The Reginal Differences in Attracting FDI and the Changing Influences of FDI Determinants: A Study on China

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Abstract

Academic research on the determinants of foreign direct investment in China is abundant. However, recent research on this topic is relatively few, and previous studies have neglected the significant economic and social differences among Chinese regions. Thus, the purposes of this study are exploring the regional differences in attracting FDI and investigating whether the determinants of FDI are of varying importance in different periods. I divide the Chinese provinces into the East, Middle and West based on research traditions and partition the selected period into three sub-periods. According to the regression results, the determinants of FDI vary in different regions and are of shifting influences over time.

Keywords: foreign direct investment, regional differences, FDI determinants

1. Introduction

1.1 Aims of the study

After the implementation of the reform and opening-up policy[1] in 1978, the world has witnessed the outstanding progress of China's economy. One step of the central government's reform includes the introduction of policies to stimulate the inflow of foreign capital and enterprises. The policies are still followed, and until now the enthusiasm of drawing FDI has not yet changed.

Concerning the reasons why some countries can attract a considerable amount of FDI while others cannot, abundant studies have given the answers—economic size, labor costs, cultural affinity, social institutions, infrastructure and other factors contribute to the attraction of a country. Since China began to integrate deeper into the world market (joining the WTO in 2001), China has gradually become a hub of FDI. The reasons are in general similar to those stated above. There are plenty of studies on the determinants of FDI into China. However, I noticed that there are only a few studies focusing on the noticeable regional differences among different parts of China. For instance, the development status of Shanghai differs a lot from that of rural provinces

[1] A series of measures aim at improving economic and social system, and expanding openness. The process is still under way.

such as Yunnan. The following tables show how notable the gaps among different parts of China are.

Table 1. Total nominal GDP of each region and its shares in percentages in corresponding years (billion yuan)

	1995	***2000***	***2005***	***2010***	***2014***
the East Region[2]	3,264	5,741	11,780	25,049	37,873
	56.7%	58.2%	59.6%	57.4%	55.4%
the Middle Region	1,441	2,400	4,636	10,515	16,752
	25.0%	24.4%	23.5%	24.1%	24.5%
the West Region	1,053	1,716	3,334	8,090	13,718
	18.3%	17.4%	16.9%	18.5%	20.1%

Source: National Bureau of Statistics of China.

Table2. Total annual inward FDI of each region and its shares in percentages in corresponding years (million dollars, current price)

	1995	***2000***	***2005***	***2010***	***2014***
the East Region	32,278	34,886	68,363	129,158	174,910
	85.5%	86.3%	81.5%	73.0%	65.2%
the Middle Region	3,272	3,594	11,056	30,253	63,950
	8.7%	8.9%	13.2%	17.1%	23.9%
the West Region	2,213	1,961	4,440	17,527	29,222
	5.9%	4.8%	5.3%	9.9%	10.9%

Source: National Bureau of Statistics of China.

From Table 1, each region's share of total GDP barely changed between 1995 and 2014. It is clear that the East Region (all coastal provinces and cities except Beijing) is basically much more developed than the rest places, and the Middle Region is relatively more advanced than the West Region. Reasons that have caused the various development status are multiple. First, coastal provinces and municipalities naturally have the geographical advantages which lead them to an open-economy type. Secondly, because of the convenience of the East Region, the central government granted it many privileges, such as it has the right to be the first to introduce foreign capital. From 1979 the establishment of special economic zones to the overall opening, the process always followed the sequence of coastal places to inner land. Besides the geographical and

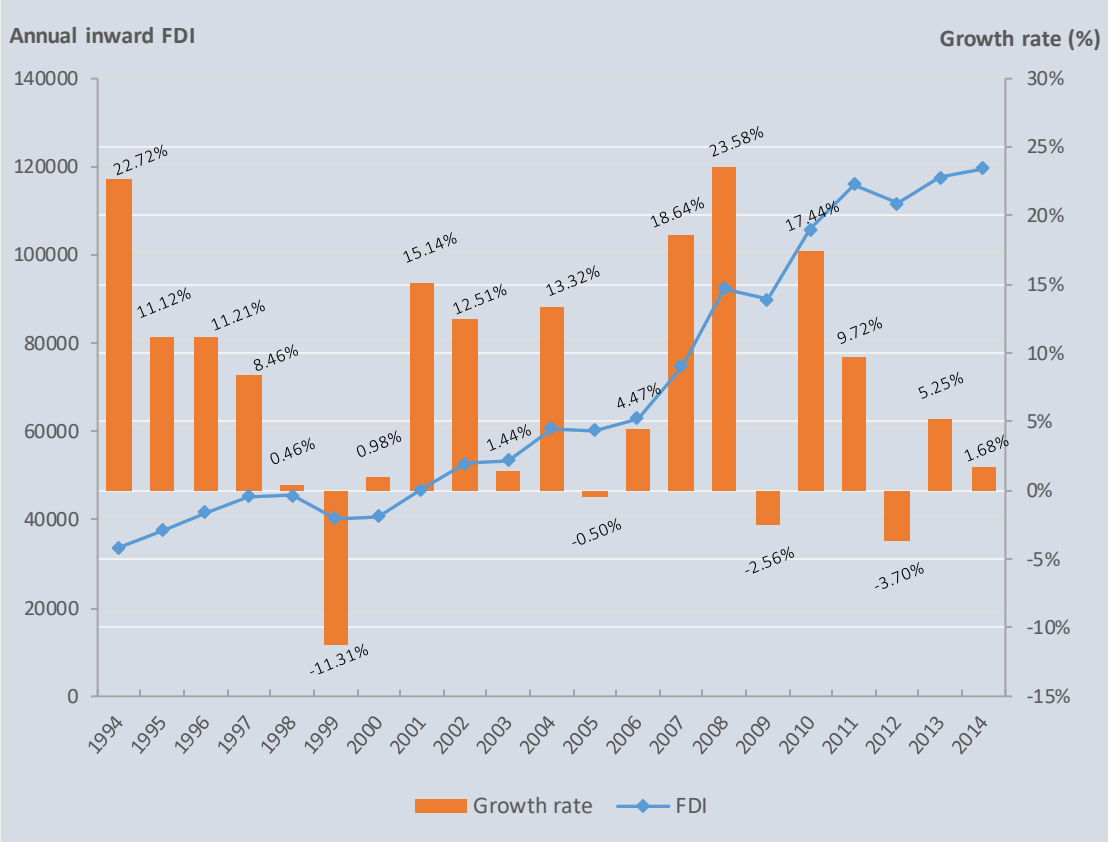
[2] The division of regions accord with the practice of statistics work and academic studies. The East Region includes 11 provinces and municipalities: Beijing, Tianjin, Liaoning, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong and Hainan. The Middle Region has eight provinces: Shanxi, Henan, Anhui, Hubei, Hunan, Jiangxi, Jilin and Heilongjiang. The West Region includes Inner Mongolia, Shaanxi, Gansu, Ningxia, Xinjiang, Guizhou, Sichuan, Chongqing, Guangxi, Yunnan, Qinghai and Tibet.

policy differentiation, the infrastructure of transportation, education and technology, population quality and past development altogether formed the current economic map of China. From Table 2, although the FDI share of the East Region has dropped gradually over time, it is still far more than that of the other two regions. In 2014, the East Region occupied 65% of total FDI, while the middle and west only achieved 24% and 11% respectively. Thus, whether the different economic and social status affects the introduction of FDI is of importance. In this study, I intend for discovering whether overseas investments are drawn by discrepant factors for different regions. In other words, do factors that influence FDI into one region also have an impact in other regions? The regional differences in attracting FDI are the subject of this study.

Besides the aim of exploring the spatial differences of the determinants of FDI, another main point is checking whether during different time periods the importance of determinants would change or not. This study covers a time range from 1994 to 2014. The chosen period basically covers the rapid developing stage of China's economy. To achieve the second aim, I divide the time range into three sub-periods: 1994-2000, 2001-2007, and 2008-2014. This division firstly accords with the historical performance of inward FDI. As shown in Graph 1, before 2001, the annual FDI into China fluctuated around 40 billion USD, while between 2001 and 2007, the inward FDI had a stable upward trend. After a surge in 2008, the amount of FDI suffered a drop because of the global financial crisis, and soon it rose sharply again and fluctuated between 110 billion and 120 billion USD. Apart from the above facts, the intervals of those periods witnessed several momentous events. First of all—the reform of state-owned enterprises (privatization of SOEs[3] in essence) in 1998 revived the Chinese economy while at the same time led to a dismissal of millions of workers. Secondly, China entered the WTO in 2001. Thirdly, the financial crisis in 2008. All these events led the economy of China and the world into new stages. Thus, this period division reasonably reflects the time differences of the inward FDI and unavoidable mega-events. In summary, combining the two aims together shows the primary purposes of the study: 1. Discover the regional differences in attracting FDI; 2. Check the varying importance of the FDI determinants.

[3] The abbreviation for state-owned enterprises.

