

The Impact of FDI on Economic Openness of Provinces along "the Belt and Road"

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Abstract—The implementation of "the Belt and Road" initiative has further enhanced China's economic openness and attracted more foreign direct investment (FDI). However, China is characterized by unbalanced economic development and distribution of resources in different regions. Therefore, analyzing the impact of FDI on economic openness of 18 provinces along "the Belt and Road" and developing the economies of these provinces more specifically have become an important issue. This paper uses factor analysis and DEA-Malmquist model to construct the economic openness of 18 provinces. FDI proxied by 5 measurements are selected to evaluate the impact of foreign direct investment on each province's economic openness by using spatial econometric model. Empirical results find that FDI has a positive impact on the economic openness of the provinces along "the Belt and Road", and the surrounding provinces also have a significant role in promoting the economic openness of a province. But FDI has different impact on different regions with East Region exhibiting the most significant effect. FDI enhances economic openness mainly through registered capital of foreign-invested enterprises and total import and export of foreign-invested enterprises.

1 INTRODUCTION

China's reform and opening up has achieved great success. At present, China's economy is closely related to the world's economy. Under the New Normal and idle reform, China urgently needs to build a new open economic development system and comprehensively deepen the reform in various fields. In September and October 2013, Present Xi proposed "the Belt and Road Initiative" when he visit Central Asia and Southeast Asia. On March 28, 2015, the National Development and Reform Commission, the Ministry of Foreign Affairs, and the Ministry of Commerce jointly issued the "Vision and Action for Promoting the Construction of the Silk Road Economic Belt and the 21st-Century Maritime Silk Road", which designated 18 provinces, autonomous regions and municipalities, and clarified the key development directions.

The implementation of "the Belt and Road" strategy has attracted a large number of foreign direct investment, and the amount of contracts undertaken by China has also increased significantly. On January 25, 2018, "the Belt and Road" economic and trade cooperation has achieved remarkable results according to data from the Ministry of Commerce. Foreign direct investment has had an important impact on the economic development of "the Belt and Road" provinces in China. At the same time, the implementation of the "the Belt and Road" strategy has also affected the economic openness of all provinces,

autonomous regions and municipalities. Therefore, it is of great significance to study the impact of foreign direct investment on the economic openness of the provinces along "the Belt and Road".

2 LITERATURE REVIEW

Extant research on the impact of foreign direct investment on the economic openness of the provinces along "the Belt and Road" is extremely limited. Most of the literature mainly analyzes the economic openness of various provinces and cities in China through empirical research, and provides opinions of selecting indicators to measure economic openness. Kojima Kiyoshi (1987) first proposed using foreign trade dependence (Ratio of foreign trade volume of a country to the total value of domestic trade production) as an evaluation index to measure economic openness. Since foreign trade activities accounted for a large proportion of foreign economic activities after World War II, it is advisable to use the dependence of foreign trade to measure the economic openness of a country. Consequently, later studies mostly used trade dependence to measure economic openness (Wu Fenglan, Ma Dexin, 2017). However, using trade dependence to measure economic openness is greatly limited with the development of every country's economy and finance. As a supplement for the evaluation indicators, Hu Zhi and Liu Zhixiong (2004) added investment openness in the indicator system. Besides, Zhou Maorong

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and Zhang Zijie (2009) added production openness in the review of openness measurement researches.

For the measurement method of economic openness, the methods used in the research are different. In general, Luo Long (1990) believed that openness contains many aspects such as international division of labor and international trade. As a result, he establishes the formulation to measure the economic openness. Qu Ruxiao (1997) chose goods, labor and long term capital in balance of payments to formulate a model which can reflect the economic openness. Huang Fanhua (2001) noted that economic openness should be measured from commodity trade, service trade, direct investment and indirect investment. Furthermore, these four parts are summed up to get the formula for measuring economic openness. Later, most existing studies used factor analysis when measuring economic openness (Zhu Tingxi, Sun Rui, 2016). Based on this, Zhang Xiuying and Gao Xiaowei (2017) used DEA-Malmquist model to measure the technological progress rate of the economic opening of the western provinces along "the Belt and Road".

