# Research on the Impact of Host Country Institutional Environment on the Efficiency of China's Foreign Direct Investment——Based on empirical data from EU countries

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*Abstract:* New institutional economics incorporates institutions into the scope of economic research, believing that institutional factors that have been overlooked in the study of economic growth factors may also play a decisive role. With the continuous acceleration of economic globalization, economic and trade exchanges between countries are becoming increasingly frequent. The vigorous development of information technology and transportation industry has gradually weakened the position of traditional geographical distance and other influencing factors in bilateral investment. The importance of non-traditional factors such as the institutional environment of the host country in bilateral investment is becoming increasingly prominent. The EU is an important destination for China's outward direct investment. This article takes the institutional environment of EU countries as the starting point and conducts empirical analysis based on the World Bank Worldwide Governance Indicators to analyze the impact of host country institutional factors on the efficiency of China's direct investment.

*Keywords:* Efficiency of Outward Direct Investment; Stochastic Frontier Gravity Model; Institutional Environment of the Host Country

## 1. Introduction

The European Union, as a representative of the developed country group, is one of China's important trade and investment partners. However, the increase in China's direct investment flow to the European Union has been facing stagnation since 2015. It is necessary to conduct in-depth research on why China's increase in direct investment in the EU has stagnated and what factors are influencing it. New institutional economics believes that the institutional environment is an important influencing factor for enterprises' cross-border operations. During the OFDI process, Chinese enterprises also experience forced suspension of investment projects and significant losses due to political and legal reasons in the host country. In recent years, scholars have conducted valuable research on the efficiency of OFDI in China. There is also an endless stream of research on the impact of institutional quality on China's outward direct investment. For example, Peng (2008) pointed out that Chinese enterprises should quickly familiarize themselves with and adapt to the institutional environment of the host country when making overseas investments, fully understand and grasp the political system, economic market, and legal regulations of the host country. Holburn and Zelner (2010) argue that when companies make cross-border investments, they are not only constrained by market mechanisms, but also more susceptible to the macroeconomic regulation of the market by the host country government. Appropriate government macro-control can maintain market order and promote the clearance of market commodities when "market failure" occurs. However, excessive macroeconomic regulation by the government can seriously hinder the market mechanism from unleashing its advantages and potential, leading to increased transaction costs, resource mismatch, and low utilization efficiency for enterprises, hindering the improvement of investment efficiency for enterprises. Buckley et al. (2009) argue that Chinese multinational corporations are mostly state-owned enterprises, with a clear national policy orientation and are not committed to pursuing profit maximization. Kolstad and Wiig (2012) found through

their study of China's outward direct investment that when Chinese multinational enterprises make overseas investments, institutional deficiencies in the host country do not become a hindrance to Chinese enterprises' investment, but rather a favorable factor for enterprises to seek benefits. EU countries are at various stages of economic development and have significant differences in institutional quality, so how does the institutional quality of EU countries affect China's OFDI efficiency?

Based on this, this article intends to conduct empirical research on the influencing factors of China's investment efficiency in EU countries from the perspective of institutional quality in the host country. This will help clarify the current situation of China's direct investment in EU countries and explore the prospects for future development. It is of great practical significance for promoting the development of direct investment between China and EU countries and promoting regional economic cooperation along the "the Belt and Road".

## 2. Variable Selection and Empirical Analysis

## 2.1 Variable selection

### 2.1.1 Analysis of EU institutional environment data

The research focus of this article is on the impact of the institutional environment of the European Union on the efficiency of China's direct investment, and the data source is the Worldwide Governance Indicators of the World Bank. The Worldwide Governance Indicators refers to the effectiveness of government governance, mainly reflected in six aspects: greater public discourse and stronger government accountability, higher political stability and less social violence, higher government efficiency, higher regulatory quality, more complete rule of law, and less corruption. Figure 1 shows the changes in the annual averages of six variables in the 25 EU countries. Overall, from 2005 to 2020, the EU's institutional environment deteriorated.
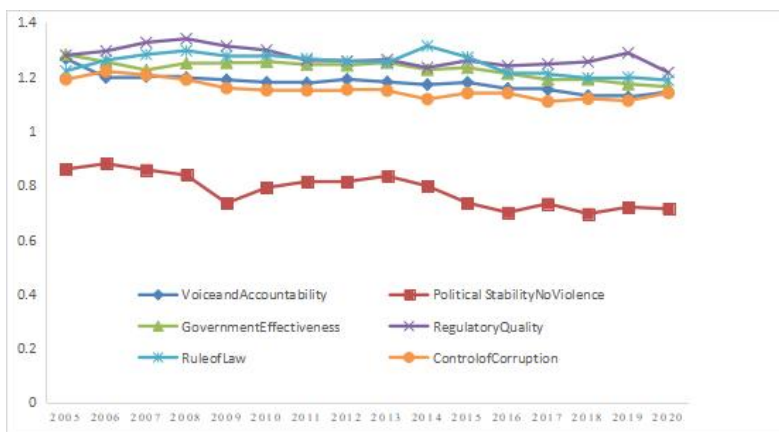


