

# Research on the Impact of FDI on China's Regional Economic Growth

Fanqi Sun

Nanjing University of Information Science & Technology, China

## Abstract

Since the reform and opening-up, China has made remarkable achievements in economic development, and Foreign Direct Investment (FDI) has played an indispensable role to achieve such development. However, the distribution of FDI was extremely unbalanced in China: nearly 80% of FDI flowed into the eastern part of China, and other regions only account for 20%, causing the unbalanced regional economic growth. This paper will carry out empirical research by building mathematical models and selecting the panel data from 2000 to 2016 to analyze the impact of FDI on the regional economic differences in China. Finally, the empirical results show that FDI has contributed significantly to the current regional economic differences, and the paper suggests that China should strengthen to guide the region selection of FDI, realize the more efficient development and application of FDI, narrow the gap of regional FDI, and eventually realize the coordinated development of the regional economy.

## Keywords

FDI; Economic Growth; Regional Economic Differences.

## 1. Introduction

After the reform and opening-up, China rapidly integrated into the process of economic globalization. The breadth of opening-up has been constantly expanded, providing more channels for foreign direct investment (FDI). The domestic reform also has been intensified, providing a better environment for the development of FDI. What's more, China's vast territory, abundant resources, and huge domestic demand market have injected inexhaustible driving force into the capital market of FDI. According to the report of the Organization for Trade and Development, China is the largest country that attracts foreign capital and invests abroad among developing countries. However, China's economic development has the characteristics of dual structure and imbalance - the economic development level of the eastern region is far ahead of that of the central and western regions. Such structural and unbalanced development is closely related to geographical, historical, institutional, and other factors, leading FDI tend to enter the eastern regions in China. Although China's economy has developed, the gap between the east and the west is widening constantly. From the year of 1985 to 2018, the eastern region accounted for 73.59% of FDI inflows, while the central and western regions accounted for only 26.41%. To a certain extent, this causes the imbalance of the regional distribution of FDI. Although FDI flows into China's capital market on a large scale and China's economy grows at an average annual rate of 10%, the gap in regional economic development is becoming more obvious and showing an ever-widening trend.

## 2. Literature Review

As an important way to accelerate economic growth, FDI has always been the research hotspot of scholars. As for the research on the impact of FDI on China's economic growth, most scholars and experts found that FDI was positively correlated with economic growth, but the correlation

degree was affected by different variables. Based on the relationship between the mode of FDI entry and economic growth under the new situation, Zhou Yue (2016) held that cross-border M&A and greenfield investment can promote the economy in economically developed regions, while in economically less developed regions, only greenfield investment can promote economic growth. Therefore, FDI has different effects on the different regional economies. Wang Kaihua (2010) believed that FDI could expand employment and export, promote technological progress, and enhance management level, thus promoting regional economic growth. Feng Xueyan (2016) supported that the impact of FDI was different on the economic growth of the whole country and the eastern, central, and western regions. Li Yuxin and Sun Peilei (2016) used the VAR model to study the time series data from 1985 to 2014 in the northwest part of China's Silk Road Economic Belt and concluded that FDI had an obvious promoting effect on economic growth. Using the extremum boundary model, Shu Tong et al. (2014) concluded that the impact of FDI on economic growth could be affected by the stage of development in China. By studying the panel data of 30 provinces from 1998 to 2010, Cui Jianjun et al. (2014) concluded that FDI had different impacts on the economic development of different regions in China. FDI has a significant promoting effect on the development of eastern regions and western regions, while its impacts on central regions are not significant. Feng Xueyan (2016) claimed that FDI was one of the important ways of economic growth in developing countries or economically underdeveloped regions and that the impacts of FDI on economic growth are significantly different among the eastern, central, and western regions.