However, most of the literatures still have the following shortcomings when studying the economic openness of each province in existing research. Firstly, most of the evaluation indicators are only use foreign trade dependence, and the selected indicators are not comprehensive. Secondly, few literature studies the impact of FDI on economic openness of provinces along "the Belt and Road". Finally, the existing studies did not take the spatial correlation of economic openness in each province into account when studying the factors affecting economic openness.

Based on these shortcomings, this paper made the following improvements: 1. This paper adds new indicators to measure the economic openness; 2. This paper adds variables related to foreign direct investment to analyze the impact of the economic openness of the provinces along "the Belt and Road"; 3. Considering the spatial correlation of economic openness in each province, this paper adopts spatial model.

3 EMPIRICAL ANALYSIS

3.1 Methodology

3.1.1 Factor Analysis and DEA-Malmquist Model

3.1.1.1. Factor Analysis

The purpose of factor analysis is to classify several related variables into the same factor and use fewer factors to reflect the relationship between multiple variables. The model is described as follows:

$$\begin{cases} X_1 = a_{11}f_1 + a_{12}f_2 + \dots + a_{1k}f_k + e_1 \\ \vdots \\ X_p = a_{p1}f_1 + a_{p2}f_2 + \dots + a_{pk}f_k + e_p \end{cases}, \quad (1)$$

The matrix form of the factor analysis model in formula (1) is $X=AF+e$, where X is the variable, F is the common factor of X , $A=(a_{ij})$ is the factor load matrix, and a_{ij} is the factor load, which is the i -th variable and the j -th

factor. The correlation coefficient reflects the importance of the i -th variable on the j -th factor. The larger the absolute value of a_{ij} , the greater the dependence of X_i and F_j , and e is the special factor of X . It is generally believed that the cumulative contribution rate of the common factor is not less than 80%, which can reflect the majority of information contained in the original variables (Zhang Xiuying, Gao Xiaowei, 2017).

3.1.1.2. DEA-Malmquist Model

DEA (Data Envelopment Analysis), which is a data envelopment analysis, is a more efficient method for evaluating decision units (DMUs) with multiple inputs and multiple outputs by constructing production frontiers using DEA models based on known data. DEA-Malmquist model mainly combines the DEA method with the Malmquist index which is usually used to measure the growth of "total factor productivity" compared to the previous year, that is, the rate of technological progress (Zhang Xiuying, Gao Xiaowei, 2017).

3.2 Data source and description

According to the "Vision and Action of Promoting the Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road" which is jointly issued by the National Development and Reform Commission, the Ministry of Foreign Affairs and the Ministry of Commerce on March 28, 2015, there are 18 provinces along "the Belt and Road". The Silk Road Economic Belt includes: Xinjiang, Shaanxi Province, Gansu Province, Ningxia, Qinghai, Chongqing, Yunnan, and Guangxi. The 21st- Century Maritime Silk Road includes: Shanghai, Fujian, Guangdong, Zhejiang, and Hainan. Besides, 18 provinces include Inner Mongolia, Heilongjiang, Jilin, Liaoning, and Tibet.

This paper selects the data of the 18 provinces, municipalities and autonomous regions from 2007 to 2016 for a total of 10 years to study the impact of foreign direct investment on the economic openness of the provinces along "the Belt and Road". In order to maintain a high degree of data consistency, the original data of this paper are taken from the National Bureau of Statistics and the China Statistical Yearbook.

4 EMPIRICAL ANALYSIS

4.1 Measurement of economic openness

4.1.1 Construction of economic openness evaluation system

Economic openness is a comprehensive indicator, which measures the degree of openness of the regional economy and reflects the closeness of economic interaction between the region and other regions. The higher the degree of economic openness is, the closer the economic interaction between regions and the more helpful to

promote economic development (Liu Xi, 2018).

