

## Infrastructure, openness and Production Capacity Cooperation of China-ASEAN

Tingyu Xie<sup>a</sup>, Hongxiang Tang<sup>b,\*</sup> and Qi Li<sup>c</sup>

School of economics and trade, Guangxi university of Finance and Economics, Mingxiu West Road, Nanning, China

<sup>a</sup> 28866410@qq.com, <sup>b</sup> 4707575@qq.com, <sup>c</sup> 393650484@qq.com.

\*Corresponding author

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**Abstract.** The connectivity promoted by the “One Belt And One Road” initiative has greatly enhanced the infrastructure and openness of countries along the belt and road. Whether the infrastructure and openness are “accelerators” for China-ASEAN production capacity cooperation or not is worth further study. This paper has constructed an analytical framework to analyse the impact of the continuous increase of openness on bilateral production capacity cooperation, and explored the realistic prospect of the improvement of China-ASEAN production capacity cooperation in transportation, energy, information, finance and other infrastructure under the constraints of regional economic integration. Empirical analysis of the path of infrastructure and openness to promote production capacity cooperation, the regression results show that transportation, information, energy and other infrastructure and production capacity cooperation is positive correlation, openness to promote production capacity cooperation, threshold regression further explained the infrastructure construction on the threshold of production capacity cooperation. It is of great significance to clarify the relationship between infrastructure, openness and production capacity cooperation for improving the connectivity and opening up of countries along the “One Belt and One Road”.

### 1. Introduction

China and ASEAN countries are linked by mountains and rivers. Our economic and trade cooperation enjoys favourable geographical conditions and a time-honoured historical and cultural foundation. In particular, with the deepening development of the china-ASEAN free trade area, bilateral economic and trade cooperation has continued to deepen, with the scale of trade expanding and the depth of value chain synergy strengthened. Since 1998, the total trade volume of China and ASEAN has been growing continuously, and it has become the third largest trading partner after the EU (European Union) and the USA, while China is the largest trading partner of ASEAN. The total trade volume between China and ASEAN countries increased by 24.7 times from us \$23.798 billion in 1998 to us \$587.87 billion in 2018. Among ASEAN countries, Vietnam, Malaysia and Thailand are major trading partners. The ASEAN countries are the priority direction and important partners of China's “One Belt and One Road” initiative, and occupy a very important position in the construction of “One Belt and One Road”. The proportion of ASEAN countries in the total trade volume between China and One Belt and One Road countries has been increasing year by year, rising from 31.45% in 2013 to 46.37% in 2018.

ASEAN countries have been an important source of FDI capital and an important destination of China's foreign investment. With the deepening of “One Belt and One Road”, the scale of bilateral investment has further grown. By the end of 2018, the cumulative two-way investment between China and ASEAN reached us \$205.71 billion, and the stock of two-way investment has increased 22-fold in the past 15 years. China's investment in ASEAN countries mainly focuses on infrastructure. Whether this infrastructure investment promotes the growth of our foreign investment, foreign investment growth is direct traded or reverse trade type, is the need for in-depth analysis of the problem, combined with the present transfer of large enterprises of our country to

invest in ASEAN countries, and expounds the question out, to build our country in the current complex environment that gives priority to with my country value chain, enhance bilateral economic relationship, deal with complex national competition environment.

This paper focuses on analyzing the bilateral economic and trade cooperation between China and ASEAN and the investment status of China in ASEAN under the background of One Belt And One Road. Through empirical analysis, the influencing mechanism and internal correlation between China's OFDI and ASEAN countries' infrastructure investment, openness and bilateral trade are analyzed. The structure of this paper is as follows: the second part of the ASEAN countries infrastructure construction, trade openness to promote China and ASEAN OFDI mechanism, the third part of the establishment of a model, empirical analysis of the improvement of ASEAN countries infrastructure and trade openness to China and ASEAN countries OFDI specific impact, the fourth part of the specific countermeasures.

## 2. literature review

Dunning (1981) argued that the factors influencing the FDI decision-making of transnational corporations could be divided into three aspects, namely, the specific advantages of ownership owned by transnational corporations, the location advantages of investment host countries and the internalization advantages of corporations. Among them, the location advantage is possessed by the host country and can be distinguished from other countries, such as larger market size, higher quality cheap labour force, richer natural resource endowment, more stable political environment, better and high-quality infrastructure and other advantages that attract multinational companies to invest in it.