In the foreign scholars' research, no matter the research objects were Latin American countries or Asian countries, developed countries or developing countries, there was a strong conclusion that FDI can promote the economic development of a country. D. Gregorio (1998) researched Latin American countries and concluded that FDI could significantly help Latin American to grow economy. Based on the endogenous growth theory, Makki et al. (2004) concluded that FDI had a positive effect on the economic growth of developing countries, and FDI had a stimulating effect on domestic investment. Tiwari et al. (2011), based on the panel data of Asian countries from 1986 to 2008, deeply explored the impact of FDI on economic growth and concluded that FDI had a promoting effect on the economic development of Asian countries. Matsuzaki(2015) studied the impact of FDI on SAARC economies and concluded that FDI not only positively promoted economic growth, but also indirectly affected GNI level and export level. Taking panel data as samples, P Pheang et al. (2017) studied the relationship among FDI, economic growth, and export in the Association of Southeast Asian Nations (AEEAN). The study showed that FDI in the Association of Southeast Asian Nations (AEEAN) promoted economic growth under the premise of introducing export variables.

Experts and scholars around the world have their views on FDI's impact on the economic growth of host countries. Therefore, it is greatly significant to study the influence of FDI on China's economic growth. Through the analysis of the various references, it can be seen that the current researches on the influencing factors of regional economic development differences caused by FDI mainly focus on the following two aspects: First, in terms of the selection of research objects and data, most scholars confine their visions to the overall level of a province or a country. Second, most of the available studies only discuss the role of a single factor in economic development. Based on these two limitations, this paper makes a separate study on the Eastern, central, and western regions in China, and compares the impacts of FDI on the economic development in the three regions. By selecting an appropriate econometric model, the paper makes a comprehensive empirical study - the influences brought by capital, labor cost, and technological progress are also taken into account so that conclusions and suggestions which reflect the actual situation could be obtained.

### 3. Empirical Analysis: The FDI's Impact on the Differences of Regional Economic Growth in China

#### 3.1. Model and Data

Drawing on the new economic growth theory after the 1980s and the Cobb-Douglas production function, we created a new model required by this paper. In general state,  $Y=AK^\alpha L^\beta$  is the production function, where Y represents output, K and L correspond to capital factor and labor factor respectively, A corresponds to technical factor,  $\alpha$  corresponds to the output elasticity formed by the capital factor, and  $\beta$  corresponds to the corresponding elasticity of labor factor. In this study, the general production function is adjusted and modified to the new production functions of the different regions. We suppose an open economic environment where there must be domestic investment inflow and foreign investment inflow, so  $K_d$  and L are set to represent them respectively. Besides, we use regional GDP to describe the overall output of different regions (Y). This paper compares the degree of impact of FDI on the eastern, central and western regional economies when the inflow of FDI is equal and then measures the influence coefficient of FDI on these three regional GDP growths, comparing the size of FDI and making analysis and summary.

##### 3.1.1. Model Selection

Because the influencing factors of the regional economic development level and differences are various, we need to select the relevant indicators. Finally, the following indicators are selected: domestic capital, labor, human capital level, industrial structure, and government guidance.

Based on the endogenous growth model, the following model is constructed:

$$GDP = F(FDI, K_d, L, RD, I, M) = AFDI^\alpha K_d^{\beta_1} L^{\beta_2} RD^{\beta_3} I^{\beta_4} M^{\beta_5} \quad (1)$$

Take logarithms on both sides of the above formula:

$$\ln GDP_{it} = C_i + \alpha \ln FDI_{it} + \beta_1 \ln K_{dit} + \beta_2 \ln L_{it} + \beta_3 \ln T_{it} + \beta_4 \ln I_{it} + \beta_5 \ln M_{it} + \varepsilon_{it} \quad (2)$$

Where,  $C_i$  is a constant, representing that each region has the fixed effect, which does not change with the change of the dependent variable in the equation. A represents factors that change over time, such as economic fluctuations or production efficiency. Here, i corresponds to region, t corresponds to time, GDP represents regional GDP, FDI represents the foreign direct investment,  $K_d$  represents domestic capital, L represents labor force, RD represents the human capital level, 'I' represents industrial structure, M represents policy factors,  $\varepsilon_{it}$  represents possible perturbations.  $\alpha$ ,  $\beta$  stands for elasticity, which is the percentage change in GDP when different elements vary by 1%.

