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Analysis on FDI and the Industrial Structure Changing of Chongqing

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Abstract: Since, the founding of Chongqing municipality, the FDI scale has been expanded and the influence of the structure of the industry has also been increased. This study firstly applies shift-share analysis to analyze the industrial structure changing in Chongqing. And then they are analyzed empirically on the actual amount of FDI in three industries and the added value of the three industries in 1999-2010. For the second, FDI have significant role in promoting in the second and the third industry and with long-term stable cooperative relations. But the first industry does not been promoted enough.

Key words: FDI, Industrial structure changing in Chongqing, shift-share analysis

INTRODUCTION

Since the founding of Chongqing in 1997, Foreign Direct Investment (FDI) has gradually become one of the main sources of funds for the industry investment of Chongqing. From 1998-2010, the investment is \$17554510000 that Chongqing has attracted FDI. Only in 2010, there is 261 foreign capital (contract) by signed in Chongqing, growing 18.64% compared to the same period and the capital of agreement contract is \$6289020000, a year-on-year growth of 65.56% and the actual utilization of foreign capital is \$6369560000, a year-on-year growth of 57.51%.

Numerous studies show that FDI has not only brought the industry development of host country needs, also brought the advanced technology and management knowledge at the same time and the spillover effect, directly promoted the technical progress of relevant industries and upgrading of the structure. Jiang (2000) pointed out that FDI could improve the asset quality of host countries, promote technological progress, improve the industrial structure and drive the development of supporting industries and so on. Cao (2002) proposed that our country should seize the opportunity, introduce and apply foreign high-tech to promote industrial structure upgrading, with the use of FDI and the changing regularity of industrial structure. Liu (2007) pointed out that FDI is the obvious effect on three industries in China, FDI promoted the adjustment of industrial structure in our country. Tian (2004), Huang and Xu, (2008) found that FDI promoted the industrial structure upgrading in Shanghai,

with analyzing the relationship between FDI and three industrial added value. Zhou and Wang (2008) showed that FDI played a role of the catalyst in industrial structure adjustment and upgrading and optimized the industrial structure in our country.

In domestic numerous studies, most eyes were on FDI to the national or the eastern developed areas of the country's industrial structure change. In the analysis of regional industrial structure optimization, there is no literature from the perspective of longitudinal regional industry structure and the changes of the national industrial structure and the reasons. Therefore, this study attempts to analyze the relationship between FDI and industrial structure in Chongqing and should solve two problems: first, the comparison of industrial structure in Chongqing and industrial structure in the country; Second, the positive effect of FDI on industrial structure changing of Chongqing.

Comparative analysis of chongqing industrial structure and the national industrial structure: Industrial structure is the core of spatial allocation of resources. The essence of economic growth is not only the expansion of the total, but also the optimization of structure. Therefore, This study firstly applies shift-share analysis to analyze the industrial structure changing in Chongqing.

This article selects the sample for increases in Gross Domestic Product (GDP) of 31 provinces from 1998-2010 (excluding Hong Kong, Macao and Taiwan), the basic variables for the first industry (including farming, forestry, animal husbandry and fishery), the second industry

Table 1: Deviation-share analysis of Chongqing GDP (100 million yuan)

Years	Actual increase	Share of area	Share of industrial structure			Share of location	
	G_k	RS_k	PS_k	PS_{k1}	PS_{k2}	PS_{k3}	DS_k
1999	72.58	124.32	-20.01	-7.07	28.78	1.71	-53.45
2000	262.94	300.31	-50.73	-5.13	57.20	1.33	-38.70
2001	422.11	486.10	-70.68	-20.19	95.09	4.22	-68.21
2002	693.64	675.29	-92.90	-29.56	128.55	6.09	12.26
2003	1009.84	788.93	-131.15	-5.72	138.94	2.07	33.31
2004	1388.51	1317.04	-129.99	0.35	130.60	0.96	70.51
2005	1788.15	1714.95	-192.77	34.93	153.01	-4.83	78.03
2006	2128.60	2220.11	-263.40	60.56	193.93	-8.92	-82.59
2007	2662.70	2879.69	-325.33	46.07	273.46	-5.81	-211.19
2008	3401.45	3398.22	-365.01	56.31	301.34	-7.35	10.59
2009	4129.46	3864.57	-422.35	1.46	423.94	3.05	261.84
2010	5137.82	4626.35	-496.53	30.84	463.99	-1.70	513.17

National Bureau of Statistics of China: National Bureau of Statistics of China (2011) (Calculated at comparable price), Bureau of Statistics of Chongqing: Bureau of Statistics of Chongqing (2011) (Calculated at comparable price)

(including mining, manufacturing, electricity etc.) and the construction industry and transportation, commerce and other third industrial annual GDP.

Based on GDP from 1998-2010 about the first, second, third industrial structure (evaluation) growth rate as the benchmark, the assumed share of industrial structure is calculated according to the national growth rate in Chongqing and compared this assumption to share with Chongqing actual growth, the growth of Chongqing GDP deviates from the condition of relative national average level. The GDP increment is divided into three parts: Firstly, the regional shares, that is, the growth of Chongqing GDP should reach the level of increase according to the national GDP growth rate; secondly, the industrial structure deviation factor, it is the impact of Chongqing industrial structure on economic growth and the deviation is calculated about the development of the speed of its development for the i industry and the GDP, which reflect the quality of industry; thirdly, the location deviation factor, it is Condition of Chongqing of industrial structure and competitiveness impact on its economic growth. The formulation (Hao and An, 2004) is:

$$G_k = \sum_i Y_{it}^k - \sum_i Y_{i0}^k \quad (1)$$

$$G_k = RS_k + PS_k + DS_k \quad (2)$$

$$RS_k = \sum_i Y_{i0}^k \sum_k Y_{it}^k / \sum_k \sum_i Y_{i0}^k - \sum_i Y_{i0}^k \quad (3)$$

$$PS_k = \sum_i Y_{i0}^k \left\{ \sum_k Y_{it}^k / \sum_k Y_{i0}^k - \sum_k \sum_i Y_{it}^k / \sum_k \sum_i Y_{i0}^k \right\} \quad (4)$$

$$DS_k = \sum_i \left\{ Y_{it}^k - Y_{i0}^k \left[\sum_k Y_{it}^k / \sum_k Y_{i0}^k \right] \right\} \quad (5)$$