Graph 1. Chinese annual inward FDI (million dollars) and FDI growth rate 1994-2014



Source: China Statistical Yearbook 2015.

1.2 Outward foreign direct investment from China

The theme of this study is the inward FDI of China. However, in recent years, there is an increasing zeal for China's outward foreign direct investment (OFDI) in the academic world. According to the 2014 Statistical Bulletin of China's Outward Foreign Direct Investment, the annual Chinese OFDI of 2014 reached 123 billion US dollars, which exceeded the amount of inward FDI (119 billion US dollars). It is evident that China has become an important economy for both receiving foreign investment and providing investment abroad. However, although investing massively abroad has been a new feature of China's economy, I do not include this issue in the study. For the reasons, first, let us take a look at the destinations of Chinese OFDI.

From Table 3 it can be seen that—in 2014, investment towards Hong Kong, the Cayman Islands and the British Virgin Islands occupies nearly 65% of the total Chinese OFDI. Those regions are famous for being tax havens. It is critical because domestic capital can take advantages of them and flow back to the home country with an identity of foreign investment. Generally, tax havens have several features such as small-sized

economy, richness and high governance capability (Dharmapala and Hines Jr., 2009). They charge no or considerably low taxes so that foreign investors would love to establish companies and offices to avoid high taxation. Large multinationals are more willing to take advantages of tax havens, because those firms have massive intra-firm trades (Desai et al., 2006). Thus, on many occasions, it is difficult to define the identity of foreign investment, and also tricky to verify the final destination of the capital that flows to tax havens. It is possible that the investment unnoticeably goes back to China later with an identity of foreign investment so as to enjoy preferential policies. For example, the dominant domestic search engine company of China—Baidu is actually registered in the Cayman Islands. Thus, when studying the determinants of Chinese OFDI, some scholars discard the data of those tax havens, only focus on the investment into America, Europe and Africa (Kolstad & Wiig, 2012).

Table 3. Destinations of Chinese OFDI in 2014

Regions	*Amounts (million USD)*	*Percentages*
Asia	84988.03	69.0%
Europe	10837.91	8.8%
Africa	3201.92	2.6%
North America	9207.66	7.5%
Latin America	10547.39	8.6%
Oceania	4336.95	3.5%
Total	123119.86	100%
Hong Kong[4]	*70867.3*	*57.6%*
The Cayman Islands	*4191.72*	*3.4%*
The British Virgin Islands	*4570.43*	*3.7%*

Source: 2014 Statistical Bulletin of China's Outward Foreign Direct Investment

Besides the difficulty of verifying the real purposes of OFDI (it is also an issue for inward FDI), it is a natural process for China to finally become one of the chief providers of capital. Worldwide, the sources of FDI are mainly situated in developed countries such as the US and the Netherlands, and in most times they are net exporters of FDI. In the meantime, the less-developed countries not only receive little FDI, but also provide even much less FDI to other countries. It is a general knowledge that FDI activities are dominated by developed countries and FDI mainly flows within the advanced economies. As an emerging economy, China has reached high economic

[4] Hong Kong is counted into Asia. The Cayman Islands and the British Virgin Islands are included in Latin America.

achievements and has been a desirable location for FDI for a decade. Recently it also gradually became one of the main sources of FDI. It is an indication of more national wealth and higher corporation competitiveness. I would rather take the inward FDI and OFDI of China as two independent phenomena. When studying the two cases, we are facing different objects—host countries for inward FDI and destination countries for OFDI. Thus, synthesizing the above explanations, I decided not to include OFDI issue into the study.

1.3 Outline of the study

This study on Chinese inward FDI has two aims. One is inspecting the existence of regional differences in attracting FDI. The other is detecting the changing importance of FDI determinants over time. To conduct the empirical study, the first step is to choose the dependent variable and a set of explanatory variables. Annual inward FDI flow is chosen as the dependent variable. The selection of independent variables is based on the research needs and related literature. In this study, I use provincial data, and apply panel data analysis to conduct the research. Regressions of each region in each period I have divided are performed. As reference, regressions of full period and full regions are also operated. At last, detailed interpretation and conclusion are given after obtaining the results.

2. Literature Review

The study on the explanation of the flow of foreign direct investment is a problem of the last 50 years. In the 1960s, Stephen Hymer (1960, 1976) argued that the movement of foreign direct investment cannot be explained by the interest rate theory. He put forward that because of the imperfection of the market, a few large companies can acquire a monopoly position and hence gain more profits through investing abroad. One of his inspiring argument is that multinationals' pursuit of internalization of markets is for exploiting advantages not reducing costs. (Dunning & Pitelis, 2008). This monopolistic advantage theory makes FDI and MNEs new fields of academic research. Since then, new theories kept coming forth. After the ground-breaking work of Hymer, Raymond Vernon (1966, 1979) created the product cycle theory which explains the new phenomena of international investment and trade. It argues that three periods constitute the life cycle of one product—innovation, maturation and standardization. Each period requires different location and management strategies, which indicates the

corresponding investment and trade patterns. A Japanese scholar Kojima (1973, 1975) used macroeconomics and international economics theories to examine the FDI pattern of Japanese firms. He found that, distinct from the American pattern, most of FDI from Japan are provided by the Japanese sunset industries (domestic comparative disadvantage industries, such as the labor-intensive sectors). International trade would be promoted if FDI were from the parent country's comparative disadvantage industries. Thus, this investment pattern is called trade-oriented FDI. In 1976, Buckley and Casson put forward their internalization theory: the imperfection of the market makes it inefficient to obtain intermediate products from the external market; with internalization, multinationals can acquire internalization advantages such as reduced transaction costs and enhanced productivity. Soon after, in 1977, Jone H. Dunning combined previous research results, built the eclectic theory of international production and continuously enhanced it with later work (1988, 1998, and 2000). The eclectic theory argues that foreign direct investment activities are determined by three factors—

1. Ownership advantages which are exclusive factor endowments (such as technology, management and innovation);
2. Internalization advantages (avoid market imperfection, reduce transaction costs);
3. Locational advantages which include direct locational advantages (host countries' market potential and preferential policies) and indirect locational advantages (such as high transportation costs).

Companies with ownership advantages would prefer to invest abroad if common foreign business (such as export and licensing) are less profitable. In the meantime, to introduce FDI, the destination country must possess certain locational advantages. In other words, ownership and internalization advantages are necessary conditions for firms to invest abroad, while locational advantages are the sufficient conditions. Since the establishment of the eclectic OLI (ownership, location and internalization) paradigm, it has become a dominant framework to analyze the effectiveness of theories in explaining the determinants of FDI and multinationals' behavior.

The previous fundamental work has explained the origins of foreign direct investment and the mechanism of the activities. When examining the determinants of FDI, the following scholars concentrate more on specific and detailed issues using either theoretical or empirical arguments. And all the research either focuses on the firm-level decision making (factors affect the MNEs' decision on investing abroad) or

country-level factors that attract FDI. According to Helpman (1984), the openness of the economy is considered to be positively associated with FDI. Due to trade liberalization of the host countries, more capital would be attracted, and MNEs are more willing to expand their business through internalization. Froot and Stein (1991) found that a depreciation of a country's currency would attract more inflows of FDI. A study of Desai et al. (2004) verified the argument by discovering that during several currency crises in developing regions, the foreign affiliates of American companies increased their investment in those regions. In the studies on bilateral FDI activities, some scholars applied and expanded the gravity model of trade. They found that foreign direct investment is significantly associated with the gravity model factors such as economic size and geographical distance, and also other factors such as cultural affinity and the number of trade agreements (Carr et al., 2001; Bergstrand & Egger, 2007; Stein & Daude, 2007). There are also plenty of studies on the institutional factors. Wei (2000a, 2000b) adopted several corruption indexes to examine their effects and found that corruption is negatively associated with FDI. Bénassy-Quéré et al. (2007) argued that bureaucracy and corruption are two critical factors of reducing FDI inflows. In a study of Asiedu and Lien (2011), they investigated African countries and found that the effect of democracy on FDI is related to natural resources export. If natural resources hold a small share in total exports of a country, democracy will boost inward FDI. Otherwise, it will act as an adverse factor.

Since China has performed eminently in economic development and FDI drawing, substantial China-focused studies have emerged. According to Cheng and Kwan (2000), large market size and infrastructure upgrade can boost inward FDI, while wage poses a negative effect on it. Similar findings are given by Sun et al. (2002). Additionally, they studied the changes in the importance of FDI determinants through time, based on the shifting nature of FDI in China. They divided the data from 1986 to 1998 into two periods and discovered that the influence of the determinants varies over time. This research has offered particular inspiration for my study. As for other Chinese studies, in a spatial research of Coughlin and Segev (2000), an inspiring conclusion was drawn—more FDI into a province simultaneously drives more foreign capital into neighboring provinces, which indicates FDI has a regional externality effect. As China has a different social and economic system, institutional reforms seem to be a concern for foreign investors. Fung (2006) examined that foreign investors are more interested in soft infrastructures (economic reforms) other than hard infrastructures (such as

railways and highways). From the company aspect, Bjorkman et al. (2008) stated that foreign subsidiary operation is one central problem concerning the research on multinationals. In the case of China, Demir & Soderman (2007) discovered that, at the initial stage, most FDI in China are in the form of joint ventures, and thus there is a rising concern of ownership preferences. At this period, the host country's business and institutional environment seems to be the most important. After China entering the WTO, ownership restrictions have been lessened and MNEs tend to enhance the control of affiliates and joint ventures (Cheung & Leung, 2007; Xia et al., 2008).