##### 3.1.2. The Description of the Data

Y stands for the level of production output, and GDP is calculated by referring to relative prices. In the analysis, GDP, deflated through the deflator method that regards the price in 1985 as the constant price, judges the level of economic development. The detailed processing conversion is  $GDP \text{ in year } t = GDP \text{ index in year } t / 100 * 1985 \text{ GDP value calculated based on current prices}$ , unit: RMB 10,000.

FDI represents the total amount of foreign direct investment. In the actual analysis process, the dollar-denominated data is converted into RMB based on the current year's exchange rate. Then, the GDP index deflator is used to complete the subsequent data processing, controlling the impact of the price problem. Unit: RMB 10,000.

$K_d$  stands for domestic capital and is generally calculated by subtracting the actual amount of FDI from the total investment. However, due to insufficient data, the value of FDI subtracted from the fixed asset investment of the whole society represents domestic capital. Then, the GDP index deflator is used to process data to avoid the impact of price problems. Unit: RMB 10,000.

L stands for the specific number of registered employees at the end of the year, unit: 10,000.

R&D represents the actual level of human capital and is expressed in the form of internal expenditure of R&D investment in the three regions.

'T' stands for industrial structure, which is expressed by the ratio of the output of the tertiary industry in each region to the total industrial output value.

M represents the influence of the government, which is expressed by the ratio of the difference between regional total revenue and fiscal expenditure to total revenue, as the basic indicator of government intervention.

In the actual analysis process, according to the relevant data of the Bureau of Statistics, 31 provinces and municipalities were selected and defined as the three basic regions of East, West, and East. In the east, there are many provinces such as Beijing-Tianjin-Hebei, Shandong, and Guangdong. The central region has jin, Hei, Yu, Xiang, and other provinces; In the west, there are many provinces, including Mongolia, GUI, GUI, and Qing. Select panel data from 2000 to 2016 for regression analysis. Table 1 introduces the division of the three basic economic zones.

**Table 1.** The introduction of the three basic economic zones

Eastern regions	Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan 11 provinces
Central regions	Jilin, Shanxi, Heilongjiang, Anhui, Jiangxi, Henan, Hunan, and Hubei 8 provinces
Western regions	Inner Mongolia, Guangxi, Guizhou, Xizang, Sichuan, Chongqing, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang 11 provinces and autonomous regions

To control the impact of prices on data as much as possible, the 1985 price index as the base period carries out the adjustment operation, and the central parity of the dollar exchange rate at the end of the year is utilized to convert FDI. The above data and materials are from the China Statistical Yearbook, China Statistical Yearbook of Foreign Countries, China Fixed Asset Investment Statistical Yearbook, and China Economic Network statistical Database.

### 3.2. Relevant Tests

#### 3.2.1. Stationary Test

Most of the time-series data used in the model estimation are non-stationary, while the traditional measurement method is only suitable for the stationary time series, but not for the non-stationary time series. If a direct regression analysis is made, the result of false regression may appear. Although a high R square is obtained, it is not of great significance, causing errors in the empirical results. So, this paper conducts an ADF test to test the stationary of relevant time series, ensuring the validity of regression results and avoiding the occurrence of false regression.

The formula is  $y_t = \rho y_{t-1} + \mu_t$ . The null hypothesis of the unit root test is  $H_0: |\rho| \geq 1$ ; the alternative hypothesis of the unit root test is  $H_1: |\rho| < 1$ . In the actual test, it is,  $\Delta y_t = \delta y_{t-1} + \mu_t$ .

$\delta = \rho - 1$ , the test of the null hypothesis and the alternative hypothesis become  $H_0: \delta = 0$ ;  $H_1: \delta < 0$ , respectively. If the result shows that the null hypothesis is accepted, the  $Y_t$  is a non-stationary sequence; if the result shows that the null hypothesis is rejected, the  $Y_t$  is a stationary sequence.