A larger infrastructure scale and better infrastructure quality will reduce the corresponding cost of FDI from the home country to the host country and expand the profit space of transnational corporations. It is generally believed that a country's road, railway, aviation, port and other transportation facilities, as well as fixed telephone, mobile phone, Internet and other communication facilities are prerequisites for attracting foreign direct investment and realizing domestic economic growth. At the same time, with the overall economic and social progress of developing countries, human development (science, education, health, etc.) also needs the support of infrastructure. The completion of infrastructure can help multinational companies achieve the goal of cost minimization and profit maximization. The efforts of developing countries to integrate into GVCS have increased the demand for total FDI introduction and structural adjustment, and raised higher requirements for improving the quality of infrastructure.

Infrastructure capital stock contributes to the improvement of private sector total factor productivity (Aschauer, 1989) and plays an important role in attracting FDI inflows. If the public infrastructure cannot well serve local enterprises and transnational corporations, it will not be conducive to the improvement of enterprise operating efficiency, which will force enterprises to build their own infrastructure, leading to redundant construction and waste of resources (Erenburg, 1993). For developing countries, the level of infrastructure development mechanism of the impact of FDI inflows and the differences between developed countries and developing countries, infrastructure to improve the level for the marginal impact of FDI inflows stronger (Asiedu, 2006), with the improving of the level of infrastructure, infrastructure diminishing marginal efficiency, this makes the investment in infrastructure in developing countries than in developed countries are more efficient. This lays a theoretical foundation for some backward ASEAN countries to attract foreign capital through infrastructure investment improvement. Obviously, FDI tend to enter the market scale, open degree is high, infrastructure, political stability and national empirical analysis aspect of legal environment, Wheeler and Mody (1992), using panel data of 42 countries of FDI inflows influence factors are analysed, and pointed out that the quality of the infrastructure of FDI has stronger positive effect, and the elasticity coefficient is greater than 1. Asiedu (2002) analysed the role of infrastructure based on the data of 34 African countries from 1980 to 2000, and introduced such indicators as market size, return on investment, trade openness and macroeconomic stability as control variables. The results showed that countries with good infrastructure attracted more FDI

inflows. Rehman et al. (2011) studied Pakistan and showed that infrastructure had a strong positive impact on FDI inflows. The research of Fitriandi et al. (2014) on Indonesia shows that improving the level of infrastructure is significantly conducive to FDI inflow.

In production capacity cooperation between China and ASEAN countries, we should give full consideration to China's motives for overseas production capacity cooperation. Kun-ming Chen et al. (2006) divided OFDI motivation into market-oriented motivation and cost-oriented motivation. Market-oriented motivation refers to the purpose of OFDI which is to expand the market. Products are produced in the host country and supplied to the host country for consumption. Cost-oriented motivation refers to the purpose of OFDI to reduce costs and reduce production and operating costs by utilizing the host country's cheap labour force or raw material costs. Baltagi et al. (2007) divided investment motivation into horizontal type and vertical type. Horizontal motivation is to expand overseas market, avoid trade barriers, reduce trade costs; The vertical motivation is to seek the host country cheap labour and other elements, put the non-core production links in the host country, and transport the products back to the home country for consumption. On the basis of the above two categories, Dunning & Lundan (2008) divides motivation into four more detailed categories: efficient-acquisition motivation, market-acquisition motivation, natural resource acquisition motivation, and strategic resource acquisition motivation. Meng Qingqiang (2016) empirically investigated China's motivation for direct investment in countries along the "One Belt And One Road" route. He thinks that the market seeking motivation, natural resources seeking motivation and efficiency seeking motivation are the main motivation of China's direct investment in "One Belt And One Road" countries along the line, and the imperfect infrastructure and high tariffs of countries along the line are also the reasons for China's direct investment in "One Belt And One Road" countries along the line. Zhai Hui and Xu Yonghui (2016) concluded that China's motivation for direct investment in different regional countries along the "One Belt And One Road" route is diversified, and market size, per capita wage level and natural resource endowment are the main factors affecting China's direct investment. Zhou Qiang (2017) studied China's direct investment in "One Belt And One Road" countries using panel data of direct investment in 20 countries along "One Belt And One Road" from 2004 to 2014, and the research results showed that China's direct investment in "One Belt And One Road" countries was closely related to geographical distance and market size of host countries. Liu Zhenlin (2017) pointed out that the investment of Chinese state-owned enterprises in "One Belt And One Road" countries focused on the effect of political achievements while ignoring the economic benefits, and gave an example of the contribution of SINOPEC.

