

Environmental Regulation of Host Countries and China's Foreign Direct Investment Under Different Investment Motivations — An Empirical Study Based on European Panel Data

Qihui Du¹ Xuemei Wang^{1,*} Muqi Zhou¹

¹ School of Economics & Management, Beijing Forestry University, Beijing, China

*Corresponding author. Email: bjwangxm0105@bjfu.edu.cn

ABSTRACT

Based on the sample data of 37 European countries from 2006 to 2018, this paper conducted an empirical study on the impact of environmental regulations of host countries on China's OFDI from the perspective of differentiated investment motivation. The findings were as follows: firstly, regarding the overall sample, environmental regulations of European countries had a significant inhibiting effect on China's OFDI; secondly, China had obvious natural resource-seeking motivation, market-seeking motivation and strategic asset-seeking motivation for European countries' OFDI, and the level of environmental regulation in host countries would affect the investment flow guided by different investment motivations. Specifically, China's OFDI of European countries was mainly guided by the different motivation of seeking natural resources, the vast market size of the host countries also had a significant promoting effect on China's OFDI of Europe, and the technology reserve factor of the host countries had a significant positive impact on investment.

Keywords: Environmental regulation, OFDI, Investment motivation.

1. INTRODUCTION

In recent years, China's investment in European countries has grown steadily and remained at a high level. For example, the total investment flows to Europe reached US\$10.52 billion in 2019, with a large increase of 59.6% from that in 2018, indicating that China's investment in Europe was in a phase of rapid growth. The motives for OFDI can be divided into four categories: searching for resources, searching for efficiency, searching for strategic assets and searching for markets (Buckley P J, 2009)[1]. According to the "Statistical Bulletin on China's Outward Foreign Direct Investment" released by the Chinese Ministry of Commerce in recent years, the industrial distribution of China's multinational investment enterprises to European countries is mainly concentrated in manufacturing, finance, mining and so on. As the invested host countries gradually realize the importance of sustainable economic development, increasingly stringent environmental protection policies would

be implemented successively (Sun Ran, 2019)[2]. In recent years, the EU has continued to introduce a series of linked environmental regulations and ordinances, increase the stringency and breadth of environmental legislation protection, and use economic instruments such as levying emission fees and product taxes and emissions trading to increase the investment costs of enterprises, effectively reducing the emission levels of enterprises. While China's investment flows to European countries have generally been on the rise in recent years, it is suggested to be concerned about whether the impact of the more stringent environmental regulations being updated in European countries on China's OFDI flows has also tended to increase.

In academic world, the relationship between the level of environmental regulation in the host countries and OFDI is generally represented by the "pollution paradise hypothesis" and the "pollution halo hypothesis". Therefore, many Chinese scholars have analyzed the impact of environmental

regulation on the OFDI strategies of firms from the perspective of environmental regulation of home and host countries respectively. For example, from the perspective of the home country, Yin Feixiao and Zhu Yingming (2017)[3] examined the impact of formal and informal environmental regulations on China's OFDI. A number of scholars have also studied the impact of environmental regulations on China's OFDI from the perspective of environmental regulation of the host country. For example, Yin Yuexia (2014)[4] provided suggestions for China's environmental regulation policy and treatment policy of foreign investment by analyzing the impact of differentiation in the stringency of environmental regulations of host countries on attracting foreign OFDI; Sun Ran (2019) explored the impact of environmental regulations of host countries on Chinese firms' overseas investment decisions, and provided a larger sample size for the later relevant studies on this basis; Qiu Qiang, Wang Sai and Zhang Tengxun (2018) [5] studied the impact of environmental regulations in Asia-Pacific countries on China's OFDI based on direct investment panel data from 17 countries in the Asia-Pacific region; Yu Pei and Peng Ge (2019) [6] used a traditional econometric model to analyze the mechanism of the impact of the intensity of environmental regulations in the US on the scale of China's investment.

From the existing studies in academia, there are many studies on the relationship between environmental regulations and FDI, but few studies have been conducted from the perspective of differentiated investment motives and using panel data of European countries as the basis for empirical analysis, which should be attributed to the fact that China's investment development in Europe has only started to grow rapidly in recent years and it is difficult to obtain data. The innovation of this paper is to explore the impact of environmental regulations of host country on China's OFDI by using panel data of 37 European countries and combining it with an analysis of the motivation of Chinese investment in European countries, in order to provide a reference for Chinese enterprises to invest in Europe.