The regression form of ADF test is as follow:

$$\Delta y_t = c + \beta t + \delta y_{t-1} + \sum_{i=1}^k \gamma_i \Delta y_{t-i} + \mu_t$$

Where, k is the lag order, which is determined by Schwartz’s rule.

First, the ADF test was conducted on China's GDP and FDI respectively to verify the stationarity of these two major sequences. The results are shown in the following Table.

**Table 2.** The result of the ADF test

variables	ADF statistic	1% critical value	5% critical value	10% critical value	Test result
LnFDI	-0.6020	-1.820	-1.730	-1.690	Non-stationary
D.LnFDI	-2.8333	-1.820	-1.730	-1.690	stationary
LnGDP	-1.1098	-1.820	-1.730	-1.690	Non-stationary
D.LnGDP	-3.4800	-1.820	-1.730	-1.690	stationary

According to Table 2, after taking logarithms of the value of FDI and GDP respectively, the statistics tested by ADF are all greater than the critical values of 1%, 5%, and 10%. In this case, the null hypothesis should be accepted, showing that this is a non-stationary time series. We conducted first-order differences for LnFDI and LnGDP respectively and concluded that the ADF statistic of DLnFDI and DLnGDP was less than the critical value of 1%, 5%, and 10%. In this case, the null hypothesis was rejected, showing that the first-order difference series is stationary. Therefore, both FDI and GDP are first-order integration, belonging to the same order integration. There may be a stable co-integration relationship in the long run.

**3.2.2. Hausman Test**

The Hausman statistic is used to test the choice of either the random-effects regression model or the fixed-effects regression model. The null hypothesis and the alternative hypothesis are:

H0: Individual effect is not correlated with regression variables. (stochastic effect regression model)

H1: Individual effect is correlated with regression variables. (fixed effect regression model)

Hausman statistics:

$$H = (\beta^{\wedge}_{RE} - \beta^{\wedge}_{FE})' Var[(\beta^{\wedge}_{RE} - \beta^{\wedge}_{FE})]^{-1} (\beta^{\wedge}_{RE} - \beta^{\wedge}_{FE})' \sim \chi^2(k)$$

Where  $\beta^{\wedge}_{RE}$  represents the estimated coefficient of the fixed-effect model,  $\beta^{\wedge}_{FE}$  represents the estimated coefficient of the random-effect model,  $Var[(\beta^{\wedge}_{RE} - \beta^{\wedge}_{FE})]$  is the covariance matrix of the coefficient vectors  $(\beta^{\wedge}_{RE} - \beta^{\wedge}_{FE})$ . Under the null hypothesis of random effects, the Hausman test obeys  $\chi^2$  distribution with degree of freedom k. If the statistical value of H is less than the critical value, the null hypothesis is accepted and the random effect regression model is selected; if the statistical value of H is greater than the critical value, the fixed effect regression model is selected.

**Table 3.** The result of the Hausman test

	Whole country	Eastern region	Central region	Western region
Test statistics	52.18	12.25	14.29	34.57
Degree of freedom	6	6	6	6
P-value	0.0000	0.0567	0.0265	0.0000

According to the Hausman test, P values are generally less than 0.1, so we don't accept random effects, so we can use fixed effects.

#### 4. The Analysis of Regression Results

Regression analysis was carried out through model 2 in the whole country, eastern region, central region, and western region, and the results were shown in Table 4.