Based on the research on indicators of economic openness in the existing literatures at home and abroad, and data availability of the provinces along "the Belt and Road" especially Wu Fenglan and Ma Dexin (2017),

Zhang Xiuying (2017), this paper divides the indicators for measuring economic openness into nine directions shown in Table 1. The data indicators are selected for each direction as the basis for factor analysis and the DEA-Malmquist model.

Table 1 Economic Openness Evaluation Indicators

Indicators	Calculation method
Import trade dependence	Import trade dependence =Regional import total / Regional GDP
Export trade dependence	Export trade dependence=Regional export total / Regional GDP
Foreign investment dependence	Foreign investment dependence =Actual use of foreign capital / Regional GDP
International tourism dependence	International tourism dependence=International tourism foreign exchange income / Regional GDP
International tourism activity	International tourism activity=Regional international tourist population/Regional total population
Regional market openness	Regional market openness=Wholesale and retail value added / regional GDP
Regional market dependence	Regional market dependence=Total retail sales of social consumer goods / regional GDP
Inter-regional division of labor	Inter-regional division of labor=(Regional added value of the second and third industries / national second and third industry added value) / (Gross Regional Product / Gross National Product)
Industrial production output value	Industrial production output value=Gross Industrial Product / Regional Gross Domestic Product

4.1.2 Construction of economic openness evaluation system

In order to ensure the objectivity and accuracy of the results, this paper obtains the explanatory variance and factor score matrix through factor analysis. See Table 2 and Table 3

Table 2 Interpretation Variance Of Variables

Factor	Eigenvalues	Differences	Proportion	Cumulative
Import trade dependence	4.31714	0.34373	0.7253	0.7253
Export trade dependence	0.97340	0.43291	0.1635	0.8888
Industrial production output value	0.54149	0.23777	0.0908	0.9796
Foreign investment dependence	0.30272	0.10962	0.0503	1.0305
Regional market dependence	0.19310	0.18695	0.0324	1.0629
International tourism dependence	0.00615	0.06723	0.0010	1.0639
International tourism openness	-0.06108	0.05626	-0.0103	1.0537
Regional market openness	-0.11734	0.08484	-0.0197	1.0340
Inter-regional division of labor	-0.20219		-0.0340	1.0000

Table 3 Component Score Matrix

Variables	Factor 1	Factor 2	Factor 3	Factor 4
Import trade dependence	-0.07046	-0.93196	0.53854	-1.62836
Export trade dependence	0.46395	0.17924	-0.04339	0.62635
Industrial production output value	0.33726	-0.03391	0.20957	-0.05560
Foreign investment dependence	0.10128	-0.00078	0.30168	0.17408
Regional market dependence	-0.18441	0.19853	0.26911	-0.04280

International tourism dependence	-0.34057	-0.67712	0.52601	0.37910
International tourism openness	-0.13239	0.49472	-1.30351	0.52955
Regional market openness	-0.21680	0.74604	0.16012	0.04749
Inter-regional division of labor	0.33385	0.21994	-0.06453	0.01575

It can be seen from Table 2 and Table 3 that nine evaluation indicators are divided into four common factors, and the higher scores of each factor are classified into the same category. The classification results are shown in Table 4:

Table 4 Index Classification Results

Common Factor	Evaluation Index
1	Industrial production output value, Inter-regional division of labor
2	Regional market openness
3	Import trade dependence, Foreign investment dependence, Regional market dependence, International tourism dependence
4	Export trade dependence, International tourism openness

Finally, the economic openness of the provinces along "the Belt and Road" is predicted. The specific results are shown in Appendix 1¹.

4.2 The rate of economic openness technological progress

4.2.1 Measurement of economic openness technological progress rate

This paper uses the total region export trade, total region import trade, actual use of foreign direct investment, regional international tourist visits, wholesale and retail value added as the input indicators of economic openness, and regional GDP and per capita GDP as output indicators. Then, measuring the economic progress rate of economic openness of 18 provinces, autonomous regions, and municipalities along "the Belt and Road" in 2008-2016 through the DEA-Malmquist model. The results of the calculation are shown in Appendix 2.

