How Firm Heterogeneity Affects OFDI Domestic Performance?

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Abstract

This study was set out to identify the linkage between firm heterogeneity and domestic performance. Chinese firm level data from OFDI firms in manufacturing industry are applied from year 2011 to year 2013, factors as assets level, employment scale, market sales, profit level, salary level, import and export, destinated countries OFDI, sectors of investment are investigated with fixed effect panel data model. Output is used to signify firm's performance, and the sum of firm's import and export are applied to signify firms' international connection. Findings show that market sales and salary level presented a significant positive impact on the firms' output, while number of employees, profit level and international connections presented a negative effect on the growth of output. The assets and exporting status presented an unclear effect. The growth of output is also affected by the destinated country of OFDI and the sectors invested.

Keywords

Firm Heterogeneity, OFDI, Domestic Performance

1. Introduction

With the deepening of economic globalization, China's OFDI (outward foreign direct investment) continues to grow, and Chinese OFDI market is increasingly mature. As the second largest country in the global market of foreign investment, OFDI has become one of the important driving forces for China's domestic economic development. With the further development of the "going out" strategy, the performance of OFDI firms has become the core issue of China's foreign investment.

Due to the different individual characteristics of foreign investment firms, the

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performance of investment firms is significantly varied. Existing research mainly focuses on the performance of foreign investment at the national or provincial level, or the performance of a certain type of firm's foreign investment based on macro data. Few studies are focused on the performance of OFDI at the firm level. The existing research mainly involves research of the impact of the international environment and external policies on the performance of companies' foreign investment, and few considerations are given to the heterogeneity of the firms. And most of the policy recommendations put forward are more suitable for developed countries.

Based on the "List of Overseas Investment Enterprises (Institutions)", "the Chinese Industrial Enterprise Database", and "the China Customs Database", the study is set out to explore how heterogeneity affects OFDI firms' domestic performance. Based on corporate-level data of China's manufacturing firms which has invested and has import and export activities in countries along the "maritime silk road". The performance of OFDI firms is analyzed from the perspective of heterogeneity.

2. Literature Review

Regarding the study of foreign direct investment of firms, in the early stage the representative theory is Dunning's Ownership-Location-internalization (OLI) (Dunning, 1981), which believes that the advantages of enterprise ownership, internalization and location advantages are important factors affecting foreign investment decisions. The theory comprehensively analyzes and explains the determinants of international production, the form of international production, and the development degree of international production. Regarding the study of firms' foreign direct investment, the theory believes that the advantages of firms' ownership, internalization and location advantages are important factors affecting the decision-making of foreign investment.

On this basis, scholars incorporated various macro-factors of the home country and host country into the location selection model and discussed the influence of factors (Buckley et al., 2007) such as geographic distance, institutional distance, market conditions, resource endowments, and industry differences; (Kolstad & Wiig, 2012; Ramasamy et al., 2012). With the development of heterogeneity theory and empirical research, Chinese economists have gradually begun to pay attention to the trade behavior of micro-enterprises (Cheng & Ruan, 2004). However, due to the poor availability of corporate microdata, the focus of research is mostly at the level of factor endowment and policy analysis (Liming et al., 2017). The early research on heterogeneous corporate trade theory by Chinese scholars mainly focused on comprehensive research and learning (Wang & Xu, 2017).

Macro-level research is mainly on the study of local policies, market differences, and labor differences based on actual local conditions and in-depth study of location factors (Jiang & Jiang 2012; Sun & Ding et al., 2019). In addition to

the macro factors, scholars further linked the heterogeneity of firms with foreign direct investment decision-making. From the differences of firms at the micro level, they proposed the self-selection effect model of enterprise behavior (Helpman-Melitz-Yeaple, HMY) (Helpman et al., 2004), which verified the impact mechanism of productivity on corporate foreign investment (Bernard & Jensen 2007; Yeaple et al., 2009).