2. THE CURRENT SITUATION OF CHINA'S OFDI IN EUROPE AND THE LEVEL OF ENVIRONMENTAL REGULATIONS IN EUROPEAN COUNTRIES

2.1 Current Situation of China's OFDI in European Countries

2.1.1 Investment Scale

In terms of the intercontinental layout of investment, China has been the overwhelming leader in investment in Asia, but China's OFDI flows to Europe have also grown rapidly in recent years. In 2019, China invested US\$10.52 billion in Europe, with an increase of 59.6% over the previous year, accounting for 7.7% of FDI flows in that year, and China's investment flows to Europe in previous years are shown in "Figure 1". It can be seen that China's investment in Europe began to develop rapidly after 2014 and is basically on the rise, while it is also no longer limited by the number of countries, indicating that China's investment in Europe has further opened up.

2.1.2 Location and Industry Composition

According to the "Statistical Bulletin of China's Outward Foreign Direct Investment" released by the Ministry of Commerce in 2019, within Europe, the Netherlands topped China's investment in Europe in terms of investment flow among the main countries, amounting to US\$3.893 billion, accounting for 36.4% of the total investment flow to Europe that year; Sweden ranked the second with US\$1.916 billion, with a huge increase of 80.1% over that in 2018, accounting for 17.9% of China's investment flows to Europe; while Germany ranked the third, with investment flows of US\$1.459 billion, accounting for 13.6% of total investment flows to Europe in that year. In addition, China's investment in the UK also exceeded US\$1 billion.

From the overall industrial distribution ("Figure 2"), the main industries in which Chinese companies invested in the EU in 2019 were manufacturing, followed by leasing and business services, while information transmission/software and information technology services represented by strategic asset-seeking, and scientific research and technology services ranked third and fourth in terms of China's investment flows to them.

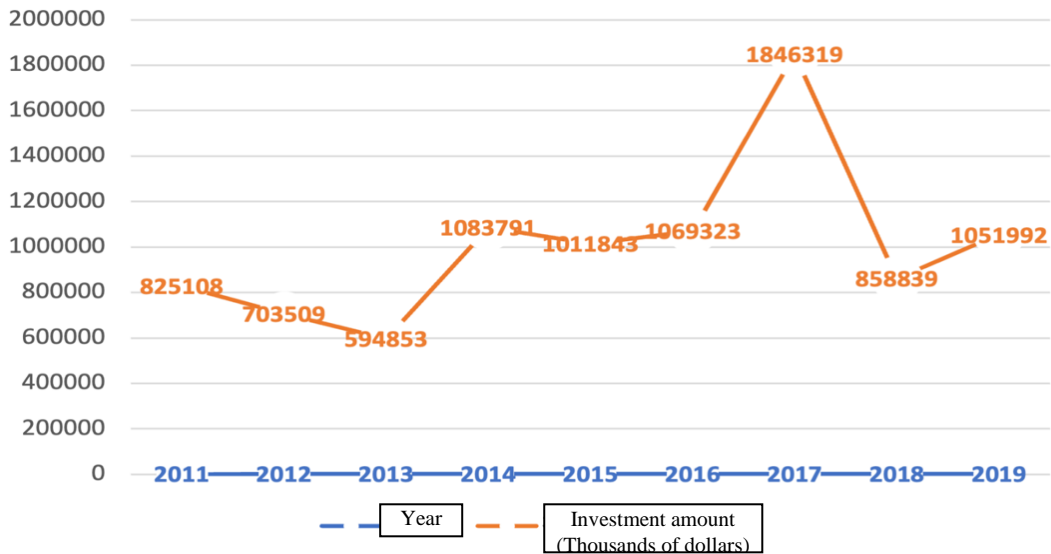


Figure 1 Changes in China's investment flows to Europe.

a Source: Statistical Bulletin of China's OFDI.