3. Model structure, data and methodology

3.1 Division of regions

The division of regions has briefly been shown in the introduction part. The following is the illustration in detail. Because of the wideness of the territory of China and the differences of development among different regions, studying China as a whole can hardly explain everything. Therefore, dividing China into several regions and investigating separately seems to be a better approach. According to the geographical nexus and economic status, I here divide China into three regions, and this division also complies with most regional studies. The division expressed in Table 4 accords with the old statistical approach of the Chinese government. In the updated category, Liaoning, Jilin and Heilongjiang are grouped in the Northeast Region due to historical and geographical connections, and also the similarity of the economy. Nevertheless, in this study, I keep the old categorizing because the over-segmentation will significantly reduce the observations and the old approach is sufficient to meet the study aims.

Table 4. The division of regions of China

Regions	Provinces included
The East	Beijing, Tianjin, Liaoning, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Hainan
The Middle	Shanxi, Henan, Anhui, Hubei, Hunan, Jiangxi, Jilin, Heilongjiang
The West	Inner Mongolia, Shaanxi, Gansu, Ningxia, Xinjiang, Guizhou, Sichuan, Chongqing, Guangxi, Yunnan, Qinghai

This study focuses on the mainland China, thus excluding Hong Kong, Macao and

Taiwan. Tibet is also excluded due to a lack of data. The following table shows how many provinces each region contains. The East and West Regions both include eleven provinces while the Middle Region contains eight.

3.2 Potential independent variables

In the studies on the determinants of FDI, the selection of explanatory variables varies a lot. Because of the limitation of sample size and inaccessibility of data, it is not possible to cover all the potential determinants. Table 5 summarizes the potential variables I intend to detect. Following the table are the detailed description on the variables. However, the final selection should depend on the multicollinearity test.

Table 5. Potential determinants of FDI

Determinants	Proxy
1.Economic size	Real GDP
2.Labor cost	Rea annual average wage (WAGE)
3.Labor quality	Ratio of college students on campus to ten thousand population (EDU)
4.Infrastructure	Highways per 1000 km^2 (HIGHWAY)
	Traditional railways per 1000 km^2 (RAIL)
	High-speed railways per 1000 km^2 (HSR)
5.Reform	Industrial output of state-owned enterprises over total industrial output (SOE)
6.Technology Level	Patent authorizations per 100 people (TECH)
7.Corruption	Corruption indicator from ICRG
8.Economic openness	Import/GDP (OPENNESS)

Firstly, *economic size* as a main attraction for FDI has been tested by plenty of studies. A popular approach to measure the economic size is using GDP. In this research, I choose the real GDP of each province as the proxy. The reason to use the real GDP is to avoid the effects of price change and inflation. Nevertheless, GDP actually carries multiple implications, not only the economic size of a country, also purchasing power or production capability. Therefore, we should be prudent when interpreting the results.

Wage or *labor cost* is intuitively a negative factor. However, it is not always certain that the relationship between wage level and FDI is negative, especially when the FDI is more interested in advanced industries such as IT and finance. The need for high-skilled labor will raise the labor costs but also creates more value. China is now on the path of industrial upgrading. The real effects of wage level need further investigation.

In this study, I use the real average annual wage of Chinese workers as the proxy.

Labor quality, which denotes the productivity of workers, should be positively related with inward FDI. There are several suitable proxies of labor quality such as the education level and the number of engineers. Here I apply the number of college students in campus within ten thousand people.

Well-built *Infrastructure* is a large competitiveness of China comparing with many other developing countries. Infrastructure covers many aspects such as electricity production and transportation infrastructure. In my study, I focus on the effects of transportation infrastructure which includes traditional railways, high-speed railways[5] and highways. The high-speed rail system that started to operate in 2008 is of large difference with traditional railways (higher technological requirements and more investment). This improvement in transportation is worth studying.

Economic and social reform is always a central task for the Chinese government. Reforms that lead to better economic and institutional systems give positive signals to foreign investors. In the case of China, state-owned enterprises contribute a considerable part to the whole economy. With the support of the government, they usually have unbalanced advantages against the foreign companies. Government policies on the state-owned companies are always regarded as an indicator of the freedom of Chinese economy. Thus, to assess the influence of the state-owned companies on the FDI, I take the proportion of industrial output produced by the state-owned companies as a measurement of Chinese reforms.

Technology level of a country generally reflects its development status. Its impact on FDI may be mixed. On the one hand, the higher technology level a country can achieve, the more FDI related to advanced industries can be attracted. On the other hand, higher technology level means higher competitiveness of domestic firms. The increasing competition is a negative push to foreign firms. I adopt the patent authorization quantity per ten thousand people to measure the technology development. In fact, the fittest indicator should be the R&D personnel full-time equivalent, but the data cannot cover the time range of this study.

Corruption is always a concern of foreign companies. Severe corruption can harm the confidence and willingness of foreign investors. I choose the corruption indicator from the International Country Risk Guide (ICRG) to measure the corruption status of

[5] According to the *Code Design of High Seed Railway* published by China's Ministry of Railways, high-speed railways are a kind of railways with a designed speed over 250 km/h.

China. The score range of the indicator is 1 to 6. A *high* score means the corruption level of a country is *low*. Because the guide only contains indexes at country level, the scores among the Chinese provinces are the same. The determinant of corruption here acts more as a control variable.

At last, *economic openness* should be a positive factor in attracting FDI. To measure the degree of openness of each province, I adopt the ratio of import value over nominal GDP. Import value and GDP are in current prices in this factor.

3.3 Data

When conducting an empirical study, it is crucial to gather necessary data from trustable sources. Data used in this study are basically collected from authentic publishers, mainly from statistical yearbooks published by the Statistics Bureau of China and provincial statistics bureaus. The following table summarizes the sources where the data were gathered from.

Table 6. Data Sources.

Variables	**Sources**
Annual FDI inflows	*China Statistical Yearbooks;* *Statistical Yearbooks of each province*
Annual wage College students in campus Output of state-owned enterprises Import	*China Statistical Yearbooks;* *China Compendium of Statistics*
GDP Highway Distance Railway Distance	*China Statistical Yearbooks*
High-Speed Rail Distance	*Government Reports and News*
Corruption Indicator	*International Country Risk Guide*

However, there is one proxy—high-speed railway has the potential problem of data source. In this study, I take the high-speed railway density (the ratio of the length of high-speed railways to the area of one province) to measure the effect of this improvement in transportation. Because of the short history of Chinese high-speed railways, there is a lack of official statistics about the length each province possesses every year. To overcome the problem, based on the construction reports and news from the government, I added each year's newly-built high-speed railway length of each province to obtain the data needed. Although the approach of getting the data may be

questionable, the calculation is precise enough for the study.

For the convenience and necessity of the empirical study, some of the raw data have to be further processed. For the dependent variable FDI, the original unit is USD. For consistency, the unit is changed into Chinese currency CNY based on each year's average exchange rate. All other variables measured with currency are all in per CNY, such as GDP and wage. Moreover, to eliminate the price effect, GDP and wages are measured with constant price (the price of 1994).

3.4 Methodology

Since the study focuses on the regional differences in attracting FDI and varying importance of FDI determinants through time, panel data analysis is adopted. As stated in the introduction part, the time range of the study covers 21 years from 1994 to 2014. According to the character of FDI and development status of China's economy, I divide the time range into three sub-periods: 1994 to 2000, 2001 to 2007, and 2008 to 2014. Because the study also covers three regions, totally nine regional regressions will be operated. Besides, for reference, regressions that include full time periods and all regions will also be performed.

Between the potential independent variables, multicollinearity probably exists. Thus, before operating the regressions of each period, variables that are highly correlated with the others should be excluded based on the correlation matrix. Appendix 1 displays all the correlation matrixes. Overly large correlation coefficients (absolute values equal or greater than 0.70) are highlighted. According to the correlation matrixes, variables WAGE and EDU are excluded because they are highly correlated with some other variables in almost all the cases. Moreover, WAGE is measured by the annual average wage of all urban workers not average wage provided by foreign established companies. The estimation may be biased because the gap between the two wage levels is generally large. Moreover, the data of the average wage in foreign companies are hard to obtain. Thus, it is better to rule out this variable.

Concerning the form of the regression equation, I assume the relation of FDI and the explanatory variables is linear, and least square approach is applied. All the variables are in logarithmic form. Also, in case of endogeneity, all explanatory variables are in one-period lag except CORRUPTION. Below are the specific regression equations. Equation (1) is used in the first two period regressions of the East Region, the Middle Region, and all regions included. The second equation is also for them but for the period 2008-2014; variable HSR is added. Equation (3) is for the West Region.