With the in-depth research on firm's heterogeneity, more and more scholars believe that productivity cannot fully represent the differences between enterprises (Conconi et al., 2016). Scholars have begun to explain the impact of enterprise heterogeneity on enterprises in terms of innovation capabilities, export conditions, financing constraints, and ownership (Huang et al., 2017; Yan et al., 2018).

Based on this, the OFDI firm data of China's manufacturing industry are used to explore the impact of firm heterogeneity on enterprise performance from the perspective of firm heterogeneity, sector of investment, destinated country of investment and other multi-factor perspectives, to provide a certain reference for OFDI firms in developing countries.

3. Model Specification and Data Description

According to the Cobb-Douglas production function, capital input and labor input are important factors affecting firms' performance. At the same time, the level of firms' market development, firms' profitability, employee income levels, the sectors in which the firm is located, the country of investment destination, firms' international connections, and whether it is exporting may all affect firms' performance. Considering a variety of factors, the following Econometric model is set as follows,

$$
\begin{aligned}
LNOUTPUT_{it} = {} & \beta_0 + \beta_1 LNASSET_{it} + \beta_2 LNEMP_{it} + \beta_4 LNSALE_{it} \\
& + \beta_7 LNPROFIT_{it} + \beta_8 LNSAL_{it} + \beta_9 SECTOR_{it} \\
& + \beta_{10} CONTRY_{it} + \beta_{11} LNINTER_{it} + \beta_{12} EX_{it} + \epsilon_{it}
\end{aligned}
\tag{1}
$$

Here the subscript i represents the foreign investment enterprise, t represents the year; ϵ_{it} it is the error term.

$OUTPUT_{it}$ is the firm's output in the current year, representing firms' performance; $ASSET_{it}$ represents the company's total assets; EMP_{it} represents labor inputs; $SALE_{it}$ is the market sales, which represents firms' market development level; $PROFIT_{it}$ is the firm's current year's profit, representing the level of firms' profitability; SAL_{it} is the current year's employee wages, representing the employee's income level; $SECTOR_{it}$ is the sector in which firm invested; $COUNTRY_{it}$ is the destination country of the firm's OFDI; $INTER_{it}$ is the firm's degree of openness, or the level of international relevance, measured by the logarithm of the company's total import and export volume; EX is whether the company has exports or not.

344 firms are selected that have made direct investments and have import and export trade in countries along the "Maritime Silk Road" from year 2011 to year

2013.[1] All data comes from the "List of Overseas Investment Enterprises (Institutions)", "the Chinese Industrial Enterprise Database", and "the China Customs Database". Capital inputs, labor inputs, firms' market development, profitability, employee income, international connections, and so on are all de-inflated based on the price level of year 2010.

After de-inflation, the original data is logarithmically processed according to Equation (1) and the following characteristics are shown. According to the following mean value, standard deviation, maximum and minimum value of the overall data in Table 1, the dataset is balanced panel data with small standard deviations and no outliers.

4. Empirical Analysis

4.1. Pooled Regression

As a frame of reference, pooled regression was carried out first. We first assume that the regression equation of the firms are the same and individual specific effects are absent. Cluster robust standard error pooled regression, robust standard error pooled regression and standard error pooled regression were performed respectively. The results are shown in Table 2.

It can be seen from the results in Table 2 that the three types of errors have similar results. Factors of market sales and country of destination are significant in all three progression models, and all other factors are statistically insignificant.

In the pooled regression model, it is assumed that all firms have the same regression equation. Sample firms selected are all manufacturing firms and investing in countries along the "Maritime Silk Road", they may have remarkably similar regression equations, however, since each firm has its specific characteristics, that is, individual differences or heterogeneity.

Therefore, we need to use F-test to further confirm if there are individual specific effects. The P value of the F test is 0.0000, which strongly rejects the null hypothesis. Therefore, each firm has its own invariant heterogeneity, that is, intercept term, and the mixed regression results are not effective.