4.2.2 Evaluation of economic openness technological progress rate

From Appendix 2, in the period of 2008-2016, the economic openness technological progress rate in the western regions (such as Tibet, Xinjiang, Qinghai, etc.) was lower than the national average, while the economic openness in the eastern region was higher than the national average. 2013-2014 is precisely the period when "the Belt and Road" initiative was proposed and implemented. Nearly half of the provinces have exceeded

the national average in terms of economic openness technological progress rate, which indicates that the implementation of the "the Belt and Road" strategy has played a positive role in promoting economic openness of provinces along "the Belt and Road". In 2015, the technology progress rate of economic openness in the western provinces was increased, which also led to the overall increase in the national level.

4.3 Analysis of the impact of foreign direct investment on economic openness

4.3.1 Explained variable selection

The subject of this paper is the impact of foreign direct investment on the economic openness of the provinces along "the Belt and Road". Therefore, the explained variable of this paper is the economic openness calculated by the factor analysis method. The panel data includes 2007-2016 economic openness of 18 provinces, municipalities and autonomous regions.

4.3.2 Explanatory variables selection

This paper selects the number of foreign-invested enterprises per capita, the total investment of foreign-invested enterprises per capita, the registered capital of foreign-invested enterprises per capita, the total import and export of foreign-invested enterprises per capita, and the registered capital of foreign-invested enterprises per capita as the core explanatory variables.

4.3.3 Control variables

Human capital, industrial structure upgrading, innovation capability, marketization level, and traffic density also affect economic openness, which are control variables. According to existing research, the specific calculation methods are as follows:

a. Human capital = population above junior college / total population of the region;

b. Industrial structure upgrading = (addition value of primary industry + added value of secondary industry × 2 + added value of tertiary industry × 3) / GDP;

c. Innovative ability = three types of patent application acceptance / total population of the region, to examine the impact of technological openness on the economic openness;

d. Marketization level = number of employees in private enterprises (including self-employed individuals) / total population in the region;

e. Convenient transportation degree = road and railway mileage / area of the area, that is, traffic density.

¹ Due to space limit, all appendices can be found on <https://www.jianguoyun.com/p/DR2pQbwQ38HrCBibj8D>

4.3.4 Space spillover effect

4.3.4.1. Factor Analysis

This paper selects Moran's I test to test whether there is spatial correlation between the economic openness of each province, then obtains Moran's I test results of economic openness of each province from 2007 to 2016, as shown in Table 5:

From the test results, it can be found that there is a significant spatial correlation between the economic openness of each region, and they all show positive correlation. It indicates that the economic openness between regions has a positive promotion effect. At the same time, the data of each group shows that the test results are significant, which also indicates that there is a spatial spillover effect on the economic openness of the provinces along "the Belt and Road". So it is also proved that the spatial measurement model is more suitable.

Table 5 Spatial Correlations Moran's I Test Results

Year	Moran's I value	Year	Moran's I value
2007	0.100*** (3.019)	2012	0.126*** (3.469)
2008	0.124*** (3.463)	2013	0.088*** (2.820)
2009	0.121*** (3.388)	2014	0.094*** (2.907)
2010	0.111*** (3.250)	2015	0.104*** (3.080)
2011	0.124*** (3.449)	2016	0.111*** (3.161)

Note: *** indicates that the significance test was passed at the 1% level; the z test statistic in parentheses

The economic openness corresponding to each province is scattered on the provincial vector map of China. The depth of the color represents the size of each value, that is, the degree of economic openness. This makes it possible to more intuitively see the spatial relationship of economic openness. Figure 1 shows the economic openness of the provinces along "the Belt and Road" in 2016:

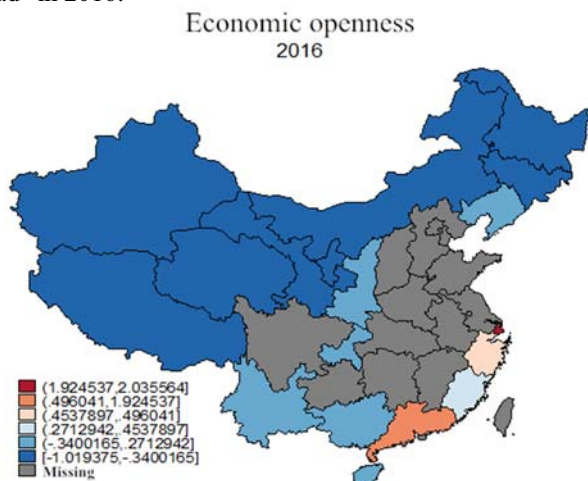


Figure 1 Economic Openness of Provinces along "The Belt And Road" in 2016

It can be seen from Figure 1 that the eastern region is brighter and has a higher level of economic openness. The western region is darker, showing that the provinces with low economic openness are adjacent to the provinces with lower economic openness. The level of economic openness in the central region is between the east and the west.

4.3.4.2. Factor Analysis

Data applied to a spatial model can result in bias if other types of spatial measurement models are used. Therefore, the applicability of each model is tested before the data is substituted into the appropriate model for regression. When selecting the spatial econometric model, it is generally considered that the spatial auto-correlation effect of the dependent variable and the independent variable is taken into account, and the spatial auto-correlation effect without the error term is more robust. That is, the spatial estimation of the spatial Doberman model (SDM) is preferred. This paper first introduces each variable into the SDM model for regression test, in order to calculate the spatial lag variable. The spatial model formula of this paper is as follows:

$$\ln y_{it} = \alpha + \rho \ln y_{it-1} + \rho \sum_{j=1}^n W_{ij} \ln y_{it} + \sum_{k=1}^K X_{itk} \beta_k + \sum_{k=1}^K \sum_{j=1}^n W_{ij} X_{jtk} \theta_k + \mu_i + \gamma_i + \varphi_{it}$$

$$\varphi_{it} = \lambda \sum_{j=1}^n m_{ij} \varphi_{it} + \epsilon_{it}, \quad i=1, \dots, n \quad t=1, \dots, T \quad (2)$$

Where $\ln y_{it}$ represents the lagged first-order term of $\ln y_{it}$, W_{ij} represents the corresponding value of i, j under the spatial weight matrix, and θ_k represents the spatial lag variable. X represents all explanatory variables and control variables.

- When λ is 0, it is Spatial Dubin Model (SDM);
- When ρ and θ are 0, it is Spatial Error Model (SEM);
- When λ and θ are simultaneously taken as 0, it is Spatial Lag Model (SLM);
- When θ is taken as 0, it is General Space Model (SAC).

The following two hypotheses were tested by the Lagrange multiplier test (LM Test) and the Wald test: $H_0: \theta + \rho\beta = 0$ and $H_0: \theta = 0$. If the test results pass this assumption, it is considered reasonable to use the SEM model or the SLM model. Variable data passed the LM test after testing, that is, it is reasonable to use the SEM model. At the same time, variable data also passed the WALD test, that is, it is reasonable to use the SLM model. As an unconstrained spatial hybrid model, the SAC model includes both features of SEM model and SLM model. Since the SEM and SLM have passed the applicability test, the use of the SAC model is also reasonable. The regression results are shown in Appendix 3 and Appendix 4.

4.3.4.3. Factor Analysis

The Akaike information criterion (AIC) and the Bayesian information criterion (BIC) test are carried out to select the optimal model suitable for the data. The results of the

AIC and BIC test are shown in Table 6:

Table 6 Spatial Measurement Model Information Criteria Test Results

Spatial model	Fixed effect	AIC value	BIC value
SEM	Area fixed	-238.5463	-200.2308
	Time fixed	153.2981	191.6136
	Double fixed	-259.8997	-221.5842
SLM	Area fixed	-241.7547	-203.4392
	Time fixed	138.9991	177.3145
	Double fixed	-257.4997	-219.1842
SAC	Area fixed	-241.3601	-199.8517
	Time fixed	140.6166	182.1251
	Double fixed	-257.9639	-216.4554
SDM	Area fixed	-244.8446	-177.7925
	Time fixed	41.05251	98.52574
	Double fixed	-296.838	-242.5577