**Table 4.** The result of regression

variables	Whole country	Eastern region	Central region	Western region
C	2.198***	-0.599	-3.596	-3.965***
	(0.2697)	(0.6002)	(2.3258)	(0.6622)
LnF	0.046***	0.114***	-0.044*	0.028***
	(0.0080)	(0.0215)	(0.0257)	(0.009)
LnK	0.482***	0.442***	0.545***	0.511***
	(0.0250)	(0.0481)	(0.0346)	(0.0230)
LnL	0.085***	0.534***	0.279	0.163
	(0.0250)	(0.0776)	(0.3202)	(0.1003)
LnR&D	0.188***	0.128***	0.099***	0.167***
	(0.0137)	(0.0254)	(0.0307)	(0.0211)
Lnl	-0.208***	0.069	-0.207**	-0.107
	(0.0527)	(0.115)	(0.069)	(0.0733)
LnM	-0.589***	-0.700***	-0.280	-0.007
	(0.0739)	(0.2401)	(0.6285)	(0.0413)
R <sup>2</sup>	0.9923	0.9922	0.9691	0.9737
F	1935.45	1486.43	1303.46	2170.10

Note: For the standard error corresponding to the data inside the brackets, \*\*\* means significant at the 1% level, \*\* means significant at the 5% level, and \* means significant at the 10% level.

Table 4 with the research results of fixed effects shows that the F value was significant at the level of 0.0000 from 2000 to 2016, indicating that this model has significant statistical significance. R<sup>2</sup> is greater than 0.99, which means that this model can explain more than 99% of the variation in GDP, satisfying the characteristic significance. This result indicates that there is a significant correlation between the economic growth of the three regions and FDI, domestic capital, labor force, human capital level, industrial structure, and government orientation, and the model can explain the economic development of different regions.

According to the regression results, from the national perspective, FDI, K, L, R&D are all significantly positive at the 1% level, which indicates that foreign direct investment, domestic investment, labor force, and the level of human capital are significantly positively correlated with the level of economic growth in China. The more foreign direct investment, the more domestic investment, the more labor, and the more human capital can promote the economic growth of our country more. Specifically, FDI has a positive relationship with economic growth in the east and west. 1% increase in FDI in the eastern region will increase the region's GDP by 0.114%; 1% increase in FDI in the western region will increase the region's GDP by 0.028%; 1% increase in FDI in the central region will decrease the region's GDP by 0.044%. It indicates that FDI has a so much stronger promoting effect on the economy in the east than in the middle and in the west. However, the total amount of FDI introduced by the eastern region far exceeds that of the central and western regions, which will inevitably increase the economic growth difference among the three regions. Therefore, it can be concluded that the introduction of FDI will increase the differences in the economic growth of the three regions to a large extent. In addition, domestic investment and human capital have a significant positive relationship with economic growth in the whole country and each region and have different impacts in different regions.

Regression analysis shows that:

1. FDI, which is significant at the level of 10% in the central region and at the 1% in the other regions, has a relatively obvious impact on economic development. The influence coefficient of FDI on the national economic growth is 0.046, which means that FDI has a significant influence on the national economic development. The coefficients of FDI on the eastern, central, and western regions are 0.114, -0.044, and 0.028, indicating that FDI has different influences on the economic development of each region, and its contribution to the eastern region is significantly better than that of the central and western regions. The data from the central region show that FDI hurt the central region, and the main reason is that FDI squeezed out local investment. Meanwhile, FDI did not replace local investment, so it hurt the economic development.
2. Domestic capital, as a key driving force for accelerating economic growth, has more than 0.4 units of economic growth per unit of domestic capital in the whole country, eastern, central, and western regions. 1% increase in domestic capital increases the GDP of the eastern, central, and western regions by 0.442%, 0.545%, and 0.511%. Compared with other factors, the economic growth of the central and western regions depends more on domestic investment. The impact of domestic capital on the central and western regions is greater than that on the eastern region. Based on the data, it can be determined that domestic capital is one of the core elements for accelerating construction in the western region.
3. The labor force has a significant positive impact on the eastern region with a coefficient of 0.534 and a significant level of 1% and has no significant impact on the economy in the central and western regions. The labor force is also significantly positively correlated with the national economic growth, with a coefficient of 0.085 which is significantly lower than that in the eastern region. This indicates that labor resources played a crucial role in the eastern economic growth from 2000 to 2016.
4. R&D investment is positively correlated to economic development. The influence of R&D on the whole country and each region is significant at the 1% level, and the difference of the influence on the whole country and each region is small.
5. The impact of industrial structure on the regional economic level is only positive in the eastern region. In this paper, the industrial structure is represented by the proportion of the output of the tertiary industry in the total output, and the tertiary industry is the service industry mainly. The service industry includes finance, construction, transportation, and other