4.2. Fixed Effect Regression and Random Effect Model

There are two kinds of kinds of individual-specific effects model involved, which are Fixed Effects Model (FE)[2] and Random Effect Model (RE). Therefore, we

[1]The "Belt and Road" is connected to the Pacific Ocean in the east, the Baltic Sea in the west, and runs through Asia, Europe and Africa, covering 65 countries in Central Asia, West Asia, North Africa, Southeast Asia, South Asia and Central and Eastern Europe, involving 11 ASEAN countries, 18 West Asia countries, 8 South Asia countries, and Central Asia. 5 countries, 7 CIS countries and 16 countries in Central and Eastern Europe. Among them, there are 25 countries along the "Maritime Silk Road "and 40 countries on the "land Silk Road". Here we selected 21 countries including Bangladesh, Brunei, Cambodia, Egypt, India, Indonesia, Iran, Kuwait, Laos, Malaysia, Myanmar, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Thailand, UAE, Vietnam, and Qatar as countries along "Maritime Silk Road".

2 The word "fixed effects" may be misunderstood. Even in fixed effects model, individual-specific effects --μi is still a random one, but not a fixed constant.

perform both respectively. Fixed effect model regression is shown in Table 3. And the results of random effects model are presented in Table 4.

From the results of fixed effects model and random effects model, we can see that the results are significantly different. In the fixed effect model, all factors are statistically significant except the factors of assets and export. While in random effect model, only market sales and destination country of OFDI are significant.

Table 1. Statistical Summary of the data.

Variable		Mean	Std. Dev.	Min	Max	Observations
lnoutp	overall	12.7132	1.718333	9.61808	17.68503	N = 344
	between		1.707877	9.61808	17.68503	n = 331
	within		0.058439	12.2398	13.18661	T-bar = 1.03927
lnasset	overall	12.56505	2.030446	7.997322	17.53869	N = 344
	between		2.023572	7.997322	17.53869	n = 331
	within		0.037845	12.1676	12.9625	T-bar = 1.03927
lnemp	overall	6.342739	1.240679	3.526361	10.27946	N = 344
	between		1.225394	3.526361	10.27946	n = 331
	within		0.032037	6.108399	6.577079	T-bar = 1.03927
lnsale	overall	12.68471	1.714141	9.61808	17.70685	N = 344
	between		1.70653	9.61808	17.70685	n = 331
	within		0.043854	12.36319	13.00623	T-bar = 1.03927
lnprofit	overall	8.182021	5.566073	−13.2544	15.23455	N = 344
	between		5.360028	−13.0953	15.23455	n = 331
	within		1.155097	−2.52625	18.89029	T-bar= 1.03927
lnsal	overall	9.895905	1.72555	5.428046	15.75628	N = 344
	between		1.708076	5.428046	15.67765	n = 331
	within		0.077623	8.970002	10.82181	T-bar = 1.03927
sector	overall	29.34012	8.985444	6	44	N = 344
	between		8.998848	6	44	n = 331
	within		0.07636	28.84012	29.84012	T-bar = 1.03927
country	overall	10.625	5.603161	1	19	N = 344
	between		5.529478	1	19	n = 331
	within		1.15428	3.125	18.125	T-bar = 1.03927
lninter	overall	23.61943	8.333098	0	40.75674	N = 345
	between		8.33294	0	40.75674	n = 332
	within		0.629708	17.43863	29.80024	T-bar = 1.03916
ex	overall	0.575581	0.494974	0	1	N = 344
	between		0.491077	0	1	n = 331
	within		0.093522	0.075581	1.075581	T-bar = 1.03927

Table 2. Comparison of three pooled regression.

