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OUTWARD DIRECT INVESTMENT, FIRM PRODUCTIVITY AND CREDIT CONSTRAINTS: EVIDENCE FROM CHINESE FIRMS

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Abstract. China is currently the third largest country in terms of outward direct investment (ODI), with the investors mainly being state-owned enterprises. This presents a question: What inhibits private enterprises from increasing ODI? Using a firm-level panel data set for Zhejiang Province in China, we examine the impact of firm heterogeneity on private firm ODI. We have three main findings: first, a higher productivity level contributes to better access to ODI, and increases ODI value as well; second, lowering a firm's financial constraint level can increase both the probability and volume of ODI; third, productivity cannot offset the negative effect of financial constraint on private firm ODI.

1. INTRODUCTION

China is currently the third largest country in terms of outward direct investment (ODI). Since China's Ministry of Commerce started to report annual data on ODI in 2003, the flows of China's ODI have successively increased. The average annual growth of ODI from 2002 to 2013 was 39.8% (Department of Commerce *et al*., 2014). While ODI in the world decreased by 18 percent in 2012, ODI value from China grew by 17.6 percent, hitting a record US$84bn, and, for the first time, China became the third largest country in terms of ODI value, right behind the United States (US$329bn) and Japan (US$123bn) (UNCTAD, 2013). In 2013, China's ODI grew even higher, reaching its highest level of $107.8bn.

Another significant feature of China's ODI is that state-owned enterprises (SOEs) play an important role, especially central SOEs, which, by definition, are controlled by the central government. For instance, central SOEs' non-financial ODI flows amounted to US$43.524bn in 2012, accounting for 56% of China's total non-financial ODI flows (Department of Commerce *et al*., 2013). This raises some interesting questions: Why are SOEs the primary overseas investors from China and what inhibits the ODI of private enterprises?

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Recent published literature shows that overseas market entry decisions are closely related to firm heterogeneity. The most studied kind of heterogeneity is firm productivity. Krugman (1980) first introduced firm heterogeneity into international trade models. Later on, Melitz (2003) built a model with firm heterogeneity to prove that only firms with high productivity enter the exporting market, while less productive firms remain in the domestic market, and the least productive firms exit the market altogether. Helpman *et al.* (2004) further introduced firm heterogeneity into a foreign direct investment model. Their empirical work on US firms found that low-productivity firms serve the domestic markets, firms with higher productivity choose to export goods, and the most productive firms choose to invest in foreign markets.

However, productivity is not the only determinant in internationalization behaviour of enterprises. Many productive firms only serve the domestic market and, likewise, some low productive firms export and invest overseas as well (Bernard *et al.*, 2003; Mayer and Ottaviano, 2007). Figure 1 depicts productivity (total factor productivity and labour productivity) distributions of ODI firms and non-ODI firms in China. It confirms that the average productivity level of ODI firms is higher than that of non-ODI firms, but there is a large overlap between the distributions. Bernard *et al.* (2003), Mayer and Ottaviano (2007) and Todo (2011) found a similar phenomenon, respectively, in the USA, Belgium and Japan.

Besides productivity, a firm's financial constraints might influence its decision to enter overseas markets. More and more micro evidence shows that imperfect credit markets seriously restrict firms' export capacity. Manova *et al.* (2014) identify a significant negative effect of credit constraint on firm exports. More specifically, financial friction limits the range of export products, the number of destinations and the total value of each bilateral export flow. Feenstra *et al.* (2014) develop a model to examine why credit constraints for domestic and exporting firms arise when banks do not observe firms' productivity levels, and they find that export enterprises are facing tighter credit constraints than purely domestic firms in China. Muuls (2008), Berman and Héricourt (2010), Minetti