industries, and the service industry in the eastern region is more developed than other regions, providing an important motivation for economic development and attracting the inflow of FDI. 6. The influence of government intervention on economic construction is negative, with a coefficient of -0.7 in the east, -0.280 in the middle, and -0.007 in the west. Government spending harms economic construction. In the low-income stage, government intervention is conducive to increase input, promoting economic growth; in the high-income stage, government intervention will inhibit the efficiency of the use of elements, imperiling economic growth. Therefore, it is meaningful to reduce government intervention to break the dependence of economic growth on factor input and avoid the stagnation of economic growth in the new stage.

## 5. Conclusion and Suggestions

### 5.1. Conclusion

Using the panel data econometric model for regression analysis, this paper quantitatively studies the impact of FDI on China's regional economy and draws the following conclusions:

First, FDI promotes regional economic growth in China and plays a stronger role in the east than in the middle and the west. FDI is one of the reasons for the unbalanced regional economic development in China. The research results in this paper shows that the FDI's inflow is important to regional economic growth. FDI, a combination of various resources such as the inflow of capital, the introduction of talent, the upgrading of technology and management experience, can promote China's economic growth by promoting capital formation, increasing employment, improving talent level, optimizing the industrial structure, and enhancing technological innovation. The panel data show that FDI has different effects on the three regions in China.

Second, domestic investment, labor force, human capital level, and other factors are still important forces to promote China's regional economic growth. From the perspective of capital formation, both domestic investment and FDI promote economic development, but domestic investment contributes more to economic growth than FDI. This also shows that China's economic growth is driven by domestic capital to a large extent. Therefore, domestic investment has a significant impact on economic development and causes regional economic differences. The labor force will have a significant promoting effect on the economic construction of the eastern region, but the scope is not large. After the reform, the labor force continuously has been flowing into the eastern region from the central and western regions. This change is also one of the main reasons for the imbalanced development between regions. R&D input has a promotion effect for economic growth, but the influence is relatively small. The tertiary industry in central and western regions is underdeveloped and only contributes to regional economic growth in eastern regions.

### 5.2. Suggestions

First, the central government should optimize the investment environment in the central and western regions and guide the transfer of foreign direct investment from the east to the central and western regions to achieve balanced economic development in the eastern, central, and western regions of China. In the central and western regions, the lack of the ideal investment atmosphere and insufficient infrastructure results in unsatisfactory investment efficiency, exerting a significant negative effect on investment attraction. In the future development, we should actively strengthen the government's service to achieve a better investment environment.

Second, the central government should increase investment in human capital in the central and western regions. FDI can not only fill the shortage of capital in the host country but also form a relatively strong technology spillover. The absorption of superior technologies is closely



related to the local human and capital status of the host country. Therefore, in the future development process of the central and western regions, it is necessary to constantly increase investment in human resources, further optimize the original talent training mechanism, actively promote the counterpart training system, and rely on their significant advantages in human capital and resources to obtain more adequate foreign investment.

Third, the central government should increase transfer payments of the central and western regions. The means of central financial transfer payment to support the underdeveloped areas is crucial for promoting the coordinated development of the regional economy. Nowadays, it is suggested to accelerate the establishment of a standardized transfer payment system based on strengthening the central policy. The key points of the transfer payment in the western region are as follows: First, major infrastructure construction projects, such as roads, railways, and airports, should be further strengthened or revamped. Rebuilding the new transportation network may solve the backward situation of information technology and related supporting facilities. Second, accelerate the development of technological and educational industries in the western region. We should not only increase the educational investment in the western region but also pay attention to technical education.

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