lnoutp	Cluster-Robust standard error			Robust standard error			Standard error		
	Coef.	Std. Err.	P > |t|	Coef.	Std. Err.	P > |t|	Coef.	Std. Err.	P > |t|
lnasset	0.000462	0.0064033	0.943	0.000462	0.0063749	0.942	0.000462	0.0069606	0.947
lnemp	−0.0094815	0.0106149	0.372	−0.0094815	0.0104395	0.364	−0.0094815	0.0073436	0.198
lnsale	1.001695	0.0086144	0.000	1.001695	0.0083712	0.000	1.001695	0.0087208	0.000
lnprofit	0.0001548	0.0007684	0.840	0.0001548	0.0007583	0.838	0.0001548	0.0010297	0.881
lnsal	0.0033551	0.007644	0.661	0.0033551	0.0074641	0.653	0.0033551	0.0074873	0.654
sector	0.000587	0.0004633	0.206	0.000587	0.0004492	0.192	0.000587	0.0006298	0.352
country	0.0019612	0.0010303	0.058	0.0019612	0.001156	0.091	0.0019612	0.000985	0.047
lninter	0.0006741	0.0006933	0.332	0.0006741	0.0006781	0.321	0.0006741	0.0007971	0.398
ex	0.0037165	0.0111339	0.739	0.0037165	0.010566	0.725	0.0037165	0.0108544	0.732
_cons	−0.0293093	0.0570048	0.607	−0.0293093	0.0548073	0.593	−0.0293093	0.0477682	0.540

Table 3. Fixed effect model.

lnOUTP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnasset	0.0417723	0.1737819	0.24	0.810	−0.3000877	0.3836322
lnemp	−1.961882	0.3109876	−6.31	0.000	−2.57365	−1.350113
lnsale	1.637151	0.2133924	7.67	0.000	1.21737	2.056932
lnprofit	−0.0368069	0.0087044	−4.23	0.000	−0.0539299	−0.0196838
lnsal	1.001138	0.1810688	5.53	0.000	0.6449431	1.357333
sector	0.6286804	0.1591778	3.95	0.000	0.3155493	0.9418116
country	0.0405621	0.0074041	5.48	0.000	0.0259971	0.0551272
lninter	−0.0324923	0.0099708	−3.26	0.001	−0.0521067	−0.0128779
ex	−0.0677961	0.0621712	−1.09	0.276	−0.190098	0.0545058
_cons	−23.80859	6.158515	−3.87	0.000	−35.92349	−11.69369
sigma_u	5.9932677					
sigma_e	0.11160688					
rho	0.99965334 (fraction of variance due to u_i)					

Table 4. Random effect model.

lnOUTP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnasset	0.000462	0.0064033	0.070	0.942	−0.0120883	0.0130122
lnemp	−0.0094815	0.0106149	−0.89	0.372	−0.0302863	0.0113233
lnsale	1.001695	0.0086144	116.28	0.000	0.9848112	1.018579
lnprofit	0.0001548	0.0007684	0.200	0.840	−0.0013513	0.0016608
lnsal	0.0033551	0.007644	0.440	0.661	−0.0116269	0.018337
sector	0.000587	0.0004633	1.270	0.205	−0.0003211	0.0014951
country	0.0019612	0.0010303	1.900	0.057	−0.0000581	0.0039805

Continued

lninter	0.0006741	0.0006933	0.970	0.331	−0.0006848	0.002033
ex	0.0037165	0.0111339	0.330	0.739	−0.0181056	0.0255386
_cons	−0.0293093	0.0570048	−0.510	0.607	−0.1410367	0.082418
sigma_u	0					
sigma_e	.11160688					
rho	0 (fraction of variance due to u_i)					

Table 5. Hausman test (fixed effects and random effects.

	coefficients			
	(b) FE	(B) RE	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lnasset	0.0417723	0.000462	0.0413103	0.3475335
lnemp	−1.961882	−0.0094815	−1.9524	0.5618493
lnsale	1.637151	1.001695	0.635456	0.3739597
lnprofit	−0.0368069	0.0001548	−0.0369617	0.0130951
lnsal	1.001138	0.0033551	0.9977828	0.3295843
sector	0.6286804	0.000587	0.6280935	0.235726
country	0.0405621	0.0019612	0.038601	0.0103643
lninter	−0.0324923	0.0006741	−0.0331664	0.0148397
ex	−0.0677961	0.0037165	−0.0715126	0.0820911
_cons	−23.80859	−0.0293093	−23.77928	8.393102

b = consistent under Ho and Ha; obtained from xtreg. B = inconsistent under Ha, efficient under Ho; obtained from xtreg. Test: Ho: difference in coefficients not systematic. $chi2(9)$ =
(b-B)'[(V_b-V_B)^(−1)](b-B) = 28.83. Prob > chi^2 = 0.0007.