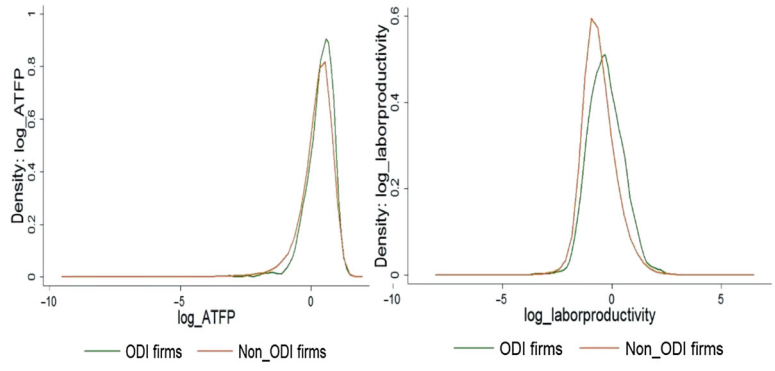

Figure 1. Productivity distributions of outward direct investment (ODI) firms and non-ODI firms in China

and Zhu (2011), Li and Yu (2013) also observe similar results. Amiti and Weinstein (2011) examine how banks in Japan transferred negative shocks of financial crises to exporters during the 1990s, which overcame the endogeneity issues and established the casual link between financial constraint and firms' exports. Besides the decision to export, Todo (2011) finds a negative effect of credit constraints on firms' decisions regarding ODI.

However, most of the related papers have only examined export behaviour (see Bernard *et al*., 2003; Girma, Kneller and Pisu, 2005). Besides, they are mainly based on the experience of developed countries, such as the USA (Helpman *et al*., 2004), Japan (Tomiura, 2007; Todo, 2011) and Korea (Lee, 2010). Studies on ODI from developing countries are limited. Damijan and Rojec (2007) use manufacturing data for Slovenia and find that the productivities of export and ODI firms are, on average, 20% higher than for domestic firms. Because Slovenia is a transition economy with large inefficient overseas projects, the authors do not find that ODI firms have higher productivity levels than export firms. Tian and Yu (2012) use a data set of Chinese industrial enterprises and show that firms' total factor productivity positively contributes to their choice of ODI, and also increases their ODI value.

There is even less research concerning the impact of financial constraint on firm ODI, let alone related studies on China. One reason is that although ODI from China has been growing fast since the financial crisis in 2008, the phenomenon is quite new, and China is still mainly a recipient of foreign capital. Another reason is that firm-level data on ODI is not publicly accessible. The existing published literature is mainly focused on macro-level cross-country analysis (Cheung and Qian, 2009; Contessi and De Pace, 2012; Wang and Huang, 2012). For example, Wang and Huang (2012) use annual ODI data for 22 industrialized countries and 44 developing countries (including China) during 1981–2005, and demonstrate that financial repression significantly improves ODI in developing countries.

This paper attempts to reveal the impact of productivity and financial constraints on firms' internationalization behaviour, focusing on small and medium private enterprises. Financial constraints of small and medium private firms in China reflect institutional issues like financial repression and capital control. The present paper provides some micro evidence calling for further reforms and structural changes in the economy. It also sheds light on the development of other emerging and developing countries.

The rest of the paper organized as follows. Section 2 describes the data and variables that we use, Sections 3 and 4 examine the effect of firm heterogeneity on firms' ODI decisions and ODI value, respectively. Section 5 concludes.

2. DATA AND VARIABLES

2.1. *Firm-level data in Zhejiang Province*

Outward direct investment in Zhejiang Province is representative of local private firm ODI throughout China. Although central SOEs were responsible for 83% of

the value of non-financial ODI in China during 2003–2009, 92% of the value of ODI projects was through local private firms, with ODI projects from Zhejiang Province forming the largest part (Department of Commerce *et al.*, 2010). Moreover, 70% of the value of private firm ODI in China is from Zhejiang and Fujian Provinces (Department of Commerce *et al.*, 2010). Because investment decisions made by private firms are more driven by market demand, using firm-level data for Zhejiang Province can largely overcome the influence of policy issues, with results more comparable to international experience and the existing literature.

Our main data set is firm-level ODI from Zhejiang Province during 2006–2008. It includes important information about firm ODI value, ODI destination, firm location and industry.[1] In order to obtain other firm-level information like financial statements and export value, we merge the data set with data from the Chinese Industrial Enterprises Database. A few samples in this database are noisy due largely to misreporting by firms. Following Tian and Yu (2012), we clean the sample and delete outliers using the following criteria: (i) some key financial variables cannot be missing (such as total assets, sales and employment); and (ii) variables should not violate the general accepted accounting principles, such as the liquid assets exceeding the total assets or an invalid date of establishment. After the outlier filter, we obtain a sample of more than 40 000 manufacturing firms in Zhejiang Province during 2006–2008. The final data set sums up to 135 247 observations, which includes 526 observations with non-zero ODI value and 55 185 observations with zero ODI value and non-zero export value..

