

Digital Economy and Location Selection of OFDI: A Study Based on the Data of Listed Manufacturing Companies in China

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ABSTRACT

This paper empirically analyzes the investment data of Chinese A-share manufacturing listed companies in 52 host countries from 2003 to 2022, and discusses the influence of digital economy development on Chinese manufacturing enterprises' direct investment location choice. The results show that the development of host country digital economy has a significant positive impact on the location choice of Chinese manufacturing enterprises' OFDI. In terms of the mechanism of action, the digital economy of the host country affects the location choice of Chinese manufacturing enterprises on direct investment by influencing innovation ability and institutional quality.

KEYWORDS

Chinese manufacturing enterprise; digital economy; innovation ability; institutional quality; location choice; OFDI

1 Introduction

The 20th National Congress of the Communist Party of China proposed "accelerating the construction of a new development pattern and focusing on promoting high-quality development". As a leader in the "Go globally" strategy, foreign direct investment in the manufacturing sector (hereafter referred to as OFDI) has given a strong impetus to the high-quality development of our economy. According to the announcement of China's Ministry of Commerce, the outbound foreign direct investment flow of China's manufacturing industry in 2021 will be \$26.867 billion, compared with \$25.838 billion in 2020, an increase of 3.98%. However, since the outbreak of COVID-19, world economic growth has slowed down, and OFDI of various countries has been hit by unprecedented impacts, and investment and trade volume has declined year by year. While the amount of investment and trade in countries around the world shows a downward trend, why can China's manufacturing industry buck the trend? Part of the reason is due to the rapid development of the world's digital economy, which has profoundly changed the investment model of enterprises.

2 Literature Review

2.1 Digital Economy Connotation and Measurement

At first, the digital economy was considered to be the production activities using information and communication technology, which mainly includes three parts: e-commerce infrastructure, e-commerce and e-commerce transactions^[1,2]. The Economist Intelligence Unit (2010) suggests that the focus should not be solely on digital technologies, but rather on a comprehensive measure of digital infrastructure and connectivity, including the institutional environment, government policies, and business and consumer acceptance^[3]. The UK's Economic and Social Research Institute believes that the digital economy should also include the benefits that businesses gain from the use of digital technologies^[4]. Since then, the digital economy has gradually been regarded as a new economic activity. The 2016 G20 Hangzhou Summit crystallized this new economic activity. The blurring of direct boundaries between the digital economy and the rest of the economy makes measuring the digital economy more difficult^[5]. At present, academics mainly adopt the method of value-added statistics and the construction of indicator system for the measurement of digital economy. As for the statistics on the value added of the digital economy, the results of different organizations and scholars on the measurement of the same objective currently vary considerably. The reason for this phenomenon is mainly due to the use of different methods in the measurement, the mainstream methods include: expenditure approach^[6,7] and production approach^[8,9].

2.2 Location Factors of Outward Direct Investment

The eclectic theory of international production put forward by Dunning indicates that OFDI is based on location advantage, which has aroused the attention of many scholars on location factors in investment activities^[10]. At present, the location factors generally recognized by the academic community include: institutional factors, natural resource endowment, market size, geographical distance, cultural distance, strategic resources^[11] and intellectual property protection degree.

2.3 The Impact of Digital Economy on Outward Direct Investment

At present, there are some controversies in the academic circles about the influence direction of the development of digital economy on OFDI. Some scholars believe that the development of digital economy has a restraining effect on OFDI, especially the market-seeking OFDI. They pointed out that the development of digital economy leads to changes in the host country's demand for specific tangible assets, resulting in a decrease in foreign direct investment. However, most academics believe that the development of the digital economy can be effective in attracting inflows from host countries. They believe that the development of the digital economy will facilitate the choice of OFDI regions, where network externalities will play an important role. In terms of its mechanism, digital economy mainly attracts more foreign capital inflows by improving the host country's human capital level and innovation ability and the total factor productivity of enterprises. Secondly, the development of the digital economy in host countries can also stimulate technological progress in local businesses, optimize the way of obtaining information for enterprises in the home country and alleviate the financing pressure of enterprises in the home country, thus promoting the dual marginal growth of enterprises' OFDI.