4.3. Further Test of the Results

T further investigate the validity and scientificity of the above two model estimation results, Hausman Test is carried out on the fixed effect model and random effect model respectively to determine the scientificity of the above results (see Table 5).

Test results in Table 5 show that P value equals 0.0007, which strongly reject the H0 hypothesis, which indicates that the difference in coefficients is systematic, and fixed effects regression is effective.

5. Discussion

From the results of fixed effect model (Table 3), except assets level and exporting status, all factors are statistically significant on the level of 1%. Market sales, salary level, destinated country and sector of OFDI have positive impacts on the output of OFDI firms. While employment level, profit level international connections have significantly negative impacts on firms' output level.

The coefficient of market sales is 1.6371, indicating that market sales increased

by 1%, output increased by 1.6371%, and market sales had a multiplier effect on output growth. Wage level has a significant positive effect on output, with a coefficient of 1.0011, indicating that an increase in work level will increase employee morale and working status, and help increase output. In addition, high wages correspond to employees with stronger technical and innovative capabilities. Improving employees' technical and innovative capabilities has a positive effect on output growth. Both the investment destination country and the investment sectors have a significant effect on output, indicating that OFDI companies must carefully select the investment country and investment sectors. Profit level and international connections has a significant negative impact on firms' outputs, indicating that pursuit of profits will hinder the growth of outputs, and the import or export of intermediate goods will reduce domestic production.

The number of employees, the level of profit, and the volume of imports and exports have a significant negative effect on output. The coefficient of employment is -1.9618, indicating that the increase in employment has a significant inhibitory effect on output growth, indicating that labor input has reached saturation, and labor input can no longer be used to increase output. Capital has no significant effect on the growth of output, indicating that manufacturing companies should devote themselves to technological advancement and technological innovation, and improve output levels through innovation. The level of profit and the volume of imports and exports have a restraining effect on output growth, indicating that expanding profits and increasing imports and exports cannot promote the increase in output.

6. Conclusion

Based on the data of OFDI firms with import and export activities in manufacturing industry, we established the panel data model to explore how firm heterogeneity affects their outputs. Factors as assets level, employment level, market sales, market profits, employee salaries, international connection, exporting status, destinated country of OFDI and sectors of investment are invested. The study offered a firm level study and provided a reference for the output analysis in developing countries. However, since the samples are focused on the manufacturing firms, therefore, it excludes OFDI firms in the service industry, which is the limitation for the study.

Findings show that assets and exporting status do not show significant impacts on the outputs of OFDI firms during the study period. Market sales, salary level of employees, sectors invested, and country of destination have positive impacts on firms' outputs, while employee scale, market profit and international connections present negative effects in the study period.

It should be noted that assets show no positive impacts on firms' output, and employee scale has negative impacts on firms' output. This is contrary to the conclusions obtained from the analysis of most production function growth fac-

tors. This shows that the output growth of OFDI firms in manufacturing industry could not be further promoted by capital and labor inputs. The promotion of outputs should be enhanced by technology innovation. Therefore, firms should focus more on technology upgrading and innovation, to further improve productivity hence increase outs.

Employees' salary level is closely related to employees' technology efficiency and professional skills. The increase of employees' salary presented a significantly positive impact on outputs, indicating that more professional and efficient labor would be beneficial for the growth of outputs. Therefore, efforts should be taken to improve employees' professional knowledge and skills from the recruiting to employee training, such as cooperation with famous universities to codevelop talents, performance-related promoted programs to improve employees' professional skills, and talents training should be an important target for firms' human resource development.

Supporting Projects

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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