R., Mandel B., Reinsdorf M., and Slaughter M. (2013b), Effects of terms of trade gains and tariff changes on the measurement of U.S. productivity growth, American Economic Journal: Economic Policy, 5(1): 59–93.

Gabbitas, O. and Gretton, P. (2003), Firm Size and Export Performance: Some Empirical Evidence, Productivity Commission Staff Research Paper, Canberra.

Greenaway, David, Alessandra Guariglia and Richard Kneller (2007), Financial factors and exporting decisions. Journal of International Economics, 73 (2): 377-395.

Guariglia, Alessandra and Simona Mateut (2010), Inventory Investment, global engagement, and financial constraints in the UK: Evidence from micro data. Journal of Macroeconomics, 32 (1): 239-250.

Hadlock, C. and J. Pierce (2010), New Evidence on Measuring Financial Constraints: Moving beyond the KZ Index, Review of Financial Studies 23, 1909-1940.

Heckman, J. (1979), Sample Selection Bias as a Specification Error, Econometrica, (47): 153-161.

Helpman, E., Melitz, M. and Rubinstein, Y. (2008), Estimating trade flows: trading partners and trading volumes, Quarterly Journal of Economics (73): 441–486.

Levinsohn, James and Amil Petrin (2003), Estimating Production Functions Using Inputs to Control for Unobservable, Review of Economic Studies 70(2): 317-341.

Li, Guo and Hu, Jie (2014), Regional Financial Development and Financing Constraints in R&D Investments: A Panel Study of Chinese High-Tech Firms. Available at SSRN: http://ssrn.com/abstract=2472119 or http://dx.doi.org/10.2139/ssrn.2472119.

Li, Z. and Yu, M. (2013), Exports, productivity and credit constraints: a firm-level empirical investigation for China, Economic Research Journal,06:55-70.

Liu Zhibiao and Zhang Jie (2008), export and the productivity of local firms- an empirical investigation of Jiangsu manufactures, Management World, 182(11),42-54.

Manova, Kalina (2010), Credit constraints, heterogeneous firms and international trade, Working Paper March 2010. Revised and resubmitted. NBER Working Paper 14531.

Manova, Kalina, Shang-Jin Wei, Zhiwei Zhang (2011), Firm Exports and Multinational Activity under Credit Constraints. National Bureau of Economic Research NBER Working Paper Series 16905, March.

Melitz, Marc (2003), The impact of trade on intra-industry reallocations and aggregate industry productivity, Econometrica, 71(6): 1695-1725.

Melitz, M, Polanec. S. (2015). Dynamic Olley-Pakes Productivity Decomposition with Entry and Exit. The RAND Journal of Economics, 46: 362-375.

Minetti, Raoul and Susan Chun Zhu (2011), Credit constraints and firm exports: Microeconomic evidence from Italy. Journal of International Economics ,83 (1):109-125.

Muuls, Mirabelle (2008), Exporters and credit constraints. A firm level approach, National Bank of Belgium, Working Paper 139.

Muuls, Mirabelle (2012), Expoerters, Importers and Credit Constraints. Centre for Economic Performance CEP Discussion Paper No 1169.

Olley, Steven and Ariel Pakes (1996), The Dynamics of Productivity in the Telecommunications Equipment Industry, Econometrica 64(6): 1263-1297.

Rajan, Raghuram G. and Luigi Zingales (1998), Financial Depandence and Growth., American Economic Review, 88(3): 559-586.

Roodman, D. (2006), How to Do xtabond2: An Introduction to “Difference” and “System” GMM in Stata, Center for Global Development Working Paper No. 103.

Silva, Armando (2011), Financial Constraints and Exports: Evidence from Portuguese Manufacturing Firms. International Journal of Economic Sciences and Applied Research, 4 (3):7-19.

Silva, S. and Tenreyro, S. (2006), The log of gravity. Review of Economics and Statistics, 88: 641–658.

Wagner, Joachim (2014), Credit constraints and exports: evidence for German manufacturing enterprises.

Applied Economics, 46 (3):294-302.

Windmeijer, F. (2005), A finite sample correction for the variance of linear efficient two-step GMM estimators, Journal of Econometrics, 126: 25-51.

Zhang weiyin, Zhou lian, Gu quanlin (2003), Firm Exiting Mechanism in Transitional Economy-an Empirical Study for Technology Zone of Beijing, Economy Research, (10): 3-14.