Figure 1. Changes in the overall institutional level of the European Union from 2005 to 2020

Source: Compiled by the author based on The Worldwide Governance Indicators (WGI)

### 2.1.2 Variable selection

According to the suggestion of Armstrong (2007), when applying the stochastic frontier Gravity model, Frontier determinants only introduce core factor variables that will not change in the short and medium term (such as geographical distance, economic scale, border, language, religion, etc.), while the man-made resistances, mainly policy variables (such as trade agreements, institutions, etc.), are included in the non-efficiency model. The research focus of this article is on the institutional environment of the host country, so the man-made determinants data is selected as the Worldwide Governance Indicators. As shown in Table 1 below, the institutional environment of the European Union has deteriorated from 2005 to 2020. Specifically, the indicators in Table 1 were selected.

Table 1. Variable Selection

| variable | variable name | Description | Expected sign | Data Sources |
|---|---|---|---|---|
| Dependent variable | OFDI | China's direct investment stock in EU (10000 US dollars) | | China Business Yearbook |

| | | | | |
|---|---|---|---|---|
| | GDP | The host countries' GDP (constant 2015 US dollars) | + | World Bank |
| Frontier determinants | GDPC | China's GDP (constant 2015 US dollars) | + | World Bank |
| | DIST | The bilateral distance between the two capitals | - | CEPII |
| | GDPDR | GDP growth rate | + | World Bank |
| | INFLATION | Inflation, consumer prices (annual %) | - | World Bank |
| Inefficiency determinants | PV | The Political Stability and Absence of Violence of country j, ranging from −2.5 to 2.5 | - | World Bank |
| | RL | The Rule of Law of country j, ranging from −2.5 to 2.5 | - | |
| | RQ | The Regulatory Quality of country j, ranging from −2.5 to 2.5 | - | |
| | VA | The Voice and Accountability of country j, ranging from −2.5 to 2.5 | - | |
| | GE | The Government Effectiveness of country j, ranging from −2.5 to 2.5 | - | |
| | CC | The Control of Corruption of country j, ranging from −2.5 to 2.5 | - | |

## 2.2 Formulation of models

Based on the traditional Gravity model, a stochastic frontier investment Gravity model is constructed to measure the efficiency of China's direct investment in the EU. The basic model is as follows:

$$FDI_{ijt} = f(x_{ijt}, \beta) \exp(v_{ijt}) \exp(-\mu_{ijt}), \mu_{ijt} \geq 0 \quad (1)$$

$$FDI^*_{ijt} = f(x_{ijt}, \beta) \exp(v_{ijt}) \quad (2)$$

$$TE_{ijt} = \frac{FDI_{ijt}}{FDI^*_{ijt}} = \exp(-\mu_{ijt}) \quad (3)$$

$$\mu_{ijt} = \{\exp[-\eta(t-T)]\}\mu_{ij} \quad (4)$$

In formula (1) to (3), $x_{ijt}$ is the core natural factor that affects the direct investment in the Gravity model in the short term. $FDI_{ijt}$ and $FDI^*_{ijt}$ represent the total actual direct investment and the potential value of direct investment from country i to country j in the t period respectively, and $TE_{ijt}$ represents the investment efficiency in the t period. $V_{ijt}$ is a random Error term and obeys normal distribution. $\mu_{ijt}$ follows the truncated normal distribution, which reflects the interference of policy factors on direct investment. It is called investment non efficiency, $cov(v_{ijt}, \mu_{ijt}) = 0$.