Table 1 summarizes the ODI project amounts and the ODI value from Zhejiang Province by industry. Most of the small and medium-scale ODI projects are in manufacturing sectors. In the case of Zhejiang Province, 76.93% of the ODI projects are from manufacturing sectors, and they contribute 64.44% of the total value. Among them, 'electronics, machinery and appliance' and 'textiles, clothing, footwear and leather' are two main industries with high levels of ODI, accounting for 81.47% of the total amount of ODI projects and 87.41% total investment value in Zhejiang Province.

2.2. *Variables*

Firm productivity is one of the most important determinants of firms' decision to enter overseas markets (Head and Ries, 2003; Helpman, Melitz and Yeaple, 2004; Greenaway and Kneller, 2007; Tian and Yu, 2012). We use output per worker to measure firm productivity, and keep firm capital intensity controlled. Labour productivity is a widely adopted measure of productivity (e.g. Helpman, Melitz and Yeaple, 2004), and its use makes our results more comparable to existing studies.

[1] This dataset is provided by International Cooperation Office of Zhejiang Province

Table 1. Outward direct investment (ODI) summary by industry

	Projects		ODI value (10 000$)	
Primary industry	63	4.96%	22 326	12.77%
Agriculture	34	2.68%	8330	4.77%
Mining	29	2.28%	13 996	8.01%
Manufacturing industry	977	76.93%	11 2634	64.44%
Electronics, machinery and appliance	423	33.31%	42 835	24.51%
Textiles, clothing, footwear and leather	373	29.37%	55 624	31.82%
Chemical and pharmaceutical	52	4.09%	6077	3.48%
Others	129	10.16%	8098	4.63%
Service industry	163	12.83%	28 436	16.27%
Construction and real estate	39	3.07%	11 723	6.71%
Trade and business services	111	8.74%	11 786	6.74%
Other services	13	1.02%	4928	2.82%
Others	67	5.28%	11 384	6.51%

Financial constraint is our key variable. Although there is no perfect measure, the literature on corporate finance discusses several ways to measure financial constraint, including investment-cash flow sensitivity (Fazzari *et al*., 1988; Sun and Yamori, 2009), the Kaplan and Zingales index (Lamont *et al*., 2001), the Whited and Wu index (Whited and Wu, 2006) and the size–age index (Hadlock and Pierce, 2010). The construction of all the indexes relies on a pre-ranking of all the firms based on their characteristics.

We use a synthetic index constructed by firm performance in several aspects (Musso and Schiavo, 2008; Bellone *et al*., 2010), including both internal funds and external funds (Myers, 1984). All of the variables we choose are perceived as important in determining financial constraint in existing published studies:

1. Cash reserves, as a large part of retaining earnings, reflects internal funds available for enterprises to invest. Therefore, the cash ratio (cash over total assets) is our first variable considered in the synthetic index. When this metric is higher, the firm has more internal funds to invest, and it also shows firms' ability to pay back debts, which means a lower level of financial constraint.
2. Firm size is used to capture firms' constraint on external funds. Firm size is measured by the logarithm of total assets. Larger firms usually have better access to external funds.
3. Solvency is also used to capture firms' constraint on external funds. Solvency is calculated as equity over total liability, which shows the robustness of firms' equity-liability structure. A higher solvency index means lower financial constraint.

To summarize, our synthetic index includes three sub-indicators of firm performance; that is, the cash ratio, firm size and firm solvency. Following Bellone *et al*. (2010) and Bottazzi *et al*. (2014), for each sub-indicator we sort the firms, then place them in one of the quintiles with a score ranging from one to five, with a score of one representing the smallest value. We sum up

the five scores and standardize them to [0,10], and then obtain our synthetic financial constraint index.