The last equation is used in the regressions of full time periods.

(1) $ln(FDI)_{it} = \alpha_i + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

(2) $ln(FDI)_{it} = \alpha_i + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(HSR)_{it-1} + \beta_4 ln(SOE)_{it-1} + \beta_5 ln(CORRUPTION)_{it} + \beta_6 ln(TECH)_{it-1} + \beta_7 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

(3) $ln(FDI)_{it} = \alpha_i + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(RAIL)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

(4) $ln(FDI)_{it} = \alpha_i + \gamma_t + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(TECH)_{it-1} + \beta_5 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

In equations (1) to (3), i and t denote the Chinese region i and time period t, respectively. α_i refers to the intercept. ε_{it} is the error term. Because the density of highway in the West is considerably smaller than that in the other two areas, RAIL other than HIGHWAY is used in the model of the West Region. Besides, most provinces in the West have few high-speed railways, so variable HSR is excluded from the model of the West. In all the sub-period regressions, cross-sectional fixed effects are applied. Because Chinese regions considerably differ from each other, fixed effects model is more suitable than random effects model. By this means, a unique intercept would be endowed to each cross-section to represent regional differences. Moreover, individual time-invariant variables (such as government policies, geographical distance to harbors, etc.) which cannot be included in the model would be captured in the individual intercepts. The results of Hausman tests also verify the choosing of the fixed effects. As for the period fixed effects, because the sample size of sub-period models of each region is limited, including period fixed effects will lead to a loss of degree of freedom, which may influence the effectiveness of the results. Therefore, I decided not to include the period fixed effects into those sub-period regressions. Variable CORRUPTION in the model is adopted to control for the potential period individual-invariant variables. Since the time periods applied in the sub-period models are short (seven years), autocorrelation may be not a critical issue. Instead, due to regional differences, great importance should be attached to heteroscedasticity problem. To solve this issue, general least square (GLS) approach should be taken.

The basic sub-period regression models are expressed by the above equations (1) to (3). To test the robustness of the regression results, I will replace GDP with total

retail sales of consumer goods[6] (RETAIL) to check whether the results would change significantly. As GDP, total retail sales can also reflect the economic size of an area. Moreover, the variable RETAIL is highly correlated with GDP but has minor correlations with all the other variables. In this additional model, GDP will be replaced by RETAIL while other variables will be unchanged. RETAIL is also in logarithmic form and taken one-period lag.

Besides the sub-period regressions, I also perform full-period regressions of each region and all regions included. Because of the relatively long period and sufficient observations, it is necessary to include period fixed effects. In equation (4), α_i refers to the intercept varies with individuals, and γ_t denotes the intercept shifts with different periods. Thus, the two-way fixed effects model can capture the individual time-invariant variables and period individual variables. In the full-period regression of the West Region, variable HIGHWAY is replaced by RAIL. For comparison, regressions only contain cross-sectional effects are also performed.

4 Results

Table 2 to 6 in the Appendix 2 show the full-period results, and sub-period results of the regional and full-sample regressions. The interpretation is based on the basic models.

4.1 The East Region

From the full-period regression results, it can be seen that economic size and economic openness have positive impacts on the FDI into the East (1.4 and 0.43, respectively). The construction of highway poses an adverse effect on FDI but the effect is minor (-0.04). The coefficient of *TECH* is -0.11, which means FDI into the East is negatively associated with technology progress. The only insignificant variable is *SOE*. It seems to suggest that foreign investors are not concerned about the operation of Chinese state-owned enterprises. The results of the cross-section fixed effects model display no noticeable differences from above results. The coefficient of *CORRUPTION* (0.16) in the model shows this factor is positively related with FDI. Detailed interpretation of the sub-period results are as follows.

Consistent with plenty of other studies, economic size has positive and significant effects on the FDI. The estimates of *GDP* in each period are 0.46, 1.12 and 1.38, which

[6] This indicator denotes the values of consumer goods that sold directly to individuals and groups for consumption. The data are gathered from China Statistic Yearbooks.

means that in the corresponding periods 1% increase in real GDP leads to 0.46%, 1.12% and 1.38% increase in FDI. Moreover, from 1994 to 2014, the importance of this factor is on the rise. The coefficients of *OPENNESS* in the regressions of the period 1994-2000 and 2008-2014 are positive and statistically significant. One percent increase in the ratio of total import to GDP results in 0.28% and 0.19% increase in FDI, respectively. However, the influence of economic openness declines through time. Concerning the variable *SOE*, in the first period, the coefficient exhibits a negative sign (-0.12). Then in the latter two periods, the influences become positive but considerably small (0.09 and 0.005). However, all the estimates bear no significance. The findings indicate that foreign investment into the East does not concern about the pressure from state-owned enterprises, even though SOEs enjoy many privileges offered by the government. In fact, at the beginning, state-owned enterprises in many eastern provinces were not in a high position. Then their importance has been further reduced by continuous reforms. Therefore, the insignificant results are not so unexpected.

As for the transportation infrastructure, *HIGHWAY* has negative and significant effects on the inward FDI in the latter two periods (-0.11 and -0.45). The estimate of *HSR* is insignificant, but still bears a negative sign (-0.001). Some reasonable explanations must be made for those counterintuitive findings. The first reason may be the improvement of transportation infrastructure makes domestic firms more competitive. The convenience of communication and conveyance offered by the construction of highways and high-speed railways benefits not only foreign companies but also domestic firms. Thus, there is a possibility that the upgrade of transportation infrastructure gives more advantages to indigenous companies than to foreign enterprises. Another cause may relate to domestic investment. Soon after the breakout of the financial crisis in 2008, to boost the economy, the Chinese government carried out an economic stimulus package containing four trillion RMB of investment. A considerable part of the governmental investment flowed to the infrastructure such as the construction of highways and railways. From 2008 to 2014, the total length of highways has doubled from 53 thousand kilometers to 112 thousand kilometers. Nevertheless, it took almost twenty years for the highway system to reach the level in 2008. Moreover, since the operation of the first high-speed railway line in 2008, the total length of the high-speed railway system has reached 16 thousand kilometers at the

end of 2014[7] (the capital resources of infrastructure construction are mainly from fiscal funds and loans). Although the stimulus plan temporarily boosted the GDP at some level (Ouyang & Peng, 2015), it has received criticisms because the excessive mobility brought by the plan led to a surge of local debt and excess production capacity. Hence, the unpleasant economic prospect might reduce the willingness of foreign capital to invest in China.

In the regression results, the progress of technology is found to be a negative determinant. In the models of the period 1994-2000 and 2008-2014, the estimates of *TECH* are all negative (-0.17 and -0.2, respectively) and statistically significant. In this study, I apply the quantity of patent authorization to measure the effect of technology progress. The rapid increase in the number of patent authorization should be appropriate to reflect the technology status. Technology progress, on the one hand, can attract foreign industries with high technological requirement and value-added, on the other hand means more intense competition from domestic firms in the host country. In the case of the East Region, technology advancement brings some domestic firms certain advantages so that they can match foreign companies. An example is the telecommunication industry of China. According to a patent and trademark report of 2016 released by the World Intellectual Property Organization, the Chinese technology firm Huawei has been the first in applying for the PCT (Patent Cooperation Treaty) patents in 2014 and 2015[8]. Technological progress is a reflection of rising competitiveness of domestic firms. To foreign companies, they may be reluctant to invest in the areas with fierce competition. Research on the relationship between multinationals and host countries' domestic firms is abundant. In some cases, the entry of foreign companies will crowd out domestic firms. However, a renowned study of Markusen and Venables (1999) has provided a different angle that after the entry of foreign direct investment, local firms may improve their competitiveness and finally crowd foreign companies out. They studied the effects of FDI companies at the industry level, and built a theoretical model to verify that domestic intermediate good sectors can be boosted by FDI, then local final good sectors will also be promoted through forward linkage effects. This theory is also verified by an empirical study on the Irish manufacturing sector (Görga & Strobl, 2002). Some studies also discovered that the productivity spillover effect brought by FDI can foster the productivity of local

[7] Data can be found in China Statistical Yearbook 2015.
[8] http://www.wipo.int/pressroom/en/articles/2016/article_0002.html

companies (Javorcik, 2004; Haskel et al., 2007). In the case of China, policy support from the government may play an important role in the FDI spillovers. For instance, foreign auto makers must build joint ventures with targeted local auto manufacturer before entering the Chinese market. The purpose of the government is to promote domestic companies through spillover effects provided by FDI, but the rising capability of local companies will inevitably pose a threat to foreign enterprises.

At last, the coefficient of *CORRUPTION* in the model of the period 2001-2007 has a positive sign and is statistically significant. According to the ICRG corruption indicator, higher score represents less corruption. Value 0.21 denotes 1% rise in the score of corruption leads to 0.21% increase in FDI, which suggests that the government should make efforts to eliminate corruption to attract foreign investment. In other periods, no significant result is generated.