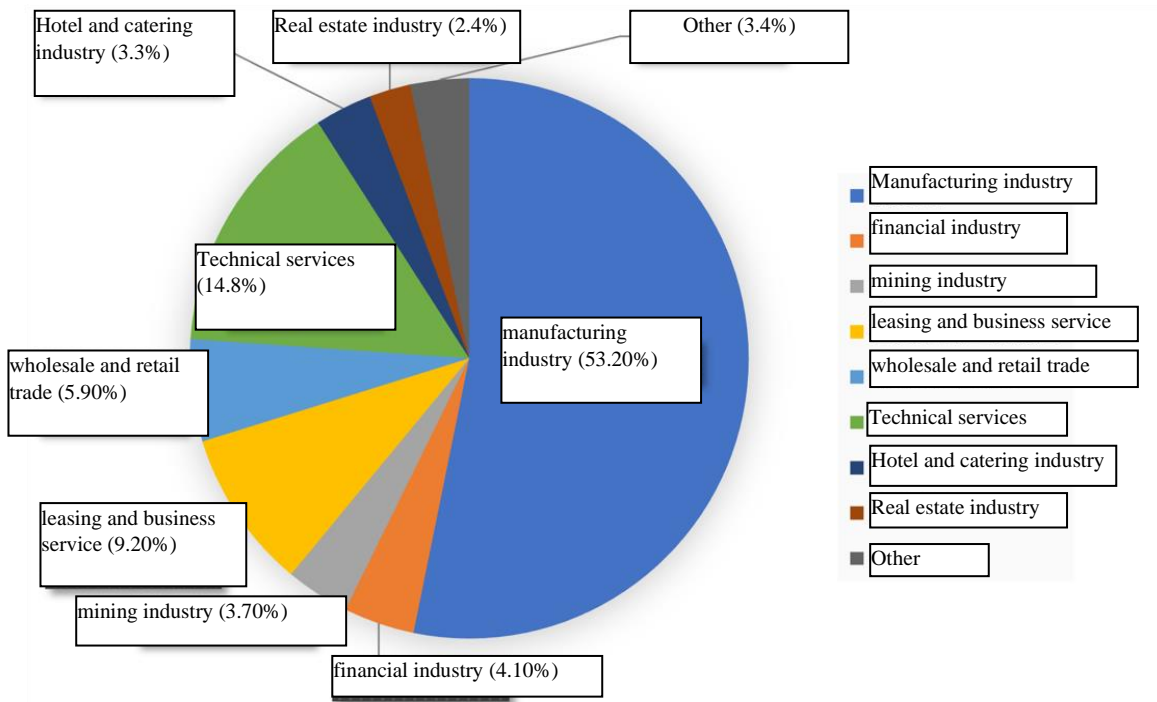


Figure 2 Industrial distribution of Chinese investment in Europe.

a Source: Statistical Bulletin of China's OFDI.

2.2 Motivations for China's Direct Investment in Europe

Since the 1960s, Western academics have categorized the investment motivations into four types, namely market-oriented investment, strategic asset-oriented investment, resource-oriented

investment and efficiency-oriented investment. This theory is summarized by John H. Dunning (1998), the famous British scholar [7]. Academics generally agree that these four investment motivations are the real driving forces of direct investment in developed countries.

Due to the low endowment of human resources and high labour costs in European countries, it is believed that China's investment in Europe is motivated by the following three factors.

2.2.1 Market-seeking Motives

Europe is a region where developed countries are concentrated and its vast market has huge consumption capacity. The developed countries, represented by France and Germany, have a much higher per capita income than that of China, so there is a clear advantage in absorbing investments oriented by foreign market-seeking motives. In order to increase their profits, Chinese companies need to use the EU's high-end market to expand their own sales channels and gain a foothold in the European market as soon as possible. Some European countries, such as Portugal, Ireland, Greece and Spain, need to develop their domestic economies by attracting foreign capital. Once Chinese companies have established production bases and set up subsidiaries in the host countries through different means of cross-border investment, as well as establishing sales channels and conquering the local market, they have accomplished the goal of using their own advantages to establish a local brand image on the European continent. These results will not only enable Chinese multinational enterprises to further expand markets and their branding in European host countries where the market is vast, but will also enable them to reduce costs and increase their profits in disguise.

2.2.2 Natural Resource-seeking Motives

Studies have shown that China's OFDI has a clear natural resource orientation. Most European countries are rich in mineral resources as well as forest resources, which is undoubtedly a great attraction for Chinese multinational investment enterprises, and the natural resource endowment is a typical locational advantage that compels enterprises to extract or process locally. Therefore, European host countries with higher natural resource endowments will attract more China's OFDI.