Except for all the key variables we discussed above, some other firm characteristics are controlled in our regression: (i) tax ratio, measured by value-added tax over total sales; (ii) FDI dummy, equal to one if it is a foreign company, and zero otherwise; (iii) firm age, counted from its established year; and (iv) capital intensity, measured by net fixed assets over employment. Moreover, we employ year and industry dummies to control for time variance and industry differences. Table 2 presents the sample statistics of all the variables used.

3. FIRM HETEROGENEITY AND ODI DECISION

3.1. *Model specification and basic results*

We employ a multinomial logit model to analyse how firm heterogeneity (productivity and financial constraint) affect firms' choices of market entry: ODI (might also export), export and domestic. Our model is as follows:

$$\Pr[y_{it} = j] = \frac{\exp\left(\alpha + \beta_{1j} prod_{it} + \beta_{2j} FC_{it} + \gamma_j C_{it} + Yd + Id\right)}{\sum_{k=D,E,F} \exp\left(\alpha + \beta_{1j} prod_{it} + \beta_{2j} FC_{it} + \gamma_j C_{it} + Yd + Id\right)} \quad (1)$$

Here, y_{it} is firm i's choice in year t. j stands for three available choices: ODI (F), export (E) and domestic (D). $prod_{it}$ and FC_{it} indicate productivity and financial constraint, respectively. They are our key explanatory variables. C_{it} includes all the other control variables listing in Table 2, Yd and Id are year-fixed effect and industry-fixed effect, respectively.

Table 2. Summary of statistics

Variables	Domestic	Export	ODI (including *ODI&export*)
ODI value	—	—	3.346 (1.464)
Export value	—	9.488 (1.565)	10.927 (1.717)
Log(labour productivity)	4.078 (0.793)	3.939 (0.754)	4.281 (0.818)
Financial constraint	4.723 (2.175)	5.387 (2.073)	6.499 (1.703)
Sub-indicators of financial constraint			
Cash index	2.881 (1.420)	3.166 (1.389)	3.510 (1.250)
Size index	2.783 (1.374)	3.300 (1.413)	4.266 (1.123)
Solvency index	3.004 (1.430)	2.998 (1.393)	3.023 (1.287)
Tax ratio	3.426 (1.847)	2.662 (2.015)	2.430 (2.093)
FDI dummy	0.083 (0.276)	0.294 (0.455)	0.290 (0.454)
Firm age	8.550 (6.451)	8.696 (6.140)	9.397 (5.672)
Capital intensity	0.789 (2.620)	0.705 (4.793)	0.938 (1.787)

The table reports mean and standard deviation (in parentheses) of all the variables by firm type.

Table 3. Multinomial logit estimates of basic model

	(1)		(2)
Variables	Export		ODI
Prod	−0.179***		0.238***
	(0.009)		(0.060)
FC	0.144***		0.394***
	(0.003)		(0.025)
Tax ratio	−0.228***		−0.299***
	(0.004)		(0.025)
FDI dummy	1.387***		1.087***
	(0.019)		(0.106)
Firm age	0.022***		0.029***
	(0.001)		(0.006)
Capital intensity	−0.116***		−0.152***
	(0.006)		(0.034)
Year fixed effect	Yes		Yes
Industry fixed effect	Yes		Yes
Observations		132 902	
Pseudo R^2		0.152	

Standard errors aren in parentheses. ***$p < 0.01$ **$p < 0.05$ *$p < 0.1$.

Table 3 reports our estimated results. Firm productivity has a totally opposite effect on the decision to export and ODI. More productive firms choose ODI, which is consistent with the finding in Tian and Yu (2012), but less productive firms in Zhejiang Province choose to export. This is a different outcome than that in Helpman *et al*. (2004). There might be two reasons for the difference. First, processing trade might play a significant role here,[1] which means export behaviour in Zhejiang Province is mostly related to low value-added production. Second, the finding in Helpman *et al*. (2004) is based on bilateral trade data, but our result is based on firm-level data from the exporting country.

The coefficients of the financial constraint indexes on exports and ODI are significantly positive; the marginal effects are approximately 2.73% and 0.12%, respectively. When the index is higher, a firm's financial constraint is lower, and it has a higher possibility of entering overseas markets. Therefore, it indicates that financial constraint will inhibit firms' exporting and firms' ODI because additional costs are involved in entering a new market. Todo (2011) also finds a negative effect of financial constraint in Japan, but the result is not significant. It suggests that inhibition effect of financial constraint on firms' internationalization behaviour is more serious in China.