2.4 Literature Review

A comprehensive analysis of the above literatures shows that: First of all, domestic and foreign scholars have reached a consensus on the connotation of digital economy. However, due to the blurred boundary between digital economy and other economic fields, different scholars and institutions have different methods to measure it. Secondly, the research on the location choice of outbound investment has been relatively mature, but with the development of economy, the location factors of investment need to be supplemented. Finally, there are still few researches on digital economy and OFDI, especially in the field of OFDI location selection enterprises, which have not attracted much attention from scholars. The marginal contribution of this paper is as follows: Firstly, this paper studies the digital economy and the location choice of OFDI of Chinese manufacturing enterprises. The research tools based on the micro-enterprise level provide a micro-level reference for the academic research in this field. Secondly, according to the input-output model, appropriate diversification indicators have been added to assess the digital economy. Thirdly, unlike other scholars who choose a specific regional group as the research object, this paper selects 52 host countries of OFDI of Chinese manufacturing enterprises to conduct research, with a larger sample size and more objective results.

3 Theoretical Analysis and Research Hypothesis

According to the Solow production model, $Y=AF(K, L)$, it can be seen that traditional economic growth can only change the input factors (K or L) or the total factor productivity (A). These two economic growth modes are applicable in the process of the development of the digital economy: First, the scale effect brought by the digital economy can ensure the precision of the distribution of means of production, and promote economic growth by changing the quality of production factors. Second, the digital economy itself can also be used as a factor of production input, thereby expanding the number of factors of production to promote production. Third, the development of the digital economy will play an important role in the production of Internet led and artificial intelligence, leading the progress of production technology. In the context of technical progress, total factor productivity will also increase significantly, effectively reducing production costs and national economic growth the promotion has been made. In addition, by promoting industrial innovation and industrial integration, the digital economy further causes the optimization and transformation and upgrading of the industrial structure of domestic enterprises, and expands the market to attract foreign investment (as shown in the Figure 1). In this regard, the paper formulates hypothesis 1:

H1: The improvement of the host country's digital economy has a positive effect on the location choice of China's manufacturing OFDI.

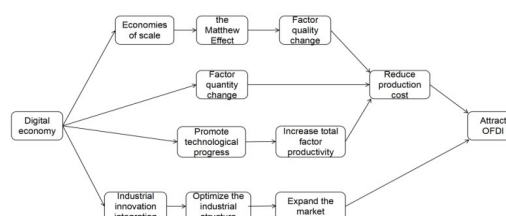


Figure 1 Digital Economy Attracts OFDI Mechanism.

Technological innovation is an important factor affecting a country's competitive advantage, and the host country's technology and innovation capability are also important location factors affecting OFDI. Only by changing the economic development mode from capital and other factors to innovation-driven, can we achieve high-quality economic

development and obtain a steady stream of sustainable competitive advantages. Therefore, this paper proposes mediating effect hypothesis 2:

H2: The development of digital economy in host countries can promote the OFDI location choice of Chinese manufacturing enterprises by improving their own innovation capability.

An eclectic theory of international production considers that a country with a stable political system and quality institutions is more likely to attract foreign investment. This is because the good institutional quality of the host country can provide a safe, efficient and stable institutional environment for foreign direct investment and has a significant promotion effect on attracting OFDI in China. In this regard, this paper proposes hypothesis 3:

H3: The development of digital economy in host country can promote OFDI location choice of Chinese manufacturing enterprises by improving the quality of domestic system.

4 Research Design

4.1 Dependent Variable

According to the research of previous scholars, when studying the location choice of OFDI, the newly built overseas subsidiaries of enterprises can be selected to represent the location choice of their investment activities. When enterprises choose to establish overseas subsidiaries to enter the host country market, they will bear greater risks, and they will only invest in this way when the benefits outweigh the risks. Therefore, the new overseas subsidiaries of enterprises can effectively represent the location choice of enterprises' investment activities. The data of new overseas subsidiaries of manufacturing enterprises are from the CSMAR database.

4.2 Explanatory Variable

Based on the input-output model, this paper comprehensively constructs the evaluation index system of digital economy development (as shown in Table 1). In this paper, the maximum - minimum value method and standardization of these indicators are firstly carried out. We use main component analysis (PCA) to measure the level of integrated development of the digital economy. To obtain the phase I indicator - the digital economy level of development index - weights were calculated for each of the 16 phase iii indicators of these four indicators after selecting the four main indicators with a cumulative contribution greater than 80%. Finally, a measure of the level of development of the digital economy is obtained by multiplying the sum of contributions by the cumulative contributions of the four main factors.