From the definition of AIC and BIC information criteria, when the AIC value or BIC value is the smallest, the optimal model suitable for the variable can often be obtained. Therefore, from the test results in the above table, it can be found that the AIC value (-244.8446) of the SDM model is the minimum of the four models when studying the fixed effect in the region. Similarly, the AIC value and the BIC value of the SDM are fixed at the time point. The double fixed effect is the minimum of the four models, indicating that the SDM model is also the optimal space model suitable for the study data under the fixed time and double fixed effect. Therefore, the SDM model is used for cumulative effect analysis.

4.3.4.4. Cumulative effects

In this paper, 18 provinces, municipalities and autonomous regions along "the Belt and Road" are divided into the eastern region and the Midwest regions. The spatial Dubin model is constructed for each region to explore the cumulative effect.

Cumulative effect analysis indicates that explanatory variables not only affect the explained variables in one region (direct effects), but explanatory variables in other regions also affect the explained variables in the region (indirect effects). The total effect is the sum of direct and indirect effects.

This section uses the double fixed effect panel SDM model to regress foreign direct investment data on economic openness data in each region. The regression results are shown in Appendix 5. The direct effect in the table indicates the impact of each explanatory variable on the economic openness of the region. The indirect effect indicates the impact of the nearby region's explanatory

variables on the economic openness of the region. The total effect indicates the impact of each explanatory variable on the region's and nearby region's economic openness.

From Appendix 5, when the number of foreign-invested enterprises, railway density and industrial structure increase in a country, the economic openness of the region will be reduced, but the impact is not very significant. The level of economic openness in the region will increase when the number of registered capital, degree of marketization level and road density in an area increase. In addition, the impact is more significant. In addition, the test results also show that foreign direct investment has a positive spatial spillover effect on the economic openness of the surrounding areas. On the whole, foreign direct investment has a positive impact on the economic openness of the region. On the contrary, when the total import and export volume and marketization level of foreign-invested enterprises in a region increase, it will have a positive impact on the economic growth of the region, but the surrounding regions have a negative impact on the economic growth of the region. At the same time, the registered capital of foreign-invested enterprises, human capital and highway density have a significant positive correlation on the economic openness of the region and surrounding areas to the region.

For the eastern region, the overall foreign direct investment has a significant positive impact on the economic openness of the province and the level of economic openness of the surrounding area to the province. For the eastern region, the total investment of foreign-invested enterprises and the number of patents per capita have no significant impact on the economic openness of the province, and the impact of the surrounding areas on the province is not significant. The marketization level has a significant positive direct effect on the level of economic openness in the province. Railway density has a significantly negative direct effect on the economic openness within the province. The number of foreign-invested enterprises, the registered capital of foreign-invested enterprises, the upgrading of industrial structure and the density of railways have a negative impact on the economic openness of the provinces and surrounding areas. In addition, the total import and export of foreign-invested enterprises have a negative impact on the economic openness of the province, but there is a positive spatial spillover effect on the economic openness of the surrounding areas. The registered capital, human capital and highway density of foreign-invested enterprises have a significantly positive impact on the economic openness of the province and surrounding provinces.

The impact of foreign direct investment on regional economic openness in the Midwest regions is quite different from that in the eastern region. For the Midwest regions, human capital and the total investment of foreign-invested enterprises have a negative impact on the level of economic openness within the province. The total investment of foreign-invested enterprises has a significant impact. The number of foreign-invested enterprises registered has a positive impact on the level of

economic openness of a region, but the number of foreign-invested enterprises registered in the surrounding areas has a negative impact on the economic openness of the region. On the contrary, human capital has a negative impact on the level of economic openness in a region, but it is not very significant, and human capital in the surrounding regions has a weak positive impact on the level of economic openness in the region. In addition, other variables have not shown significant characteristics on the impact of a region and surrounding areas on the level of economic openness in the region. From this point of view, the impact of foreign direct investment on the economic openness of the Midwest regions is not as obvious as that in the eastern region.