[1] Since there is no detailed information in the dataset allowing us to classify export firms into general trade and processing trade groups, we are not able to directly test this interpretation. However, some findings from other studies could be good supports of our argument. Dai et al. (2012) used custom data and found that processing trade accounts for nearly half of China's exports. More importantly, those firms are 4% to 30% less productive than non-exporters. Yu (2015) showed low-productivity firms self-select to engage in processing trade. These evidence are consistent with our results.

For the control variables, the tax ratio has a negative coefficient; that is, lowering taxes encourages firms to enter new markets. Foreign companies have accumulated overseas experience. As we can see from Table 3, they are more likely to be involved in exporting or ODI. Firm age also has a significantly positive effect on firms' decision to enter overseas markets. In addition, less capital-intensive firms get more involved in internationalization behaviour.

3.2. *Interaction effect between productivity and financial constraint*

When a firm is making decisions about overseas market entry, will a higher productivity level release the negative effect of financial constraint? In order to answer this question, we put the cross-term of the productivity variable and the financial constraint index into the multinomial logit model, and regress equation 2. If the release effect, β_{2j} exists, it should be significantly negative:

$$\Pr[y_{it}=j]=\frac{\exp\left(\alpha+\beta_{1j}prod_{it}+\beta_{2j}prod_{it}\times FC_{it}+\beta_{3j}FC_{it}+\gamma_j C_{it}+Yd+Id\right)}{\sum_{k=D,E,F}\exp\left(\alpha+\beta_{1j}prod_{it}+\beta_{2j}prod_{it}\times FC_{it}+\beta_{3j}FC_{it}+\gamma_j C_{it}+Yd+Id\right)} \quad (2)$$

From Table 4, it is evident that there is neither a 'release effect' on the exporting decision nor on the ODI decision. What might violate our intuition is that productivity strengthens the impact of financial constraint on exporting, because the coefficient β_{2E} for the export entry decision is positive and significant

Table 4. Multinomial logit estimates with interaction effect

	(1)	(2)
Variables	Export	ODI
Prod	−0.379***	0.235
	(0.022)	(0.199)
FC	−0.004	0.376***
	(0.015)	(0.121)
*prod*FC*	0.038***	0.005
	(0.004)	(0.028)
Tax ratio	−0.229***	−0.299***
	(0.004)	(0.025)
FDI dummy	1.385***	1.087***
	(0.019)	(0.106)
Firm age	0.022***	0.029***
	(0.001)	(0.006)
Capital intensity	−0.123***	−0.156***
	(0.006)	(0.035)
Year fixed effect	Yes	Yes
Industry fixed effect	Yes	Yes
Observations	132 902	
Pseudo R2	0.152	

Standard errors aren in parentheses. ***$p < 0.01$ **$p < 0.05$ *$p < 0.1$.

at the 1% level. Consistent with our previous finding, we think it might still be due to processing trade. Firms usually have less cost in processing trade because they mainly focus on low value-added production, like assembly, and they also have advantages in taxation and tariff exemption (Yu and Tian, 2015). Hence, processing trade firms might be less restricted by financial conditions. Given that low productivity exporting firms take part in processing trade, it makes sense that financial constraint has a larger effect on firms with higher productivity. Meanwhile, the positive coefficient of the cross-term also shows us that for firms with higher financial capacity (lower financial constraint), productivity has a less negative effect or even has a positive effect on the exporting decision.

3.3. *Robustness check: First time exporting or outward direct investment*

To deal with the potential endogeneity problem, and exclude the learning effect of existing exporting or ODI enterprises, and bias caused by fixed entry cost they have already paid (Lee, 2010), we reduce our sample to only contain first-time exporting or ODI observations and non-exporting/ODI observations during 2006–2008. We re-estimate Equation (1), and obtain the result in Table 5. It shows an outcome much like our basic result. Therefore, for first-time exporting or ODI firms, the coefficients of the financial constraint index are significantly positive, and financial constraint has a negative impact on both firms' export and ODI choice. Productivity negatively correlates with the exporting decision, but promotes firms to choose ODI.