2.2.3 Creative (Strategic) Asset-seeking Motives

China's process of independent research and development of core technologies started late, and with relatively low investment in R&D, innovative

technologies are far from those of developed countries in EU [8]. The European countries, represented by Germany, the United Kingdom, France and Italy, are the most technologically advanced countries in the world. Most of European countries have enormous advantages in terms of technology, management, protection of property rights, human resources and financial resources. At the same time, they have the world's leading companies and the most advanced technologies in various fields, can establish research and development centres to attract countries to invest in these countries and regions, and acquire advanced technologies in the relevant fields. In recent years, China has increased investment in the EU and has cooperated in setting up research and development centres, signing relevant favourable agreements and acquiring host countries' companies for technological adaptation and upgrading.

2.3 The Current Level of Environmental Regulation in European Countries

Environmental regulations in the EU are mainly in the form of regulations. The environmental regulation followed by the EU mainly consists of basic treaties and agreements, laws and regulations of EU (including regulations, directives and resolutions), and also international environmental treaties which are signed or partly signed by the EU, as well as other relevant laws and regulations and legal documents [3]. In addition, there is another important component of EU environmental regulation system — the environmental regulations developed by the EU institutions, which is mainly in the form of regulations, decisions and instructions. However, in terms of effective constraint, they are less binding on the member states than the EU basic treaties. In addition, non-legislative EU environmental policy documents, such as environmental standards, opinions, recommendations, statements, actions or plans, are also an important part of the EU environmental legislation. In recent years, the EU has issued a series of laws and regulations to regulate the environment and increase its efforts to protect the environment.

This paper selects the EPI index (the Environmental Performance Index) to measure the intensity of environmental performance of European countries. Using the EPI index to measure the level of environmental regulation in European countries has the following advantages. Firstly, as the EPI is an index published by a US

university, its results include a large number of European countries, which will reduce the resistance of the later empirical regressions due to incomplete data. Secondly, the EPI index is comprehensive in that it not only includes measures of various environmental conditions in different countries, but also has significant time variability in its measurement, which makes the final EPI results transparent, valid and high-quality. Finally, as European countries are developed countries, their strong level of environmental regulation also means better environmental performance. The EPI index, as a measure of environmental performance for a large number of European countries, will provide a comprehensive and objective representation of the level of environmental regulation in the European countries studied in this paper.

3. AN EMPIRICAL ANALYSIS ON THE IMPACT OF HOST COUNTRY'S ENVIRONMENTAL REGULATIONS ON CHINA'S OFDI — BASED ON A DIFFERENTIATED INVESTMENT MOTIVATION PERSPECTIVE

3.1 Selection of Research Variables and Empirical Model Setting

3.1.1 Variable Setting and Measurement

Variable settings in this paper were referenced from Blonigen (2001)[9], Buckley (2002)[10], Qiu Qiang (2018), and Wu Jianzu, Zheng Qixia (2020)[11].

3.1.1.1 Variable Being Explained: Outward Foreign Direct Investment (OFDI)

In this paper, OFDI flows that better reflect the annual OFDI flows to each host country were selected to measure China's investment in European countries, and OFDI flows were logarithmic.

3.1.1.2 Explanatory Variable: Environmental Regulation of Host Country (ER)

This paper used the Environmental Performance Index (EPI) to measure the level of environmental regulation in the host country, which is a comprehensive and uniform measure that facilitates comparison across countries.

3.1.1.3 Moderating Variables

- Market size of the host country (MSIZE)

In this paper, the total annual GDP of the host country was used to measure the size of the market held by the host country and was processed as a natural logarithm.

- Natural resource endowment of the host country (NRE)

In order to provide a more comprehensive picture of the attractiveness of the natural resource endowment of European countries to Chinese investment enterprises, this paper used the percentage of total natural resource rent of the host country to the host country's annual GDP to measure the natural resource endowment, the higher values, the richer in natural resource reserves of host countries.

- Technology reserve of the host country (NTECH)

Using technology reserve as a variable representing strategic asset-seeking dynamics, this paper used resident patent applications to measure the amount of technology reserve in the host country and took the natural logarithm.