In equation (4), $\eta$ represents the time-varying parameters to be estimated, reflecting the trend of changes in direct investment efficiency. $\eta > 0$、 $\eta = 0$、 $\eta < 0$ represents the non-efficiency factors of direct investment that decrease, remain unchanged, and increase over time, corresponding to the increase, remain unchanged, and decrease in direct investment efficiency.

Take the logarithms on both sides of equation (1) to obtain:

$$\ln OFDI_{ijt} = \ln f(x_{ijt} + \varepsilon_{ijt}) + v_{ijt} - \mu_{ijt}, \mu_{ijt} \geq 0 \quad (5)$$

Based on the above influencing factors, a stochastic frontier investment Gravity model is constructed to measure the efficiency of China's direct investment in EU countries. Using the panel data of China's investment in EU from 2005 to 2020, the model is as follows:

$$\ln OFDI_{ijt} = \beta_0 + \beta_1 \ln GDP_{ijt} + \beta_2 \ln GDPC_{ijt} + \beta_3 \ln DIST_{ijt} + \beta_4 GDPGR_{ijt} + \beta_5 INFLATION_{ijt} + v_{ijt} - u_{ijt} \quad (6)$$

In addition, in order to analyze the reasons for the low efficiency of China's direct investment in the EU, the investment inefficiency model is set as follows:

$$\mu_{ijt} = \delta_0 + \delta_1 PV_{ijt} + \delta_2 CC_{ijt} + \delta_3 RL_{ijt} + \delta_4 RQ_{ijt} + \delta_5 VA_{ijt} + \delta_6 GE_{ijt} + \varepsilon_{ijt} \quad (7)$$

Among them, $\varepsilon_{ijt}$ represents random Error term, i represents the country studied, and t represents the years 2005~2020.

## 2.3 Empirical Result Analysis

## 2.3.1 Model applicability test

Firstly, confirm whether China's direct investment in the EU is inefficient. If the value of $\gamma$ is close to zero, it means that random shocks from external sources are the main reason for low investment efficiency. If the value of $\gamma$ is close to 1, it indicates that policy impact is the main factor causing low investment efficiency.

$$\gamma = \frac{\sigma_\mu^2}{\sigma_v^2 + \sigma_\mu^2} \quad (8)$$

Secondly, examine whether the inefficiency of China's outward direct investment has changed over time. The results indicate that both can reject the original hypothesis. This indicates that China's direct investment in EU countries has an investment inefficiency term, which is suitable for the stochastic frontier method, and the investment inefficiency term has temporal variability. Therefore, it is appropriate to use the stochastic frontier investment gravity model built in this paper to measure the investment efficiency and analyze the influencing factors.

Table 2. Model Applicability Test Results

| Null Hypothesis | Constrained Model Log Likelihood Value ln(H0) | Unconstrained model log likelihood value ln(H1) | LR | df | $\chi^2_{1-0.05}(k)$ | conclusion |
|---|---|---|---|---|---|---|
| no non-efficiency term | -790.318 | -644.720 | 291.195 | 3 | 7.05 | reject |
| non-efficiency terms remain unchanged | -653.562 | -644.720 | 17.685 | 2 | 5.14 | reject |

Note:LR=-2x[lnL(H0)-lnL(H1)].

## 2.3.2 Estimation of stochastic frontier investment Gravity model

The results in Table 2 show that it is appropriate to select the stochastic frontier investment Gravity model to study the potential and efficiency of China's direct investment in EU countries. Then the panel data of China's direct investment in the EU from 2005 to 2020 was imported into Frontier4.1, and the estimation results of equation (6) were shown in Table 3 through the method proposed by Battese and Coelli (1992).

Table 3. Stochastic frontier model coefficient estimation results

| variable | Coef. | Std. Err. | t | variable | Coef. | Std. Err. | t |
|---|---|---|---|---|---|---|---|
| β0 | -157.677*** | 1.010 | -156.061 | INFLATION | 0.061 | 0.036 | 1.673 |
| lnGDPC | 5.833*** | 0.369 | 15.825 | $\sigma^2$ | 5.688*** | 0.808 | 7.041 |
| lnGDP | 0.738*** | 0.158 | 4.664 | $\gamma$ | 0.800*** | 0.026 | 30.465 |
| GDPGR | -0.003 | 0.016 | -0.158 | $\mu$ | 4.265*** | 0.706 | 6.038 |
| lnDIST | -2.516* | 1.430 | -1.759 | $\eta$ | -0.033*** | 0.008 | -3.972 |

Note: ***, **, *, respectively, at the level of 1%, 5%, 10% significantly.