Appendix

A: Substituting P and P^*, we can rewrite the cut-off productivities in the following way:

$$\begin{aligned}
\overline{x_d}^{\sigma-1} &= w^{\sigma-1}\frac{\sigma}{\mu L}\left(\frac{\sigma}{\sigma-1}\frac{1}{P}\right)^{\sigma-1} C_d \\
&= w^{\sigma-1}\left(\frac{1}{\omega}\right)\frac{\sigma}{\mu}\int_{x\geq\overline{x_d}} x^{\sigma-1}dF_x(x)C_d \\
&= h^{\sigma-1}(C_d)
\end{aligned}$$

$$\begin{aligned}
\overline{x_f}^{\sigma-1} &= \frac{\sigma}{\mu L^*}\left(\frac{\sigma}{\sigma-1}\frac{\tau w}{P^*}\right)^{\sigma-1} C_f \\
&= \frac{C_f}{C_d^*}(\tau w)^{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}\frac{\sigma}{\mu}\frac{P^{*1-\sigma}C_d^*}{L^*} \\
&= \frac{C_f}{C_d^*}(\tau w)^{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}\frac{\sigma}{\mu}\int_{x\geq\overline{x_d^*}}\left(\frac{\sigma}{\sigma-1}\frac{w^*}{x}\right)^{1-\sigma} dF_x(x)C_d^* \\
&= \frac{C_f}{C_d^*}\left(\frac{\tau w}{w^*}\right)^{\sigma-1} h^{\sigma-1}(C_d^*)
\end{aligned}$$

$$\begin{aligned}
\overline{x}_{cf} &= \left(w^*L^*\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\frac{\sigma}{\mu}\left(\frac{\tau w}{P^*}\right)^{1-\sigma} - \frac{\left(k_f+\lambda\eta-\lambda k_f\right)}{\lambda k_f} wL\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\frac{\sigma}{\mu}\left(\frac{w}{P}\right)^{1-\sigma}\right)^{\frac{1}{1-\sigma}} \times \\
&\left(\frac{\left(k_f+\lambda\eta-\lambda k_f\right)(1-\phi)+\lambda k_f}{\lambda k_f} w^*C_f + \frac{\left(k_f+\lambda\eta-\lambda k_f\right)}{\lambda k_f}\left(wC_d-\omega A\right)\right)^{\frac{1}{\sigma-1}} \\
&= \left(w^*C_d^*(\tau w)^{1-\sigma}\left(\frac{1}{\omega^*}\right)^{1-\sigma} h^{1-\sigma}(C_d^*) - \frac{\left(k_f+\lambda\eta-\lambda k_f\right)}{\lambda k_f}\omega^{2-\sigma}C_d\left(\frac{1}{w}\right)^{1-\sigma} h^{1-\sigma}(C_d)\right)^{\frac{1}{1-\sigma}} \times \\
&\left(\frac{\left(k_f+\lambda\eta-\lambda k_f\right)(1-\phi)+\lambda k_f}{\lambda k_f} w^*C_f + \frac{\left(k_f+\lambda\eta-\lambda k_f\right)}{\lambda k_f}\left(wC_d-wA\right)\right)^{\frac{1}{\sigma-1}} \\
&= \left(\frac{\left(\left(k_f+\lambda\eta-\lambda k_f\right)(1-\phi)+\lambda k_f\right)\frac{w^*}{w}C_f + \left(k_f+\lambda\eta-\lambda k_f\right)(C_d-A)}{\lambda k_f\tau^{1-\sigma}\left(\frac{w^*}{w}\right)C_d^*h^{1-\sigma}(C_d^*) - \left(k_f+\lambda\eta-\lambda k_f\right)C_d h^{1-\sigma}(C_d)}\right)^{\frac{1}{\sigma-1}}
\end{aligned}$$

B: Proof of proposition 1

Proposition 1 *If* x *and* A *are continuously distributed from* $[0,+\infty]$*, and if*

$$\left((1-\phi)\frac{w^*}{w}\frac{C_d^*}{C_d}+\frac{C_d^*}{C_f}\right)^{\frac{1}{\sigma-1}}\left(\frac{h(C_d)}{h(C_d^*)}\right)>\frac{\tau w}{w^*}$$

then there is a non empty set of firms (denoted Ω) which are prevented from export due to financial constraints.