4.2 The Middle Region

In the full-period model, technology progress and economic openness generate positive and significant effects on inward FDI (0.55 and 0.44, respectively). The estimates of *SOE* is -0.42, which means 1% increase of the industrial output of state-owned enterprises over the total output leads to 0.42% decrease of FDI inflows. Factors *HIGHWAY* and *GDP* both bear no statistical significance. However, in the cross-sectional fixed effects model, the estimate of *GDP* is significant and has a value of 0.66, which suggests 1% rise of GDP drives 0.66% more foreign direct investment into the Middle. As for other variables, little differences exist in the two models. Comparing the Middle with the East, we can see a main difference—foreign investors regard Chinese state-owned enterprises as an issue when investing in the Middle, but not when investing in the East.

From the sub-period results of the Middle, we can obtain some more evidence of the existence of regional differences in attracting FDI. Firstly, in the regressions of the period 1994-2000 and 2008-2014, the coefficients of *SOE* are significant and negative (-0.48 and -0.36). The results suggest that the increase in the output share of state-owned enterprises will cause a drop in inward FDI, but the impact of this factor seems on a decline. Different from the findings in the case of the East, foreign investors regard the advantageous position of state-owned enterprises as a critical issue. For a long time, Chinese state-owned enterprises have been accused of lacking efficiency, backward operation and wasting resources. In 1998, the government started a large-scale reform of ownership, and many mal-performed SOEs were transformed into private enterprises.

The reform has brought certain benefits for China's economy—more vital and market-oriented, even though caused a dismissal of millions of workers at the beginning and a large amount of state-owned assets were illegally sold to the private at low prices. Until now, the national pillar industries such as energy, banking, electricity, etc. are still dominated by SOEs. They receive much support from the government and often enjoy advantages in taxation, loans and political connection. For foreign companies, a fair competition environment is one of the main concerns. The more participation SOEs have, the more unbalanced the competition is. Thus, fewer influences from them will attract more foreign investment, and it is verified by the regression result of this study.

Secondly, the estimate of *GDP* in the regression of the first period bears no significance. In the next two periods, the estimates are significant at 1% level, and the values decrease from 1.63 to 0.39. The results suggest that foreign direct investment was not attracted by the economic size at the initial stage, but then the situation has changed. However, the rapid change of the coefficient raises doubts about the explaining variable and the proxy used. I have stated in the variable selection part that GDP has diverse economic meanings. It can represent the market size or market demand, but it can also indicate social production capability. In several studies, researchers assume that both domestic and foreign firms in China can only serve their local markets, which means they cannot expand the business to other provinces (Cheng & Kwan, 2000; Sun et al., 2002). In this way, the proxy GDP only denotes market demand. Nevertheless, whether this assumption complies with the reality is debatable. Therefore, with varying implications of GDP, it is ambiguous whether foreign investment is attracted by market potential, production ability or both factors. A fact is the industrial structure of the Middle is more labor-intensive than that of the East. With relatively low wages and also abundant labor, overseas labor-intensive sectors may tend to invest in this area. Moreover, its geographical location makes it easy to sell products to all parts of China and overseas. As a determinant of FDI, GDP is verified by plenty of studies. However, whether it bears other economic implications in this field still needs further investigation.

Thirdly, in the first two periods, the coefficient of *HIGHWAY* is found to have positive and significant influences on FDI. Values 0.03 and 0.28 mean that 1% increase in the highway density is associated with 0.03% and 0.28% increase in inward FDI. In the period 2008-2014, the coefficient has a negative sign but is insignificant. Thus, foreign companies regard the convenience of transportation as a determinant when

investing in the middle.

As for other factors, the effect of technology is negative in the first period but becomes positive in the third period. *OPENNESS* is insignificant in all the period regressions. The above findings are inconsistent with the results of the full-period regressions. The estimate of high-speed railway is also insignificant but bears a negative sign, which is the same as the finding of the East. Because the construction of high-speed railways just emerged in China, the insignificant results of *HSR* in both regional regressions are not that surprising.

4.3 The West Region

In the full-period regression of the West Region, only GDP and SOE generate statistically significant results—the former one has a positive effect (1.81) while the latter one poses an adverse effect (-1.21). Coefficients of other factors such as transportation infrastructure, technology progress and openness are all insignificant. The cross-sectional fixed effects model generates similar results. Then we proceed to the interpretation of the sub-period results.

When comparing the regression results of the West with those of the other regions, regional differences can also be discovered. Firstly, the coefficients of *SOE* in the first two periods are negative and statistically significant. Values -1.61and -0.62 suggest that 1% rise of the output share of state-owned enterprises leads to 1.61% and 0.62% decline in FDI. This finding accords with the situation of the Middle Region, but this factor is more influential to the West than to the Middle. As displayed in the data statistics in the Appendix 2, state-owned enterprises have a dominant position in industrial production in both the Middle and the West. Only the East Region does not heavily rely on them. Therefore, it is reasonable that foreign investors give this factor with different concerns.

Secondly, the estimates of *GDP* in the first two periods are positive (1.33 and 1.81) and significant. The results seem to indicate the economic scale is positively related to inward FDI. However, as discussed in the result part of the Middle Region, GDP not only denotes market size, also reflects output. One of the few advantages of the West is it possesses the most natural resources (coal, oil and metal ores) in China. Buckley et al. (2007) found that a main purpose of Chinese outward FDI is seeking for natural resources. Then we can assume that FDI into western China may have the same aim. In fact, industries related to natural resources have a dominant position in many western Chinese provinces. Xinjiang province, for instance, in 2005, the output of resources-

related industries[9] occupies 64% of the total industrial output. Thus, there is a possibility that foreign direct investment is attracted by resource abundance of the West.

As for other factors, in the period 1994-2000, the estimate of *CORRUPTION* is positive and significant (0.65), which indicates that less corruption will attract more foreign capital. An unexpected result is in the model (1) of the period 2008-2014. The estimate is -0.27, which means the score of corruption increases 1% will decrease the FDI by 0.27%. One potential problem of using the corruption data is that they might not be generated objectively. The data are produced partly based on subjective indicators, so it is unknown whether they can reflect the real situation. In a study of Mathur and Singh (2013), they applied the corruption index from Transparency International to examine the effect of corruption on FDI, and the index is calculated purely based on questionnaires filled by businessmen and journalists. Although they found corruption leads FDI to decrease, over-subjective data may undermine the validity of the study.

In the model of the period 2008-2014, *TECH* is the only independent variable that is significant. Moreover, the coefficients of *RAIL* in the first period model (-0.58) and *OPENNESS* in the second period model (-0.35) are counterintuitive. Those unpleasant results suggest that the model fitness is questionable. The following are several difficulties when modeling the West. The first, comparing with the East and Middle Regions, the developing status among western provinces differs much. For instance, there are relatively well-developed provinces Chongqing and Sichuan (the economy of their capitals is even comparable with eastern cities), while others are generally backward in economy. The second, some provinces have small scale of inward FDI. For instance, the FDI inflow in 2013 to Qinghai province is only 70 million USD, which is less than 1% of the FDI to Beijing. Small scale of FDI usually includes little information on its characteristics. Therefore, it is not easy to capture the nature of the inward FDI through empirical study. At last, to detect regional differences in attracting FDI, the sample size is inevitably smaller than that of previous research. Thus, the limitation of the sample size may affect the effectiveness of the model, and this issue also matters to the models of the East and Middle.

4.4 All regions included

Although this study focuses on the regional differences, full-sample regressions

[9] Include coal and ore mining, extraction of oil and natural gas, and processing of the resources.

can also provide us with some useful information. In the full-period model, the estimate of *GDP* is significant and positive (0.68), so 1% increase of gross domestic product leads to 0.68% rise of FDI into China. Another significant determinant is *SOE* and it has a negative effect on FDI (-0.38). Other variables all bear no statistical significance. In the comparison model (the cross-sectional fixed effects model), the estimate of HIGHWAY becomes significant but is of minor influence (0.02). Also, factor economic openness turns to be significant at 10% level. Little changes happened on the other determinants.

In the three sub-period regressions, the estimates of *GDP* are highly significant at 1% level but fluctuate much (0.27, 1.41, and 0.16). It seems economic size is of high importance in the period 2001-2007 but has relatively small impacts in the other two periods. As for the effects of transportation infrastructures, variable *HIGHWAY* only has a significant coefficient in the second period (0.06). In other periods, its coefficients are negative and insignificant. The effect of high-speed railways is also negative and insignificant.

As the findings of the Middle and West, foreign investors are concerned about the competition from state-owned enterprises. Except the insignificant result in the second period, the estimates of *SOE* in the other two periods are -0.36 and -0.47. Those two values represent, if the output share of state-owned enterprises rises 1%, foreign direct investment will drop 0.36% and 0.47% in corresponding periods. The estimates of *TECH* are all statistically significant. At the initial stage, technology progress has a negative effect on inward FDI. Then, its influence turns to be positive and shows an upward trend (0.08 to 0.27). As for the other variables, *OPENNESS* only has a significant result in the second period but is negative (-0.23). The estimates of *CORRUPTION* bear no significance in all the sub-period regressions.