5 CONCLUSION

The development of an open economy and the expansion of economic openness, which is an important theme of the "the Belt and Road" strategy, will surely become an important point for the development of the economy in various regions. Therefore, this paper studies the impact of foreign direct investment on the economic openness of the provinces along "the Belt and Road" through factor analysis, DEA-Malmquist model and spatial econometric regression. The empirical results are important for the development of the provinces along "the Belt and Road" economy and offer significant practical guiding. The empirical results of this paper find that many factors related to foreign direct investment in this paper have a significant impact on the economic openness of the provinces along "the Belt and Road", and the surrounding provinces also have a significant role in promoting the economic openness of a province. But foreign direct investment has different impact on different regions. Consequently, China should develop the economics of the provinces along "the Belt and Road" from different points. Regions that foreign direct investment has a greater role in promoting economic openness can fully utilize FDI to increase its economic openness, thereby achieving efficient economic development. While, regions that foreign direct investment is weak or even harmful to economic openness may consider developing economic openness from other aspects. To this end, this paper proposes the following suggestions:

a. China should insist on encouraging foreign direct investment. The empirical research in this paper finds that foreign direct investment has a significant role in promoting economic openness. Therefore, China should also improve the foreign direct investment policy and rely on the implementation of the "the Belt and Road" strategy to increase openness and cooperation to a greater extent in the future. However, while taking advantage of the advantages of foreign direct investment, China should pay attention to the quality of foreign investment projects and take measures to strengthen the review of foreign direct investment projects. Meanwhile, China should focus on the sustainable development of the economy of each region by encouraging the introduction of environmental friendly investment projects, and preventing high-pollution and high-energy projects from introducing.

b. Promote economic and trade cooperation with foreign investors from the higher level for eastern region. Empirical results find that foreign direct investment has a significant role in promoting the economic openness of the eastern provinces along "the Belt and Road". Specifically, the total investment of foreign-invested enterprises, marketization level, registered capital of foreign-invested enterprises, human capital and highway density have a significant positive impact on the economic openness of the eastern region. Therefore, the following points should be achieved for the eastern region. First, government should continue to improve the level of marketization, make full use of the advantages of technological innovation to attract foreign direct investment, and cooperate with domestic and foreign enterprises at a higher level and in a larger field. Secondly, it should increase the number of talent attraction, cultivate high-skill talents, and improve the "soft power" of economic development. Finally, eastern provinces should strengthen cooperation with surrounding areas, strengthen the construction of transportation infrastructure, and break the restrictions on transportation infrastructure.

c. Attract foreign investment by using the advantages of the Midwest regions. The empirical research results of this paper show that the number of foreign-invested enterprises' registrations has a significant effect on the economic openness of the Midwest regions. Based on this, the following suggestions are proposed for improving the economic openness of the Midwest regions: (1) For the central regions (Inner Mongolia Autonomous Region, Heilongjiang Province, Jilin Province), they should make full use of their regional advantages and existing resources to strengthen cooperation with neighboring countries and neighboring provinces, which can promote their position and attractiveness in economic and trade cooperation. (2) For the western region, it is the most important to strengthen the construction of transportation infrastructure and expand the coverage of traffic in various provinces, which facilitate foreign trade activities in the western region. Secondly, governments should strengthen the development of the secondary and tertiary industries and promote industrial upgrading. Thirdly, the western region should rely on the construction of the "Silk Road Economic Belt" and take advantage of financing and policies to increase the intensity of attracting foreign direct investment. At the same time, we will optimize the talent introduction policy and increase the intensity of attracting talents. Finally, we should actively explore the resource advantages of the region, give priority to attracting projects in energy and agriculture, and actively guide the implementation of foreign-funded projects to achieve maximum economic openness.

It is particularly important to develop open economy with the rapid development of China's economy and the context of economic globalization. Foreign direct investment has played a very significant role as an important indicator of the economic openness. In the future, China should formulate and improve the open economic development policies according to the development of different regions in order to achieve efficient and rapid economic development. sides.

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