4.3 Basic Models

Because, the explained variable of this paper, the investment location choice of Chinese manufacturing enterprises, is a dummy variable. Therefore, this paper is not suitable for the conventional continuous linear regression model when selecting the model. Therefore, this paper selects Logit model for benchmark regression. For specific models, see equation (1):

$$OFDI_{ijt} = \beta_0 + \beta_1 DE_{jt} + \sum_{k=2}^8 \beta_k Contorl_{jt} + \delta_t + \varepsilon_{ijt} \quad (1)$$

4.4 Descriptive Statistics

The results of the descriptive statistics for each variable are presented in table 1:

Table 1 Descriptive Statistics.

Variable	Observed value	Mean	Standard deviation	Max	Min
OFDI	2 640 612	0.019	0.136	1	0
DE	2 640 612	2.182	0.663	5.033	0.064
per_GDP	2 640 612	9.334	1.288	11.348	6.631
Tech	2 640 612	39.221	22.300	81.001	0.219
Labor	2 640 612	3.221	1.649	9.393	0.445
Fdiopen	2 640 612	3.331	5.740	36.175	-12.769
Trade	2 640 612	39.455	30.098	188.902	-23.662
Source	2 640 612	4.000	6.909	34.240	-17.048
GDP	2 640 612	26.394	1.673	30.678	23.137

5 Empirical Results

In this paper, Stata17.0 software was used to conduct full-sample regression analysis on explained variables, core explanatory variables and control variables, and the specific regression results were shown in Table 2.

Table 2 Benchmark Regression Results.

Variable	(1)	(2)	(3)
DE	1.626*** (0.0055)	1.942*** (0.0066)	1.580*** (0.0094)
Control variable	No	No	Yes
Fixed effect	No	Yes	Yes
N	2 640 612	2 640 612	2 640 612

Column (1) of Table 2 shows the regression results without adding control variables and fixed effects, while column (2) only adds fixed effects. The results show that the development level of the host country's digital economy has a positive impact on the location choice of Chinese manufacturing enterprises' OFDI. In column (3), control variables are added and time effects are fixed, where the digital economy development level(DE) still passes the test at a significant level of 1% and the regression coefficient is positive, indicating that Chinese manufacturing enterprises pay more and more attention to the influence of the host country's digital economy development level when making location selection of OFDI.

It is worth stating that since the meaning of the regression coefficients obtained from the logit model regression using Stata 17.0 software is the Odds ratio of the logarithmic odds of the change in the explanatory variable caused by an increase of one unit in the explanatory variable, and it is not used as a marginal effect to explain its economic meaning. Therefore, this paper further calculates the benchmark regression results obtained by the Logit model to obtain the average marginal effect of each variable(dy/dx). The specific results are shown in Table 3.

Table 3 Mean Marginal Effect (dy/dx) Regression Results.

Variable	(1)	(2)
	Logit model regression coefficient	Average marginal effect dy/dx
DE	1.580***	0.0251***
N	2 640 612	2 640 612

As can be seen from column (2) of Table 3, the average marginal effect of the core explanatory variable passes the test at the significant level of 1%, and its coefficient is about 0.0251, which proves that when the development level of the host country's digital economy increases by one unit, the probability of Chinese manufacturing enterprises choosing to make direct investment in the country increases by 0.0251%. According to the theory of Mathews, the reason why Chinese manufacturing enterprises choose the host country with a higher level of digital economy development for investment activities is to obtain the technology, high and new technology, intellectual property rights, management skills needed for their own development and the investment protection measures of the host government. In summary, we have validated hypothesis 1, namely that the level of development of the host country's digital economy has a positive impact on the choice of OFDI sites by the Chinese manufacturing industry.

All control variables passed the test at a significance level of 1% and the overall regression coefficients were as expected. Among them, the host country strategic resources(Tech), investment openness(Fdiopen), Trade dependence (Trade) and market size(GDP) all significantly promote the location selection of OFDI of Chinese manufacturing enterprises. This suggests that foreign direct investment in Chinese manufacturing companies is to some extent technology direct investment. At the same time, the investment environment, trading environment and market size can more effectively guide investment in Chinese manufacturing companies. The negative growth of market potential, that is, the higher the potential of the host country, the less Chinese manufacturers will invest there; Labor costs are so high that Chinese manufacturing companies are reluctant to invest in countries with more workers. The negative raw material coefficient indicates that countries with scarce natural resources are more attractive for investment by Chinese manufacturing companies.