Proof: All firms whose productivities lie between $\left(\bar{x}_f,\bar{x}_{cf}\right)$ could potentially profitably export but are prevented because of the financial constraints. A necessary and sufficient condition for Ω to be non-empty is that $\bar{x}_{cf}(0,\phi)>\bar{x}_f$. Making $A=0$, and $\lambda=0$, We substitute equation (25) and (26) into $\bar{x}_{cf}(0,\phi)>\bar{x}_f$, which will be hold when following formula satisfy:

$$\left((1-\phi)\frac{w^*}{w}\frac{C_d^*}{C_d}+\frac{C_d^*}{C_f}\right)^{\frac{1}{\sigma-1}}\left(\frac{h(C_d)}{h(C_d^*)}\right)>\frac{\tau w}{w^*}$$

So if above inequality satisfies, Ω is a non empty set, and there are some financially constrained exporters.

C: Estimates of OLS, FE and System GMM

Table 11: Estimation results of OLS, FE and System GMM

	(1) OLS	(2) FE	(3) OLS	(4) FE	(5) OLS	(6) FE	(7) OLS	(8) FE	(9) OLS	(10) FE
Exp_{it-1}	0.849***	0.118***	0.848***	0.118***	0.847***	0.106***	0.850***	0.121***	0.848***	0.118***
	(469.5)	(25.70)	(469.5)	(25.69)	(598.2)	(30.63)	(472.1)	(26.35)	(469.5)	(25.70)
$Interest_{it}$	0.0172***	0.0735***	0.0176***	0.0740***					0.0171***	0.0736***
	(9.421)	(21.39)	(9.615)	(21.48)					(9.257)	(21.18)
$Stock_{it}$					0.0314***	0.0540**	0.108***	0.278***	0.0626*	0.0583
					(-3.236)	(-2.513)	(-3.181)	(-3.636)	(-1.833)	(-0.759)
$Interest_{it} * Stock_{it}$			0.0509***	0.0808**			0.0962**	0.0335***	0.0293***	0.0408***
			(-3.285)	(-2.086)			(2.097)	(3.114)	(5.632)	(-6.0377)
TFP_{it}	0.214***	0.0874***	0.215***	0.0873***	0.239***	0.102***	0.221***	0.0781***	0.215***	0.0873***
	(26.59)	(5.377)	(26.63)	(5.372)	(39.01)	(8.578)	(27.57)	(4.786)	(26.63)	(5.368)
Pro_{it-1}	0.00534***	0.0425***	0.00556***	0.0425***	0.00211	0.0430***	0.00648***	0.0434***	0.00551***	0.0425***
	(2.889)	(13.91)	(3.005)	(13.91)	(1.518)	(19.49)	(3.507)	(14.15)	(2.980)	(13.91)
$SIZE_{it}$	0.0667***	0.156***	0.0671***	0.156***	0.0842***	0.179***	0.0787***	0.175***	0.0670***	0.156***
	(26.52)	(24.07)	(26.64)	(24.09)	(52.81)	(40.42)	(36.11)	(27.17)	(26.56)	(24.08)
$REER_t$	-1.638***	-0.964***	-1.639***	-0.963***	-1.595***	-0.916***	-1.623***	-0.852***	-1.639***	-0.963***
	(-39.68)	(-21.78)	(-39.71)	(-21.75)	(-49.66)	(-27.99)	(-39.36)	(-19.31)	(-39.72)	(-21.75)
FIE_i	0.0909***	0.133***	0.0826***	0.127***	0.0612***	0.155***	0.0740***	0.132***	0.0812***	0.126***
	(10.23)	(4.051)	(8.930)	(3.843)	(8.445)	(6.329)	(8.002)	(3.965)	(8.748)	(3.820)
$East_i$	0.0324***	0.101***	0.0329***	0.100***	0.0336***	0.0497**	0.0382***	0.0875**	0.0333***	0.0998***
	(3.491)	(2.938)	(3.550)	(2.923)	(4.858)	(2.176)	(4.120)	(2.545)	(3.593)	(2.915)
Industry-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	100,520	100,520	100,520	100,520	162,797	162,797	100,520	100,520	100,520	100,520
R-squared	0.785	0.47	0.785	0.47	0.781	0.39	0.785	0.38	0.785	0.47

Note: Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.