The research on the advantages of attracting FDI in ASEAN countries and the production capacity cooperation between Chinese enterprises and ASEAN countries is conducted from the perspectives of OFDI and FDI location selection as well as the motivation of Chinese enterprises to invest in ASEAN countries. Theory of foreign investment in developing countries carried on the thorough analysis, especially in China under the background of "area" the phenomenon of foreign investment by the educational world attention, and conducted in-depth research, for China and the capacity of cooperation of countries along the "area" motivation and the relationship with the trade has some achievements. However, there is no comprehensive study on the mode of production capacity cooperation between China and ASEAN countries and the related influencing factors. This paper aims to analyse the influencing factors of production capacity cooperation between China and ASEAN countries from the perspectives of infrastructure and trade opening.

### **3. Econometric Models, Variable Definitions and Data Sources**

#### **3.1. Econometric Models**

The influencing factors of FDI inflow in a country are diversification, and various factors exert cross-influence and mutual determination. Production cooperation between China and ASEAN countries in the construction of "area" is affected by the political, economic and cultural aspects of

concrete, the ASEAN country's GDP, infrastructure (divided into transportation infrastructure, information infrastructure, financial infrastructure), trade openness and so on all has certain influence, therefore, we will set the econometric model as:

$$\ln OFDI_{it} = c + \alpha_1 \ln GDP_{it} + \alpha_2 \ln OPEN_{it} + \alpha_3 \ln Tran_{it} + \alpha_4 \ln Info_{it} + \alpha_5 \ln Fin_{it} + \varepsilon_{it} \quad (1)$$

Therein: OFDI<sub>it</sub> refers to China's investment in country i in year t, which is used to represent the production capacity cooperation between China and ASEAN. GDP<sub>it</sub> represents the gross domestic product of country i in year t, Open<sub>it</sub> represents the openness degree of country i in year t, Tran<sub>it</sub> represents the transportation infrastructure of country I in year t, Info<sub>it</sub> represents the information infrastructure of country i in year t, Fin<sub>it</sub> represents the financial infrastructure of country iI in year t, and epsilon and epsilon it represents the random disturbance term.

## 3.2. Variable definition and data source

### 3.2.1. Explained variables

OFDI: in this paper, China's investment stock in ASEAN countries is used to represent bilateral production capacity cooperation. Although there are various forms of production capacity cooperation between China and ASEAN countries, OFDI, as the most important one, plays the most crucial role. Therefore, it is adopted as an alternative variable of production capacity cooperation. The data of China's investment stock in ASEAN countries are derived from the statistical bulletin of China's OFDI over the years, and the deflator index is used to calculate the actual stock.

### 3.2.2 Core explanatory variable

Trans: transportation infrastructure. Transportation infrastructure is the most basic condition for production capacity cooperation. Without high-quality transportation, the cost of investment and trade will increase significantly, thus reducing production capacity cooperation and China's OFDI to ASEAN countries. In this paper, the sum of air passenger volume and railway passenger volume represents the transportation infrastructure of a country, and the relevant data comes from WDI database.

Info: information infrastructure. The level of national informatization plays a very important role in reducing management costs through informatization management and customer search costs through the Internet. High-quality information infrastructure is conducive to increasing OFDI of Chinese enterprises to ASEAN countries. In this paper, the number of Internet users is used to measure the information infrastructure of a country, and the data comes from WDI database.

Fin: financial infrastructure. The financing beam available in the market and the vitality of financial institutions have a great impact on the investment of enterprises. A good financial infrastructure is conducive to reducing the financing cost and transaction cost of enterprises and promoting the OFDI of Chinese enterprises to ASEAN. Domestic credit available to the private sector (as a percentage of GDP) is used in this paper, using data from the WDI database.

### 3.2.3 Adjust the variable

GDP: gross domestic product. According to the gravity model of trade, a country's GDP plays a very important role in trade and investment. Capital always tends to flow to countries and regions with large market size. Therefore, taking GDP as an important regulating variable is conducive to comprehensively analysing and grasping the main influencing factors of production capacity cooperation between China and ASEAN countries.

Open: the degree of a country's openness to the outside world is expressed in terms of the proportion of a country's total imports and exports in GDP, that is, the degree of dependence on foreign trade. The concept measures how dependent a country's economy is on foreign markets. Related data source WDI database.

Descriptive statistical analysis of variables of ASEAN countries from 2007 to 2017 was carried out by using Stata software. The results of descriptive statistical analysis of variables are shown in Table 1.