6 Mechanism Analysis

This paper examines the specific impact mechanism of the host country's digital economy development level on the OFDI of Chinese manufacturing enterprises from two dimensions of innovation capability and institutional quality. For specific models, see equation (2), (3) and (4):

$$OFDI_{ijt} = \beta_1 + \beta_{11}DE_{jt} + \sum_{k=2}^8 \beta_{1k}Contorl_{jt} + \delta_t + \varepsilon_{ijt} \quad (2)$$

$$\text{Mediation}_{jt} = \beta_2 + \beta_{21}\text{DE}_{jt} + \sum_{k=2}^8 \beta_{2k} \text{Contorl}_{jt} + \delta_t + \mu_{jt} \quad (3)$$

$$\text{OFDI}_{ijt} = \beta_3 + \beta_{31}\text{DE}_{jt} + \beta_{32}\text{Mediation}_{jt} + \sum_{k=2}^8 \beta_{3k} \text{Contorl}_{jt} + \delta_t + \omega_{ijt} \quad (4)$$

where Mediation_{jt} represents the mediating variable and ε_{ijt} , μ_{jt} and ω_{ijt} are all randomized disturbance terms.

6.1 Innovation Capacity

According to the research of previous scholars, this paper uses the number of patent applications per capita to represent the host country's innovative capacity(Ino). The data are from the World Economic Development Indicators Database(WDI). Due to the large number of patent applications per capita, this paper deals with them logarithmically in order to obtain a reasonable and meaningful regression coefficient. The first column of model (1) in Table 4 shows the regression results of core explanatory variables(DE) and mechanism variables(Ino). It is not difficult to find that the regression results pass the test at the significance level of 1%, which proves that the development level of digital economy has a significant role in promoting the development of innovation ability. The regression results in the second column show that the level of innovation capacity of the host country plays an important mediating role. Therefore, the improvement of the innovation capacity of the host country will help the development of the national digital economy to attract Chinese manufacturing enterprises OFDI. Then, this paper tested the above intermediary effect model by using Sobel test and Bootstrap test. Thus, hypothesis 2 is verified.

6.2 Institutional Quality

Referring to the research of previous scholars, the average of six dimensions of host country's discourse, political stability, government work efficiency, government supervision quality, legal system level and corruption prevention and control are used to represent the level of host country's institutional quality. The data came from the World Governance Indicators Database(WGI), and some missing data were filled with linear interpolation to obtain complete data for regression.

By observing model (2) in Table 4, it is not difficult to find that the regression coefficients of core explanatory variable (DE) and mechanism variable(Quality) are significantly positive at the level of 1%, which proves that the better the quality of the host country's system, the stronger the ability of digital economy development to attract OFDI of China's manufacturing industry. It is further found that the p-value of Sobel test results approaches to 0 infinitely, and the confidence interval of Bootstrap test does not contain 0. In conclusion, hypothesis 3 is verified.

Table 4 Mechanism Effects Test Regression Results.

Variable	(1)		(2)	
	Ino	OFDI	Quality	OFDI
DE	3.128*** (0.0049)	0.556*** (0.009)	0.849*** (0.0008)	0.870*** (0.0090)
Ino		0.110*** (0.0007)		
Quality				0.535*** (0.0081)
Sobel		0.000 [0.0130-0.0135]		0.000 [0.0006-0.0010]
Bootstrap test		[0.0132-0.0139]		[0.0255-0.0265]
N	2 640 612	2 640 612	2 640 612	2 640 612

7 Conclusion

Taking digital economy as the positioning factor, this paper discusses the positioning choice of OFDI of Chinese manufacturing enterprises. Data on FDI of Chinese manufacturing firms from 2003 to 2022 were selected. The Logit model is used to analyze the impact of the development of the digital economy in the host country on the location of China's manufacturing industry.

The empirical study shows that: the level of development of the digital economy plays a role in the localization process of FDI. When making investment, Chinese manufacturing enterprises prefer to invest in places with a high level of digital economy development. At the same time, the mechanism tests suggest that the digital economy of the host country will expand its role in promoting FDI inflows into Chinese manufacturing firms by improving innovation capacity and institutional quality.

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