The regression results of the model show: (1) The $\gamma$ value is 0.8, which is significant at the level of 1%, indicating that there is a difference between China's actual direct investment and the potential optimal value of direct investment in the EU. This difference is attributed to the non-efficiency term rather than the random Error term of the model. The $\eta$ value is not 0, which is significant at the 1% level, indicating that non efficiency terms have time-varying effects. and $\eta$ are less than 0, indicating that China's direct investment resistance to EU countries increases over time, and the direct investment environment deteriorates.

(2) Both lnGDPC and lnGDP variables have significant significance at the 1% level, with positive coefficients, consistent with the expected sign, indicating that the improvement in economic development levels of both sides has a positive impact on China's direct investment in the European Union. For every 1% increase in China's GDP, China's direct efficiency with EU countries increases by 5.833%.

(3) The coefficient of bilateral distance lnDIST is consistent with expectations but only significant at the 10% significance level, indicating that to some extent, China's outward direct investment still leans towards closer host countries.

(4) The coefficients of economic growth rate GDPGR and inflation rate INFLATION is inconsistent with expectations and not significant.

## 2.3.3 Estimation of investment inefficiency model

By substituting (7) into (6) and using Frontier4.1 software for analysis, the impact of the institutional environment on the efficiency of China's direct investment in EU countries can be obtained. Since there is a serious multicollinearity among VA, GE, RQ, RL and CC, five models are analyzed for regression.

Table 4. Non-efficiency model estimation results

| | variable | model (1) | | model (2) | | model (3) | | model (4) | | model (5) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coef. | Std. Err. (t) | Coef. | Std. Err. (t) | Coef. | Std. Err. (t) | Coef. | Std. Err. (t) | Coef. | Std. Err. (t) |
| **Stochastic frontier model** | β0 | -163.093 | 16.543(-9.859) | -167.397 | 7.872(-21.264) | -170.238 | 22.992(-7.404) | -166.811 | 8.811(-18.932) | -170.926 | 10.317(-16.568) |
| | **lnGDPC** | 4.598 | 0.249(18.49) | 4.514 | 0.252(17.944) | 4.484 | 0.239(18.745) | 4.484 | 0.252(17.816) | 4.516 | 0.254(17.804) |
| | **lnGDP** | 0.966 | 0.065(14.747) | 1.028 | 0.064(16.052) | 0.94 | 0.062(15.053) | 1.007 | 0.064(15.777) | 0.945 | 0.067(14.196) |
| | **GDPGR** | 0.023 | 0.022(1.074) | 0.019 | 0.022(0.864) | 0.013 | 0.021(0.626) | 0.02 | 0.021(0.949) | 0.021 | 0.022(0.958) |
| | **lnDIST** | 1.937 | 0.831(2.33) | 2.197 | 0.861(2.552) | 3.193 | 0.834(3.827) | 2.146 | 0.852(2.519) | 2.424 | 0.705(3.437) |
| | **INFLATION** | 0.076 | 0.05(1.511) | 0.065 | 0.051(1.257) | 0.048 | 0.049(0.98) | 0.058 | 0.053(1.095) | 0.076 | 0.051(1.485) |
| **Non-efficiency model** | δ0 | 9.898 | 12.449(0.795) | 5.954* | 3.292(1.809) | 9.697 | 19.977(0.485) | 4.7** | 2.255(2.084) | 2.249*** | 0.326(6.889) |
| | **PV** | -0.455 | 0.304(-1.497) | -0.804*** | 0.295(-2.725) | -0.413 | 0.273(-1.511) | -0.665** | 0.295(-2.249) | -0.494 | 0.297(-1.663) |
| | **VA** | -1.706*** | 0.414(-4.118) | | | | | | | | |
| | **GE** | | | -0.553*** | 0.22(-2.52) | | | | | | |
| | **RQ** | | | | | -1.496*** | 0.261(-5.74) | | | | |