Table 5. Multinomial logit estimates of first time export/outward direct investment (ODI) sample

	(1)	(2)
Variables	Export	ODI
Prod	−0.103***	0.676***
	(0.016)	(0.133)
FC	0.193***	0.405***
	(0.006)	(0.061)
Tax ratio	−0.200***	−0.190***
	(0.006)	(0.055)
FDI dummy	1.279***	0.701***
	(0.034)	(0.260)
Firm age	0.103***	0.087***
	(0.003)	(0.019)
Capital intensity	−0.091***	−0.054
	(0.008)	(0.038)
Year fixed effect	Yes	Yes
Industry fixed effect	Yes	Yes
Observations	48 492	
Pseudo R^2	0.158	

Standard errors aren in parentheses. ***$p < 0.01$ **$p < 0.05$ *$p < 0.1$.

4. FIRM HETEROGENEITY AND OUTWARD DIRECT INVESTMENT VALUE

4.1. *Model specification*

Following the analysis of the extensive effect of firm heterogeneity on firms' exporting and ODI choice, we also want to examine its intensive effect on exports and ODI value. The model specification is as follows:

$$\ln value_{it} = \alpha + \beta_1 prod_{it} + \beta_2 FC_{it} + \gamma C_{it} + Yd + Id + \varepsilon_{it} \quad (3)$$

$\ln value_{it}$ *is* either firm *i*'s export value or ODI value in year *t*, measured in logarithmic form. All the explanatory variables are the same as in equation 1, andε_{it} is the error term. The estimated coefficients for productivity and financial constraint (β_1, β_2) are our main concern.

4.2. *Estimation result*

Table 6 reports our estimate results. The dependent variables in columns (1) and (2) are, respectively, export value and ODI value in logarithmic term.

Productivity positively influences both a firm's export value and ODI value, and the magnitude of the effect on exports is larger than on ODI (respectively, increasing export and ODI value by 0.420% and 0.344% when productivity improves by 1%). Hence, an increase in firm productivity helps to expand firms' overseas market, especially for exports.

The financial constraint index has a positive coefficient for both the export value equation and the ODI value equation. A higher index stands for a lower financial constraint level: when the financial constraint is one unit tighter, it

Table 6. Estimates of export and outward direct investment (ODI) value

	(1)	(2)
Variables	Export value	ODI value
Prod	0.420***	0.344***
	(0.011)	(0.087)
FC	0.144***	0.134***
	(0.004)	(0.039)
Tax ratio	−0.151***	0.023
	(0.003)	(0.033)
FDI dummy	0.288***	0.041
	(0.0160)	(0.141)
Firm age	0.017***	0.023**
	(0.001)	(0.011)
Capital intensity	−0.017	0.015
	(0.013)	(0.035)
Year fixed effect	Yes	Yes
Industry fixed effect	Yes	Yes
Observations	54 484	511
R^2	0.177	0.182

Standard errors are in parentheses. ***$p < 0.01$ **$p < 0.05$ *$p < 0.1$.

reduces a firm's average export value by 0.144%, while reducing the ODI value by 0.134%.

For the control variables, the tax ratio has a negative impact on export volume, but no significant influence on ODI volume. The FDI dummy only increases export value, and firm age positively affects both exports and the ODI value.

5. CONCLUSION

Using a rich firm-level panel data set for Zhejiang Province in China, we investigate firm heterogeneity and overseas market entry decisions, and we provide strong firm-level evidence on the inhibition of financial constraint for outward direct investment from China.

We find that financial constraint not only lowers firms' possibility of establishing a foreign affiliate, but also reduces their ODI value. Hence, a better financing environment would effectively improve both the prevalence of ODI and the total investment value of ODI.

We also find that high productivity promotes firms to choose ODI, but it cannot offset or release the negative effect of financial constraint on firms' choice of ODI. That is, even if a firm largely improves its productivity, because the financial constraint is still tight, it might not be able to invest overseas. Hence, those more competitive private firms with higher productivity in China might not have the opportunity to pursue ODI. While for China, as has been the case elsewhere, encouraging ODI is an important strategy for upgrading the economic structure, transferring excess production capacity, improving competitiveness and opening up export markets to the outside world.

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