Table 1 Descriptive statistical analysis of each variable

	Mean	Maximum	Minimum	S.T
LnOFDI	11.706	15.310	6.082	1.695
LnGDP	25.266	27.718	22.458	1.548
LnOpen	4.455	5.836	3.299	0.626
LnTran	15.855	18.519	12.120	1.847
LnInfo	2.987	4.552	-1.527	1.455
LnFin	3.846	4.873	1.138	0.889

## 4. Empirical Analysis

### 4.1. Reliability test of panel data

#### 4.1.1 Data stationarity test

The smoothness of the data affects the reliability of subsequent analysis. Some non-stationary economic time series tend to show a common trend, and these sequences are not necessarily directly related to each other. At this time, the data is regressed, although there is a higher R-square, but the result is not in practical terms, false regression or pseudo-regression is formed. For all variables, the same root unit root test LLC (Levin-Lin-Chu) test and different root unit root test Fisher-ADF test, the original data is non-stationary, after the first-order difference, all variables are sTable.

#### 4.1.2 Multicollinearity analysis

First, a simple correlation coefficient analysis. After the first-order difference is made to the data, the correlation coefficient of each variable is analysed, and the correlation coefficient between each variable is less than 0.5. Second, comprehensive statistical analysis. A simple regression coefficient analysis was performed on each variable, and it was found that each variable can pass the test. Explain that there is no significant correlation between data series.

### 4.2. Panel data regression results

Next, a variety of regression methods were used to analyze the quantitative relationship between variables, and the fixed effect model and the random effect model were fitted respectively. The regression results are shown in Table 2.

Table 2 Regression results of major influencing factors of capacity cooperation between China and ASEAN countries

	<b>Model 1 (Fixed effect)</b>	<b>Model 2 (Fixed effect)</b>	<b>Model3 (Fixed effect)</b>	<b>Model 4 (Fixed effect)</b>
Constant	-71.2 (0.00)***	-91.94 (0.00)***	-70.95528 (0.00)***	-70.86 (0.00)***
LNtran	0.42 (0.00)***			0.62 (0.00)***
Lninfo		0.21 (0.66)		0.13 (0.017)*** <sup>2</sup>
Lnfin			0.11 (0.75)	0.044 (0.72)
LnGDP	3.28 (0.00)***	4.37 (0.00)***	3.50 (0.00)***	3.18 (0.00)***
LnOpen	-1.41 0.00***	-1.55 0.00***	-1.41187 (0.00)***	-1.84 (0.00)***
Observations	110	110	110	110
R-squared	0.928	0.923	0.927	0.933524
	<b>Model 1 (Random effect)</b>	<b>Model 2 (Random effect)</b>	<b>Model 3 (Random effect)</b>	<b>Model 4 (Random effect)</b>

Constant	-35.66 (0.00) <sup>***</sup>	-53.75 (0.00) <sup>***</sup>	-70.95528 (0.004) <sup>***</sup>	-29.79 (0.045) <sup>**</sup>
LNtran	0.72 (0.00) <sup>***</sup>			0.95 (0.00) <sup>***</sup>
Lninfo		0.20 (0.035) <sup>**</sup>		0.19 (0.056) <sup>*</sup>
Lnfin			0.53 (0.75)	0.42 (0.064) <sup>*</sup>
LnGDP	1.63 (0.00) <sup>***</sup>	2.83 (0.00) <sup>***</sup>	1.84 (0.00) <sup>***</sup>	1.18 (0.049) <sup>**</sup>
LnOpen	-1.21 (0.00) <sup>***</sup>	-1.57 (0.00) <sup>***</sup>	-1.57 (0.00) <sup>***</sup>	-2.11 (0.00) <sup>***</sup>
Observations	110	110	110	110
R-squared	0.948	0.973	0.947	0.958

The above model was tested by LM test and Hausman test, and it was found that the random effect model had better fitting goodness. Therefore, the random effect model was adopted.

### 4.3. Empirical analysis

It can be seen from the above fitting results that the transportation infrastructure and information infrastructure can pass the test when the single variable is tested, indicating that the transportation infrastructure and information infrastructure have an important impact on the capacity cooperation between China and ASEAN countries. The impact of transportation infrastructure is more important than that of information technology facilities. The reason is that when China cooperates with ASEAN countries in capacity cooperation, it is mainly the investment of relatively primary industries and infrastructure. These production activities are related to management technology and level. The requirements are relatively low. At the same time, it may be affected by the relatively narrow market of the ASEAN countries themselves, especially as an individual in the ASEAN countries, not only the market size is small, but most of the consumption power is limited. Therefore, China and ASEAN countries use ASEAN as a production base rather than a target market in capacity cooperation. Therefore, more pursuit of better transportation infrastructure conditions to reduce transportation costs, and relatively low requirements for information infrastructure.