3.1.1.4 Control Variables

To improve the accuracy of the model estimation results and to better explain the impact of environmental regulations on China's outbound investment, and to draw on previous relevant studies, the following control variables were selected from the linkages or differences between the host country and the home country:

- (1) Distance between two sides (DIST) referred to the spherical geographical distance between China and the host country.
- (2) The trade level of Host country (TRADE) was measured by total exports and imports of the host country.
- (3) The level of infrastructure in the host country (INFRA) was expressed as the logarithm of the total railway kilometres per 10,000 people in the host country.
- (4) Institutional quality level of the host country (INSQ): the World Bank Global Governance Index was used to measure the level of government's governance in the host country by taking a weighted average of the six indicators counted in the index.

3.1.1.5 Sample Selection and Data Sources

The list of European countries studied in this paper was based on the European countries included in the annual investment statistics bulletin published by the Ministry of Commerce and the Environmental Performance Index measure (37 countries and territories in total). Since the year of

publication of the Environmental Performance Index was 2006 and the prominence of China's investment in Europe was after 2003, the data during the period 2006-2018 was selected. The specific data sources for all variables are detailed in "Table 1".

Table 1. Variables

Types	Name	Abbreviation	Description	Data sources
Variable being explained	Outward foreign direct investment	OFDI	outward foreign direct investment flows	Statistical Bulletin of China's OFDI of China's Ministry of Commerce
Explanatory variable	Environmental regulation	ER	Environmental Performance Index score	Environmental Performance Index database jointly published by Yale University and Columbia University
Moderating variables	Market size of host country	MSIZE	Total GDP of the host country	World Bank WDI database
	Natural resource endowment of host country	NRE	Total rental of natural resources of the host country	World Bank WDI database
Control variable	Technology reserve of host country	NTECH	Number of patent applications by local residents in the host country	World Bank WDI database
	Geographical distance	DIST	Spherical geographic distance between the host country and China	CEPII Database
	Level of Infrastructure	INFRA	Total rail kilometres per 10,000 people	World Bank WDI database
	Trade openness	TRADE	Total exports and imports of the host country	World Bank WDI database
	Institutional quality	INSQ	weighted average of indicators, such as World Bank Global Governance Index, control of corruption, government efficiency, government stability and anti-violence, quality of governance, legal rules, freedom of expression and government accountability.	World Bank WGI database

3.1.2 Empirical Model Setting

The following regression model was set up in this paper to investigate the impact of

$$\ln OFDI_{i,t} = \beta_0 + \beta_1 \ln MSIZE_{i,t} + \beta_2 NRE_{i,t} + \beta_3 \ln NTECH_{i,t} + \beta_4 ER_{i,t} + \sum \theta_n C_{ni,t} + \lambda_t + \varepsilon_{i,t}$$

In the formula, *i* represented the host country, *t* showed the year, β_0 was the constant term and $\varepsilon_{i,t}$ was the residual term. $\ln OFDI_{i,t}$ was the logarithm of China's OFDI flows to host country *i* in period *t*; $ER_{i,t}$ represented the level of environmental regulation in host country *i* in period *t*, i.e. the EPI score of the host country in that year; and $\ln MSIZE_{i,t}$ was the logarithm of the total GDP of host country *i* in period *t*, representing the size of the host country's market; $NRE_{i,t}$ represented the natural resource endowment of host country *i* in period *t*; $\ln NTECH_{i,t}$ represented the technology reserve of host country *i* in period *t*, i.e.

environmental regulations of host country on China's OFDI inflows from the perspective of differentiated investment motives:

the logarithm of resident patent applications. Control referred to the model control variable, including geographical distance (DIST) and level of trade (TRADE), as well as level of infrastructure (INFRA) and institutional quality (INSQ).

3.2 *An Empirical Test of the Impact of Host Country's Environmental Regulations on China's OFDI from the Perspective of Differentiated Investment Motives*

3.2.1 *Statistical Analysis of Relevant Variables*

Regression model 1 included the explanatory variable ER and four control variables. According to the regression results, it was found that environmental regulation of the host country had a significant negative impact on China's OFDI, and this results were obtained without considering the three moderating variables such as technology level, market size and natural resource endowment of the host country. The data showed that whenever the level of environmental regulation in the host country increased, i.e. the EPI score increased, the OFDI attracted by the host country tended to decrease; at the same time, the higher the level of infrastructure, the level of trade and the level of institutional management in the host country, the more significant the positive contribution of the three control variables to China's OFDI; while the regression results showed that the control variable of geographical distance between the host country and the home country had no significant effect on OFDI inflows of the host country.