| | M1a | M1b | M2a | M2b | M3a | M3b | M4a | M4b | M5a | M5b |
|---|---|---|---|---|---|---|---|---|---|---|
| **RL** | | | | | | | -0.685*** | 0.209(-3.282) | | |
| **CC** | | | | | | | | | -0.704*** | 0.156(-4.501) |
| **Mean VIF** | 1.46 | | 1.39 | | 1.36 | | 1.39 | | 1.41 | |
| $\sigma^2$ | 2.749 | 0.193(14.23) | 2.818 | 0.197(14.292) | 2.646 | 0.185(14.335) | 2.789 | 0.198(14.119) | 2.7 | 0.186(14.517) |
| $\gamma$ | 0.853 | 1.349(0.632) | 0.152 | 0.068(2.242) | 0.796 | 2.154(0.369) | 0.000 | 0.062(0.000) | 0.000 | 0.002(0.167) |
| Log-likelihood | -769.835 | | -774.815 | | -762.145 | | -772.686 | | -767.460 | |
| LR test of the one-sided error | 40.964 | | 31.005 | | 56.346 | | 35.264 | | 45.715 | |

Note: ***, **, *, respectively, at the level of 1%, 5%, 10% significantly.

The results of Table 4 indicate that (1) The coefficient of the democratic freedom VA is negative and significant, consistent with expectations. This shows that the level of people's democratic political freedom in EU countries has a positive impact on the efficiency of Chinese enterprises' direct investment.

(2) The coefficient of government stability PV is negative and significant in Model 2 and Model 4. PV captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means. The improvement of political stability in EU countries will lead to an increase in investment efficiency, which has a positive impact on China's investment efficiency.

(3) The coefficient of government efficiency GE is negative and significant, consistent with expectations. GE captures perceptions of the quality of public services, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The higher the level of government efficiency, the higher the efficiency of direct investment by Chinese enterprises.

(4) The coefficient of regulatory quality RQ is negative and significant, consistent with expectations. The improvement of regulatory levels in EU countries has a positive impact on the direct efficiency of Chinese enterprises. Market regulation is an effective means of regulating the market, and a sound regulatory level in the host country can promote Chinese enterprises to make direct investments, thereby having a positive impact on investment efficiency.

(5) The coefficient of the legal system coefficient RL is negative and significant, consistent with expectations. The sounder and more standardized the legal system of the host country, the more protective it can be for direct investment from Chinese enterprises. Conversely, if the legal system of the host country is looser and less sound, there is greater uncertainty, and multinational enterprises will face higher risks. Chinese companies are more inclined to choose EU countries with sound legal systems for investment.

(6) The coefficient of the corruption control index CC is negative and significant, consistent with expectations. The efforts of EU countries to curb corruption have a positive promoting effect on China's investment efficiency.

# 3. Conclusion

In recent years, China has vigorously promoted its "going global" strategy and achieved record high levels of foreign direct investment, which is one of the important ways for China to transform its overseas oriented economic growth model. Through outward direct investment, China can fully utilize the abundant energy, brand resources, and technology patents brought about by globalization. For different investment destinations, the determinants of China's direct investment are also different, so this paper selects China's direct investment in the EU as the research focus and constructs a stochastic frontier Gravity model to analyze from the perspective of the institutional environment of the host country. The results indicate that the six non efficiency variables that this article focuses on are positively correlated with China's direct investment efficiency in EU countries, including democratic freedom, corruption management level, government stability level, completeness of laws and regulations, government efficiency level, and regulatory level.

This indicates that the better the institutional environment of EU countries, the higher the efficiency of China's direct investment. In addition, from 2005 to 2020, the efficiency of China's direct investment in EU countries has shown a downward trend. From the previous analysis, it can be seen that this is mainly caused by the deterioration of the EU institutional environment. In addition, in order to confirm the persuasiveness of the conclusions of this article, it is necessary to conduct research on Chinese corporate strategy at the micro level. From a micro perspective, it is worth exploring how the institutional quality of the host country affects Chinese companies' decisions to make direct investment in the EU, specifically for different enterprises. This will be a topic for further research in the future.

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Note: The European Union: The research period of this article is from 2005 to 2020.The UK left the EU on 31 January 2020 but with a transition period that will end on 31 December 2020, therefore this research is including the UK. In addition, Romania and Bulgaria, which joined the EU in January 2007, and Croatia, which joined the EU in 2013, were excluded. Considering the availability of data, a total of 25 countries were included in the study sample.