The regression results of the full sample show us several key factors that attract FDI into China (economic size, performance of state-owned enterprises, and technology progress). However, regression results of the regional models all differ from those of the full-sample model at certain levels. Therefore, the full-sample model actually acts as a reference, and our focuses should be the regional models.

4.5 Robustness checks

Through the comparison of the results of the basic models and the additional models (replacing the variable GDP by RETAIL), it can be seen that the regression results have certain robustness.

Firstly, concerning the models of the East Region, most of the estimates have no changes in signs and significance. The coefficients of *RETAIL* are all positive and highly significant, only they are smaller than those of *GDP*, which is due to the different magnitude of GDP and total retail sales. The estimate of *HIGHWAY* in the second period becomes insignificant, while the effect of high-speed railway turns to be significant at 10% level. A noticeable variation resides in variable *SOE* in the period 2008-2014. Its coefficient becomes significant and has a value of -0.22.

Then, according to the regression results of the Middle Region, the estimate of *SOE* in the third period becomes insignificant. The coefficients of *CORRUPTION* in the first period and economic openness in the second period turn to be significant. Except those variations, other results basically stay unchanged in the two different models.

Thirdly, in the additional model of the West Region, the third period regression has unpleasant results—only the variable *RETAIL* is significant. In the basic model, this period regression also has only one significant factor. Thus, this regression is insufficient in explaining the realities. As for other remarkable variations, *RETAIL* in the first period regression bears a negative sign and is statistically insignificant. The coefficients of CORRUPTION in the first two periods also become insignificant.

The last, the full-sample regression results in the two models change little in general. Noticeable differences occur in the coefficients of *CORRUPTION*. Also, the coefficient of factor high-speed railway becomes highly significant.

To summarize, according to the results of the two different models, most of the estimates have no remarkable changes. Only the third period regression of the West surely has some critical problems of model fitness. Overall, the robustness check verifies that this study has certain powers in explaining the status of FDI in China and Chinese regions.

5 Conclusion and discussion

This study aims at the regional differences in attracting FDI and the varying importance of FDI determinants through time. Prior studies always inspect China as a whole, so the most noticeable differences compared with previous academic research are taking regional differences into account and operating regressions based on regional classification. This consideration of regional differentiation provides deeper understandings of the FDI activities in China. For the first aim of this study, strong

evidence to support the existence of regional differences lies in the comparison between the East and the other two regions. First is the performance of state-owned enterprises. Although the impact of SOEs is declining through time, foreign investors still take it as a crucial factor when investing in the Middle and West. In the East Region, it seems not of priority. Then, economic openness is a significant factor for FDI into the East but has no significant effect on the other two regions according to the sub-period regressions. Thirdly, technology progress is a negative factor to the FDI into the East, but its effect is unobvious in the other two regions. Moreover, in the models of the Middle and West, the values of the coefficients of *GDP* vary much over time, which might also suggest the existence of regional differences in attracting FDI.

The second aim of this study is detecting the shifting impact of FDI determinants. Firstly, concerning the East Region, economic size is always a positive factor in attracting FDI, and of rising importance. Economic openness is also positively associated with inward FDI, but its influence declines through time. Technology progress shows significant and adverse effects in the first and third periods, but the impact level stays stationary. The negative impact of infrastructure improvement is considerably small and insignificant at first, but then it grows rapidly in the next two stages. Massive domestic investment associated with the infrastructure might damage the economy and hence harm the investors' confidence, so this may be the cause of the negative effect of transportation infrastructure. Although the estimates of *SOE* exhibit no significance, they still indicate that the importance of this factor is declining through time.

Secondly, as for the Middle Region, the effect of economic size is not significant at the first stage. Then in the next two stages, the effect turns to be significant and positive, but is on a downward trend (1.63 to 0.39). Transportation infrastructure positively relates to FDI in the first two periods, and its influence shows a rapidly increasing trend. Nevertheless, after 2008, the effect becomes insignificant and bears a negative sign. Thus in this stage, excessive domestic investment in infrastructure may cause this factor no longer attractive to foreign investors. Factor *SOE* is insignificant in the period 2001-2007, but generates an adverse and significant effect on FDI in other two periods. However, the two significant values -0.48 and -0.36 indicate the reforms of state-owned enterprises are effective.

At last, about the West, the estimates of *GDP* in the first two periods indicate that larger economic size attracts more foreign direct investment and the influence of factor

GDP is on a rise. The impact of state-owned enterprises is decreasing through time, which means reforms to reduce the importance of SOEs in the economy can actually stimulate FDI. In the regression results of the Middle and the West, some variables (such as technology, economic openness and corruption status) have counterintuitive or many insignificant coefficients, so it is problematic to interpret the changing influences of those factors. Nevertheless, the unexpected results may also represent determinants of FDI in the two areas are different from those in the East.

Main problems of the research reside in omitted variables and limited sample size. Due to the issue of multicollinearity and inaccessibility of data, some potential FDI determinants cannot be included, such as wage level, taxation, polices, etc. Also, because of limited sample size, including too many variables is unrealistic. Moreover, relatively small samples may influence the effectiveness of the estimators to some extent. One solution is using the city-level data to operate the regressions. With more observations, more credible results may be obtained. However, when adopting city-level statistics, it is likely to meet problems of missing data and lacking indexes.

For future research, in my opinion, we should give more attention to regional differences to acquire deeper understandings of FDI activities in China. In this study, regional differences mainly exist between the East Region and the other two inland areas. Even though many prior studies have investigated China at the provincial level, the advanced East Region actually played a dominant role. Therefore, determinants that work on the East may be invalid in other places. Since foreign direct investment is an influential catalyst for economic development, regional study is not only practical but also necessary. Especially for the authorities, to promote inward FDI, it is critical to apply effective measures based on the recognition of FDI characters and local factor endowments.

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Appendix 1. Correlation matrixes

Table 1. Correlation matrix of potential proxies (the East Region sample, period 1994-2000)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	0.21	1							
EDU	-0.09	0.59	1						
HIGHWAY	0.30	0.42	0.45	1					
RAIL	-0.12	0.35	**0.86**	0.49	1				
SOE	-0.42	-0.20	0.29	0.19	0.43	1			
TECH	0.19	**0.78**	**0.84**	0.54	**0.70**	0.03	1		
CORRUPTION	-0.23	-0.57	-0.21	-0.39	-0.05	0.06	-0.31	1	
OPENNESS	-0.19	0.49	0.49	-0.02	0.32	-0.20	0.49	0.10	1

Table 2. Correlation matrix of potential proxies (the East Region sample, period 2001-2007)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	0.27	1							
EDU	0.05	**0.73**	1						
HIGHWAY	-0.02	**0.70**	**0.74**	1					
RAIL	-0.03	0.40	**0.81**	0.56	1				
SOE	-0.61	-0.29	0.12	0.10	0.44	1			
TECH	0.42	**0.84**	0.67	0.58	0.53	-0.27	1		
CORRUPTION	0.23	0.53	0.44	0.36	0.07	-0.24	0.25	1	
OPENNESS	0.15	**0.72**	0.49	0.60	0.28	-0.21	0.69	0.18	1

Table 3. Correlation matrix of potential proxies (the East Region sample, period 2008-2014)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*HSR*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1									
WAGE	0.06	1								
EDU	0.29	0.61	1							
HIGHWAY	0.06	**0.82**	0.69	1						
RAIL	0.27	0.60	**0.81**	**0.71**	1					
HSR	0.50	0.49	0.30	0.49	0.24	1				
SOE	0.49	0.41	0.59	0.47	**0.88**	-0.04	1			
TECH	0.54	**0.73**	0.38	0.65	0.21	0.64	-0.06	1		
CORRUPTION	0.19	-0.47	-0.10	-0.18	-0.08	-0.44	0.06	-0.32	1	
OPENNESS	0.05	0.59	0.35	0.65	0.31	0.10	0.25	0.47	0.03	1

Table 4. Correlation matrix of potential proxies (the Middle Region sample, period 1994-2000)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	0.36	1							
EDU	0.03	0.53	1						
HIGHWAY	0.46	0.58	-0.11	1					
RAIL	-0.03	0.15	-0.21	0.28	1				
SOE	-0.38	0.18	0.44	-0.15	-0.04	1			
TECH	0.24	0.59	**0.83**	0.12	-0.08	0.55	1		
CORRUPTION	-0.44	**-0.78**	-0.46	-0.52	-0.12	0.06	-0.37	1	
OPENNESS	-0.35	-0.25	0.45	-0.58	-0.05	0.27	0.26	0.36	1