Model 2 was regressed again with the addition of three moderating variables to test the main effects observed in this paper. According to the regression results, after adding moderating variables, the impact of the level of environmental regulation of the host country on the inflow of OFDI increased significantly, and was still negatively correlated; at the same time, observing the impact of the three moderating variables added according to the investment motivation theory on OFDI, it was found that the natural resource endowment of the host country would significantly promote the inflow of OFDI in China ($\beta = 12.88$, $P < 0.05$), indicating that China had a strong motivation to seek natural resources for European OFDI; in addition, the market size of the host country was also significantly positively correlated with China's OFDI ($\beta = 1.87$, $P < 0.01$), indicating that China's OFDI had strong market-seeking motivation; in terms of technology reserves of the host country, the regression results showed that the higher the technology endowment of the host country, the greater the inflow of OFDI in China.

In terms of the control variables, the data showed that although the significance of the moderating variables on the effect of the explanatory variable OFDI decreased, it still followed the same pattern, i.e. the higher the trade openness and the higher the level of infrastructure of the host country, the more OFDI of the home country attracted, however, after the inclusion of moderating variables, the overall system of the host country had been explained in a more comprehensive way, and the institutional quality level of the control variables had no significant impact on OFDI.

3.2.2 *Analysis on the Empirical Results Based on the Perspective of Investment Motives*

From the above regression results, it could be seen that China's direct investment in European countries had been subject to environmental regulatory constraints, but did not stagnated. Under differentiated motivation, the influence of environmental regulation constraint was different.

The regression model 2 added the moderating variable of natural resource endowment. Natural resources in host countries have been one of the important drivers of OFDI, but stronger environmental regulations in host countries will indirectly raise firms' production costs. Therefore, after adding natural resources endowment in regression, the negative impact of environmental regulation as an explanatory variable on China's OFDI increased significantly; in the host country with high level of environmental regulation, the attraction of natural resource endowment to OFDI would be weakened, indicating that the decision-making process of natural resource-seeking investment enterprises was more consistent with the "pollution shelter" effect, which was consistent with the expectation.

According to the "pollution halo hypothesis", it was believed that the level of environmental regulation in the host country positively contributed to the relationship between market size and OFDI in the host country. However, the impact of market-seeking motivation-oriented investment was smaller than that of natural resource-seeking motivation, and the correlation between market size and environmental regulations in host countries was much smaller than that between natural resources and market size; at the same time, the regression results showed that for the explanatory variable OFDI, the influence coefficient of natural resource

endowment was significantly larger than that of the market size variable.

In addition, according to the regression results, it was found that China's direct investment in Europe was also significantly and positively influenced by the amount of technology reserve in European host countries, which was also in line with the previous expected results. Since the technology in European countries is more mature and advanced in many aspects, Chinese enterprises are bound to enter and invest in host countries with highly sophisticated technology to obtain the support of advanced technology, so that they can respond comfortably to changes in domestic and international markets.

3.2.3 Robustness Test

To verify the robustness of the benchmark regression, the corresponding robustness tests were done in this paper.

First, a robustness test with the winsorization was done. The results were similar to those of the benchmark regressions after doing winsorization on the largest and smallest 1% samples. That is, the level of environmental regulations in the host country had a significant negative impact on the level of China's OFDI; at the same time, the relationship between the three moderating variables of host country, such as market size, natural resource endowment and technological reserves, and the logarithm of China's OFDI still significantly and positively moderated China's outbound investment flows; similarly, the two control variables of trade openness and infrastructure level both significantly affected China's OFDI. The higher the trade openness and infrastructure level of the host country, the higher China's OFDI.

Second, considering the impact of the financial crisis in 2008 and 2009 on China's outward investment, a dummy variable representing the year of the financial crisis was added. After adding this dummy variable, only market size and natural resource endowment of host country had a significant impact on the logarithm of China's OFDI, and in the year of the financial crisis, China's OFDI could be significantly reduced, indicating that the financial crisis would cause a certain impact on outward investment.

Third, the German, UK and French samples were removed to examine whether the regression results were driven by the major European

economies. The regression results were similar to those of the benchmark group, indicating that the regression results were not driven by the major economies.