In the single variable test, the financial infrastructure has not passed the test, indicating that China's and ASEAN countries have limited capacity to cooperate, and Chinese investors are not very demanding to obtain financing in the host country. It also verifies the two sides of this paper for China-ASEAN capacity cooperation. The model explains that China invests more in ASEAN as a production base rather than a target market.

From the perspective of regulatory variables, the impact of GDP and openness on Chinese investors entering ASEAN countries is quite different. The research in this paper finds that there is a positive correlation between the GDP of the host country and the entry of Chinese funds. It shows that higher GDP can provide more workers and supporting industries. It has certain problems in the legal system and other aspects relative to countries with smaller economies. It has attracted Chinese funds to ASEAN countries to a certain extent.

However, the openness index measured by the ratio of import and export commodities to the country's GDP is negative in each of the fitted models, which is related to the mode of capacity cooperation between China and ASEAN countries and the process of "One Belt and One Road" to promote interconnection. China has vigorously promoted the "One Belt, One Road" initiative. Starting in 2013, it will promote the interconnection between China and the countries along the "Belt and Road". In particular, the establishment of the "Asian Investment Bank" in 2015 provided sufficient funds for the construction of national infrastructure along the "Belt and Road" and promoted the interconnection between China and neighbouring countries. In the capacity

cooperation between China and ASEAN countries, infrastructure construction itself is an important aspect of cooperation. Due to the historical origins of China and ASEAN countries, some relatively closed countries such as Cambodia, Laos and Myanmar are important partners in China. It has a very important position in cooperation with ASEAN. Among China's direct investment in Cambodia, infrastructure projects account for more than 50% of the total, and similar characteristics with Laos and Cambodia, and the impact of these large-scale projects as the basic characteristics of the investment is not very large. At the same time, Chinese investment in ASEAN countries, due to historical and cultural traditions, often has local Chinese as investment partners, and the requirements for openness are not very high.

On the whole, GDP, transportation infrastructure and information infrastructure of a country have a positive impact on the production capacity cooperation between China and ASEAN countries, while financial infrastructure and openness to the outside world do not play a leading role in China's current investment in ASEAN countries.

## **5. Conclusion and countermeasures**

Based on the analysis of the influencing factors of FDI inflows in developing countries, this paper expounds the motives of China's foreign direct investment, with the capacity cooperation between China and ASEAN countries (using the OFDI of China to ASEAN countries) as the research object, using panel regression. The method explores the impact of transportation infrastructure, information infrastructure, financial infrastructure, host country GDP, and openness on China-ASEAN capacity cooperation. The study found that the transportation infrastructure plays a decisive role in attracting the public to play the role of FDI, and the information infrastructure plays a more active role, but the financial infrastructure does not have a positive impact on Chinese enterprises investing in ASEAN countries, indicating whether Chinese investment companies The ability to obtain financing from ASEAN countries is not a business to the relevant country. GDP and trade openness There are differences in the OFDI impact of China's investment in ASEAN countries. The size of the host country's market promotes capacity cooperation between China and ASEAN countries, and the degree of trade openness is uncertain about the impact of capacity cooperation between Chinese and ASEAN countries.

The conclusions of the study are positive for the formulation of policies: First, it is conducive to enhancing the understanding of capacity cooperation between China and ASEAN countries. Only on the basis of enhancing understanding, China and ASEAN countries will further strengthen bilateral communication and exchanges, create a good investment environment, promote more enterprises in China to carry out capacity cooperation with ASEAN countries, and firmly promote the construction of the “Belt and Road” and China. Interconnection between countries along the route.

Secondly, a clear explanation of China's foreign investment motives is conducive to the understanding and recognition of the “Belt and Road” construction concept. The motives of China's foreign investment include market seeking motives, natural resources seeking motives, and efficiency seeking motives. The capacity cooperation between China and ASEAN countries focuses on “interconnection”, and its original intention is to help countries along the “Belt and Road” to better communicate with other countries. Contact to help these countries develop their economies, while deepening the integration of global value chains, helping countries that are embedded in global value chains to gain development opportunities through globalization.

Third, the demand for infrastructure in China-ASEAN countries' capacity cooperation is very strong. Some countries in ASEAN have a relatively backward level of economic development and a relatively backward infrastructure. The important basis for China's cooperation with production capacity is infrastructure. Therefore, strengthening the transportation infrastructure and information infrastructure of ASEAN countries is of positive significance.

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