Table 5. Correlation matrix of potential proxies (the Middle Region sample, period 2001-2007)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	0.52	1							
EDU	0.34	**0.79**	1						
HIGHWAY	0.42	0.44	0.15	1					
RAIL	0.05	0.07	-0.21	0.46	1				
SOE	-0.62	-0.55	-0.21	-0.40	**-0.87**	1			
TECH	0.45	0.57	**0.75**	-0.22	-0.20	0.01	1		
CORRUPTION	0.46	**0.78**	**0.72**	0.41	0.08	-0.44	0.47	1	
OPENNESS	-0.20	0.34	0.63	-0.29	-0.18	0.38	0.50	0.38	1

Table 6. Correlation matrix of potential proxies (the Middle Region sample, period 2008-2014)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*HSR*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1									
WAGE	0.29	1								
EDU	0.11	0.35	1							
HIGHWAY	0.37	0.48	-0.10	1						
RAIL	0.01	0.19	-0.19	0.57	1					
HSR	0.41	0.65	0.17	0.61	0.26	1				
SOE	0.52	-0.34	0.11	-0.59	-0.15	-0.41	1			
TECH	0.65	**0.70**	0.37	0.29	-0.07	0.59	-0.24	1		
CORRUPTION	0.44	**-0.78**	-0.35	-0.39	-0.13	-0.66	0.27	-0.62	1	
OPENNESS	0.47	-0.04	0.34	-0.52	-0.10	-0.24	0.49	-0.12	0.02	1

Table 7. Correlation matrix of potential proxies (the West Region sample, period 1994-2000)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	-0.08	1							
EDU	0.09	0.30	1						
HIGHWAY	0.49	0.42	0.41	1					
RAIL	0.20	-0.11	0.11	0.31	1				
SOE	-0.47	0.19	-0.18	-0.24	-0.59	1			
TECH	0.30	0.43	**0.72**	0.49	0.07	-0.09	1		
CORRUPTION	-0.20	-0.68	-0.34	-0.51	-0.01	0.06	-0.39	1	
OPENNESS	0.25	-0.34	0.22	-0.12	-0.09	0.04	0.21	0.37	1

Table 8. Correlation matrix of potential proxies (the West Region sample, period 2001-2007)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	0.12	1							
EDU	0.36	0.61	1						
HIGHWAY	0.36	0.30	0.35	1					
RAIL	0.28	0.01	0.20	**0.82**	1				
SOE	-0.54	-0.37	-0.30	-0.55	-0.44	1			
TECH	0.46	0.40	**0.77**	0.51	0.32	-0.52	1		
CORRUPTION	0.23	**0.75**	0.57	0.30	0.05	-0.34	0.31	1	
OPENNESS	0.25	0.26	0.42	0.01	-0.16	-0.01	0.27	0.33	1

Table 9. Correlation matrix of potential proxies (the West Region sample, period 2008-2014)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*HSR*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1									
WAGE	0.23	1								
EDU	0.36	0.54	1							
HIGHWAY	0.30	0.41	0.47	1						
RAIL	0.23	0.37	0.49	**0.90**	1					
HSR	0.48	0.32	0.22	0.28	0.15	1				
SOE	-0.58	-0.36	-0.19	-0.35	-0.38	-0.63	1			
TECH	0.52	0.68	**0.72**	0.56	0.42	0.58	-0.47	1		
CORRUPTION	-0.23	**-0.73**	-0.29	-0.23	-0.14	-0.20	0.17	-0.48	1	
OPENNESS	0.35	-0.08	0.11	-0.07	-0.07	0.21	-0.06	0.08	0.06	1

Table 10. Correlation matrix of potential proxies (full sample, period 1994-2000)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	0.29	1							
EDU	0.24	0.59	1						
HIGHWAY	0.54	0.52	0.46	1					
RAIL	0.37	0.29	0.60	0.54	1				
SOE	-0.57	-0.39	-0.17	-0.30	-0.31	1			
TECH	0.48	**0.76**	**0.83**	0.57	0.57	-0.44	1		
CORRUPTION	-0.19	-0.54	-0.26	-0.41	-0.03	0.04	-0.24	1	
OPENNESS	0.32	0.49	0.56	0.22	0.40	-0.58	0.71	0.15	1

Table 11. Correlation matrix of potential proxies (full sample, period 2001-2007)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1								
WAGE	0.37	1							
EDU	0.41	**0.71**	1						
HIGHWAY	0.54	0.53	0.56	1					
RAIL	0.45	0.34	0.59	**0.80**	1				
SOE	-0.68	-0.53	-0.29	-0.58	-0.30	1			
TECH	0.61	**0.75**	**0.71**	0.65	0.59	-0.63	1		
CORRUPTION	0.21	0.57	0.49	0.23	0.04	-0.20	0.21	1	
OPENNESS	0.45	0.63	0.56	0.57	0.44	-0.60	0.66	0.15	1

Table 12. Correlation matrix of potential proxies (full sample, period 2008-2014)

Correlation	*GDP*	*WAGE*	*EDU*	*HIGH WAY*	*RAIL*	*HSR*	*SOE*	*TECH*	*CORRUP TION*	*OPEN NESS*
GDP	1									
WAGE	0.33	1								
EDU	0.34	0.58	1							
HIGHWAY	0.51	0.61	0.62	1						
RAIL	0.38	0.54	**0.71**	**0.87**	1					
HSR	0.64	0.53	0.47	0.61	0.52	1				
SOE	-0.67	-0.23	-0.16	-0.47	-0.24	-0.52	1			
TECH	0.67	**0.78**	0.62	0.68	0.52	0.68	-0.50	1		
CORRUPTION	-0.19	-0.53	-0.19	-0.18	-0.08	-0.34	0.11	-0.34	1	
OPENNESS	0.44	0.51	0.44	0.50	0.47	0.39	-0.40	0.61	0.02	1

Appendix 2. Data statistics and regression results

Table 1. Data Statistics of full period

	The East			The Middle			The West		
	Mean	*Mean*	*Std. dev*	*Mean*	*Mean*	*Std. dev*	*Mean*	*Mean*	*Std. dev*
FDI ***(million RMB)***	53,600	39,300	47,500	15,700	7,930	17,800	5,810	1,890	10,400
GDP ***(billion RMB)***	903	604	884	480	363	365	271	169	283
HIGHWAY	24.50	17.68	26.58	9.09	5.74	9.53	4.60	1.86	6.18
RAIL	26.90	19.35	19.57	16.46	15.93	4.18	8.22	6.39	5.08
HSR	1.59	0	3.63	0.61	0	1.33	0.10	0	0.55
SOE	0.36	0.346	0.17	0.56	0.575	0.18	0.65	0.681	0.18
TECH	0.52	0.181	0.75	0.11	0.051	0.15	0.09	0.040	0.13
CORRUPTION	2.10	2	0.73	2.10	2	0.73	2.10	2	0.73
OPENNESS	0.311	0.247	0.203	0.051	0.046	0.026	0.052	0.044	0.030

Table 2. Results of the full-period models (t statistics in parentheses)

	the East		the Middle		the West		All regions included	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Constant	-12.8 (-1.51)	-1.40 (-0.6)***	35.49 (1.59)	6.64 (1.16)	-25.38 (-1.59)	0.33 (0.10)	0.37 (0.13)	-1.86 (-1.87)*
$ln(GDP)_{it-1}$	1.40 (4.47)***	0.97 (11.17)***	-0.37 (-0.44)	0.66 (3.17)***	1.81 (2.90)***	0.82 (6.37)***	0.68 (3.05)***	0.84 (11.01)***
$ln(HIGHWAY)_{it-1}$	-0.04 (-3.06)***	-0.03 (-2.97)***	0.02 (0.84)	0.02 (0.76)	--	--	0.01 (0.55)	0.02 (2.73)***
$ln(RAIL)_{it-1}$	--	--	--	--	-0.10 (-0.37)	-0.11 (-0.75)	--	--
$ln(SOE)_{it-1}$	0.22 (1.58)	0.13 (1.32)	-0.42 (-1.72)*	-0.68 (-3.95)***	-1.21 (-2.8)***	-1.41 (-6.12)***	-0.38 (-2.86)***	-0.47 (-6.13)***
$ln(CORRUPTION)_{it}$	--	0.16 (3.00)***	--	0.15 (1.58)	--	0.34 (3.91)***	--	0.25 (5.59)***
$ln(TECH)_{it-1}$	-0.11 (-1.78)*	-0.11 (-2.3)**	0.55 (4.56)***	0.17 (1.95)*	0.18 (1.11)	0.13 (1.58)	0.04 (0.48)	-0.003 (-0.09)
$ln(OPENNESS)_{it-1}$	0.43 (5.98)***	0.35 (6.41)***	0.44 (2.57)**	0.37 (3.63)***	-0.10 (-0.59)	0.06 (0.58)	0.02 (0.18)	0.10 (1.83)*
Observations	220	220	160	160	220	220	600	600
Adjusted R^2	0.9061	0.9449	0.8816	0.9014	0.8101	0.9089	0.9077	0.9369

Notes: 1. *, **, and *** represent 10, 5, and 1 percent significant levels, respectively.