Fourth, the logarithm of GDP was replaced by the logarithm of GDP per capita, and the results were similar to the original regression.

4. RESEARCH FINDINGS AND ENLIGHTENMENT

4.1 Research Findings

Using sample data of 37 European countries from 2006-2018, this paper presented an empirical analysis of how the intensity of environmental regulation in European countries affects China's OFDI from the perspective of differentiated investment motives. The empirical results showed that: firstly, environmental regulation of European countries had a significant inhibiting effect on China's OFDI; secondly, the level of environmental regulation in host countries had different effects on investment flows guided by different investment motives. China's OFDI mainly had significant natural resource-seeking motivation. The huge market scale and market seeking-motivation also had a significant positive impact on China's OFDI to Europe. At the same time, the technology reserve factor of the European host country also positively stimulated the inflow of China's OFDI to a certain extent, but its return coefficient was small, which should be due to the increase of China's technology level year by year, and at the same time, the host country had a strong tendency to protect its own technology, which would also make it difficult to obtain foreign investment. Among the three motivations, due to the strong correlation between natural resource-seeking motivation and environmental regulation, and the weak correlation between the remaining two motivations, subsidiary conclusions were obtained: China's direct investment in Europe was oriented by natural resources, and increasing the amount of investment in this motivation category would also enhance the level of environmental regulation in European host countries. The impact of the control variables in the traditional gravity model, such as the trade openness of the host country, the level of infrastructure and the level of government regulation, on China's OFDI was consistent with findings in the other literature.

4.2 Enlightenment

4.2.1 National Level

Firstly, China should pay more attention to strengthening its relations with host countries and establishing enhanced strategic relationships with them, such as the establishment of technology cooperation parks between Chinese enterprises and European countries, so as to promote Chinese investment relations with European countries, and even more host countries, and to achieve the ultimate goal of mutual benefit and win-win situation for both sides. Secondly, China needs to strengthen its OFDI information platform. Therefore, the relevant authorities should strengthen their analysis and understanding of European countries in order to provide valid and reliable information to enterprises, optimize the quality of their outbound investments and enable them to make optimal decisions. In addition, China should aim to optimize and improve the main business structures of enterprises to support their internationalization and the extension of the production supply chain to both ends.

4.2.2 Enterprise Level

According to the findings of this paper, it could be seen that the strict environmental regulations in European countries, mainly including developed countries, had a significant inhibiting effect on China's OFDI inflows, but at the same time, driven by different motivations, China's OFDI had an enhanced inflow trend to European countries. The technology gap between China and developed countries is the main reason. Therefore, by improving the level of emission reduction technology can it fundamentally reduce the inhibiting effect of environmental regulations in developed host countries on the inflow of China's OFDI. As competition in international markets becomes increasingly fierce, Chinese exporters should strive to stop pollutant discharge to the environment in terms of production, distribution, transportation, recycling and waste, expand the development of domestic technology, and acquire valuable research and development results in environmental cleanliness in developed countries through outward investment, thereby enhancing domestic technological autonomy and facilitating Chinese multinational investment enterprises to digest and update their own environmental technologies and achieve technological progress.

Chinese enterprises must be fully aware of the efforts they will make in promoting the green transformation of their products and ideas in the future, and also realize that they must have a "green pass" in the international market. This requires objective and scientific investment analysis by investment companies, such as tracking investment motives to decide where to invest, taking into account the scale of the company's investment and enhancing the quality of the investment.

5. CONCLUSION

Using the panel data of 37 European countries, this paper made an in-depth analysis of the impact of environmental regulations in host countries on China's OFDI in the context of Chinese investment motives in Europe. It is found that China's OFDI in European countries is mainly oriented towards natural resource-seeking motives, while the market size and technological reserves of host countries also contribute to China's OFDI in Europe significantly, thus providing a reference for China's investment in Europe. As China's investment in Europe has only started to grow rapidly in recent years and the length of data is limited, the broad applicability of the empirical results in this paper needs to be further verified.

AUTHORS' CONTRIBUTIONS

Qihui Du is responsible for the experimental design, data analysis and writing of this paper; Xuemei Wang is responsible for thesis writing guidance and thesis revision; Muqi Zhou is responsible for thesis revision and editing.

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