2. Model (1) denotes the two-way fixed effects model: $ln(FDI)_{it} = \alpha_i + \gamma_t + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(TECH)_{it-1} + \beta_5 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

3. Model (2) denotes the cross-sectional fixed effects model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(RETAIL)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

4. In the regressions of the West Region, variable HIGHWAY is replaced by RAIL.

Table 3. Sub-period regression results of the East Region (t statistics in parentheses)

	1994-2000		2001-2007		2008-2014	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Constant	11.53 (2.63)**	16.79 (5.28)***	-5.66 (-1.95)**	2.98 (1.17)	-11.46 (-3.45)***	4.71 (1.38)
$ln(GDP)_{it-1}$	0.46 (2.83)***	--	1.12 (10.24)***	--	1.38 (11.21)***	--
$ln(RETAIL)_{it-1}$	--	0.27 (2.09)**	--	0.82 (8.06)***	--	0.79 (6.26)***
$ln(HIGHWAY)_{it-1}$	-0.002 (-0.26)	-0.005 (-0.52)	-0.11 (-1.85)*	-0.07 (-1.31)	-0.45 (-4.64)***	-0.34 (-3.76)***
$ln(HSR)_{it-1}$	--	--	--	--	-0.001 (-0.36)	-0.006 (-1.79)*
$ln(SOE)_{it-1}$	-0.12 (-1.20)	-0.07 (-0.62)	0.09 (0.72)	0.05 (0.4)	0.005 (0.05)	-0.22 (-1.90)*
$ln(CORRUPTION)_{it}$	-0.02 (-0.63)	-0.09 (-2.58)**	0.21 (5.21)***	0.31 (4.87)***	-0.19 (-1.57)	-0.21 (-1.15)
$ln(TECH)_{it-1}$	-0.17 (-2.20)**	-0.25 (-3.33)***	-0.007 (-0.10)	0.002 (0.03)	-0.20 (-4.10)***	-0.14 (-1.94)*
$ln(OPENNESS)_{it-1}$	0.28 (2.82)***	0.36 (1.87)*	0.02 (0.17)	0.07 (0.77)	0.19 (2.14)**	0.16 (1.66)*
Observations	66	66	77	77	77	77
Adjusted R^2	0.9710	0.9596	0.9832	0.9826	0.9863	0.9830

Notes: 1. *, **, and *** represent 10, 5, and 1 percent significant levels, respectively.

2. Model (1) denotes the basic model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

3. Model (2) denotes the additional model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(RETAIL)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

Table 4. Sub-period regression results of the Middle Region (t statistics in parentheses)

	1994-2000		2001-2007		2008-2014	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Constant	30.47 (1.77)*	23.69 (1.69)*	-22.26 (-1.79)*	-6.25 (-0.72)	13.81 (4.00)***	18.68 (7.42)***
$ln(GDP)_{it-1}$	-0.40 (-0.58)	--	1.63 (3.47)***	--	0.39 (2.84)***	--
$ln(RETAIL)_{it-1}$	--	-0.13 (-0.24)	--	1.05 (3.07)***	--	0.20 (1.90)*
$ln(HIGHWAY)_{it-1}$	0.03 (1.93)*	0.03 (1.94)*	0.28 (2.07)**	0.21 (1.79)*	-0.04 (-0.98)	-0.02 (-0.35)
$ln(HSR)_{it-1}$	--	--	--	--	-0.0004 (-0.06)	-0.001 (-0.10)
$ln(SOE)_{it-1}$	-0.48 (-1.81)*	-0.92 (-1.67)*	-0.56 (-1.09)	0.19 (0.24)	-0.36 (-2.40)**	-0.36 (-1.50)
$ln(CORRUPTION)_{it}$	-0.25 (-1.49)	-0.27 (-2.32)**	-0.06 (-0.52)	0.006 (0.07)	0.04 (0.21)	-0.12 (-0.41)
$ln(TECH)_{it-1}$	-0.35 (-2.75)***	-0.37 (-3.32)***	-0.23 (-1.36)	-0.02 (-0.12)	0.27 (11.74)***	0.24 (5.73)***
$ln(OPENNESS)_{it-1}$	-0.18 (-0.69)	-0.05 (-0.54)	-0.17 (-1.57)	-0.28 (-1.90)*	0.06 (0.61)	0.06 (0.51)
Observations	48	48	56	56	56	56
Adjusted R^2	0.7881	0.8011	0.9169	0.9097	0.9804	0.9694

Notes: 1. *, **, and *** represent 10, 5, and 1 percent significant levels, respectively.

2. Model (1) denotes the basic model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

3. Model (2) denotes the additional model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(RETAIL)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

Table 5. Sub-period regression results of the West Region (t statistics in parentheses)

	1994-2000		2001-2007		2008-2014	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Constant	-10.83 (-0.63)	27.66 (2.47)**	-26.57 (-10.32)***	-7.57 (-3.99)***	26.1 (2.03)**	4.53 (0.62)
$ln(GDP)_{it-1}$	1.33 (1.93)*	--	1.81 (18.75)***	--	-0.11 (-0.24)	--
$ln(RETAIL)_{it-1}$	--	-0.25 (-0.53)	--	1.13 (15.69)***	--	0.72 (2.61)**
$ln(RAIL)_{it-1}$	-0.58 (-2.52)**	-0.69 (-2.40)**	0.13 (1.1)	0.1 (0.75)	0.16 (1.05)	0.16 (0.92)
$ln(SOE)_{it-1}$	-1.61 (-3.72)***	-1.03 (-2.70)***	-0.62 (-2.12)**	-0.78 (-2.10)**	0.38 (0.61)	0.83 (1.49)
$ln(CORRUPTION)_{it}$	0.65 (3.72)***	0.26 (1.47)	-0.27 (-6.21)***	-0.04 (-0.85)	-0.43 (-1.00)	-0.28 (-0.71)
$ln(TECH)_{it-1}$	0.31 (1.43)	0.21 (0.94)	0.05 (0.57)	0.08 (0.86)	0.39 (2.09)**	-0.06 (-0.38)
$ln(OPENNESS)_{it-1}$	0.20 (1.24)	-0.14 (-0.82)	-0.35 (-3.14)***	-0.25 (-1.81)*	-0.14 (-1.26)	0.12 (1.41)
Observations	66	66	77	77	77	77
Adjusted R^2	0.931	0.9323	0.9583	0.9493	0.9538	0.9696

Notes: 1. *, **, and *** represent 10, 5, and 1 percent significant levels, respectively.

2. Model (1) denotes the basic model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(RAIL)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

3. Model (2) denotes the additional model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(RETAIL)_{it-1} + \beta_2 ln(RAIL)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

Table 6. Regression results of all regions included (t statistics in parentheses)

	1994-2000		2001-2007		2008-2014	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Constant	4.66 (4.17)***	4.21 (1.85)*	-9.15 (-7.65)***	-16.23 (-9.89)***	8.00 (10.33)***	3.36 (3.19)***
$ln(GDP)_{it-1}$	0.27 (2.86)***	--	1.41 (14.53)***	--	0.16 (2.82)***	--
$ln(RETAIL)_{it-1}$	--	0.15 (1.69)*	--	0.96 (15.60)***	--	0.25 (6.16)***
$ln(HIGHWAY)_{it-1}$	-0.001 (-0.24)	-0.002 (-0.30)	0.06 (3.16)***	0.08 (2.94)***	-0.02 (-0.44)	-0.02 (-0.98)
$ln(HSR)_{it-1}$	--	--	--	--	-0.003 (-1.03)	-0.007 (-2.94)***
$ln(SOE)_{it-1}$	-0.36 (-4.6)***	-0.27 (-3.29)***	-0.1 (-0.70)	-0.03 (-0.23)	-0.47 (-7.54)***	-0.31 (-3.87)***
$ln(CORRUPTION)_{it}$	0.01 (-0.13)	-0.02 (-0.46)	-0.01 (-0.28)	0.12 (2.62)***	-0.14 (-1.53)	-0.15 (-2.49)**
$ln(TECH)_{it-1}$	-0.13 (-1.97)**	-0.12 (-1.80)*	0.08 (2.24)**	0.04 (0.83)	0.27 (12.6)***	0.21 (9.98)***
$ln(OPENNESS)_{it-1}$	0.10 (1.65)	0.07 (1.30)	-0.23 (-3.13)***	-0.18 (-2.81)***	0.04 (1.01)	0.05 (1.11)
Observations	180	180	210	210	210	210
Adjusted R^2	0.9858	0.9849	0.9808	0.9843	0.9867	0.9830

Notes: 1. *, **, and *** represent 10, 5, and 1 percent significant levels, respectively.

2. Model (1) denotes the basic model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(GDP)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$

3. Model (2) denotes the additional model: $ln(FDI)_{it} = \alpha_i + \beta_1 ln(RETAIL)_{it-1} + \beta_2 ln(HIGHWAY)_{it-1} + \beta_3 ln(SOE)_{it-1} + \beta_4 ln(CORRUPTION)_{it} + \beta_5 ln(TECH)_{it-1} + \beta_6 ln(OPENNESS)_{it-1} + \varepsilon_{it}$