In the formulation: G_k is on behalf of the k region in the period GDP growth in total, Y_{i0}^k is the i industry of the

k region in 0 (base year) added value and Y_{it}^k is the i industry of the k region in t (final year) added value, RS_k , PS_k and DS_k are expressed as regional share deviation components, regional industrial structure deviation component, regional location deviation component.

If the speed of development of the k region is the same as national, RS_k is equal to zero. On the contrary, there may be a positive deviation ($RS_k > 0$), or negative deviation ($RS_k < 0$).

$PS_k > 0$, that show that the positive deviation is big industry scale in the regional industrial structure and regional industrial structure is better than the national level. On the contrary, the negative deviation is big industry scale in the regional industrial structure and regional industrial structure is behind the national level. $DS_k > 0$, that show the k regional is good at resolving unfavorable location factor and strengthen competitive ability. $DS_k < 0$, it is on the contrary.

According to the deviation-share analysis theory, this study would analyze data of Chongqing and the country from 1998 to 2010 and gets each year the actual increase in GDP in Chongqing, the share of area, the share of industrial structure, the share of location Table 1.

Industrial structure deviation factors reflect the regional industry types on its economic growth. The deviation value of industrial structure is positive that the regional industry is growth and sun-oriented industry dominates. From table one, the deviation factor of industrial structure are all positive in third industries in Chongqing, yearly growth. Specifically, in the share of the industrial structure calculation, the deviation is negative from the first industry in all years and the absolute values' increasing year by year. Because Chongqing is mountainous and hilly area, suitable for cultivation of ground and slope is little, the physical characteristics of the mountain more less is the main factor restricting the development of modern agriculture. The second industry is higher than the national average development level

from 2004. Since, Chongqing City Hall has approved the establishment of 45 industrial parks from 2003. After years of development, the Parks have become an important platform for the rapid development of the industrial economy in Chongqing and the role of economic growth has become increasingly prominent. The development level of the third industry is higher than the national average level of development, consistent with the analysis of Zeng (2006). Factors affecting location competitiveness has been negative for 4 years, which location factors of the western inland city have an adverse impact on economic growth of Chongqing.

REGRESSION ANALYSIS OF FDI ON CHANGES OF THREE INDUSTRIES IN CHONGQING

Since Chongqing became the municipality, FDI was mainly focused on the second and the third industry. As of 2010, FDI in the first industry has accounted for only 0.35% and the second industry has accounted for 35.97% and the third industry has accounted for 63.68%. To this end, this study puts forward the following hypothesis: FDI promoted the value added of the tertiary industry in Chongqing municipality with varying degrees of growth. When the newly established Chongqing municipality met Southeast Asian financial crisis, this article selects 1999-2010 FDI in Chongqing in the actual investment of three times industry and three industrial added value of the related data as the return sample in order to avoid the occurrence of abnormal values.

There are many factors that affect the upgrading of industrial structure, the main existing industrial structure of the host country, host country's science and technology, demand, government policy, foreign investment, etc., In order to separate analysis of FDI to the promoting function of three times industry growth in Chongqing, the study assumes that other things being equal, with FDI1, FDI2, FDI3 as dependent variable, value added of GDP1, GDP2, GDP3 as the dependent variable to three industry. To eliminate the phenomenon of heteroscedasticity, using the logarithmic method does not change the trend, the author establishes the following three log model:

$$\ln GDP1 = a_1 + b_1 \ln FDI_1 + e_1 \tag{6}$$

$$\ln GDP2 = a_2 + b_2 \ln FDI_2 + e_2 \tag{7}$$

$$\ln GDP3 = a_3 + b_3 \ln FDI_3 + e_3 \tag{8}$$

GDP1, GDP2, GDP3 is, respectively the added value of the first, second and third industry in Chongqing and

FDI1, FDI2, FDI3 is respectively actual investments for foreign direct investments in the first, second and third industry; a_1, a_2 and a_3 are constants; b_1, b_2 and b_3 are regression coefficients; e_1, e_2 and e_3 are random error.

According to Bureau of Statistics of Chongqing (2011), Using Eviews6.0 software, we can get the following regression equation:

$$\begin{aligned} \ln GDP1 &= 5.385 + 0.101 \ln FDI_1 \\ t &= (14.058)(1.547) \\ R^2 &= 0.193 \quad \bar{R}^2 = 0.113 \\ F &= 2.395 \quad D.W = 0.478 \end{aligned}$$

By the regression results indicated: the return of the first model and regression coefficient can't pass the test, which shows that it is clear enough that FDI promote the growth of the first industry in Chongqing. The second and third regression models can pass the test and the second industry to increase 1 unit of FDI, the output will be increased 0.528 units accordingly; the third industry to increase 1 unit of FDI, the output will be increased 0.227 units accordingly. In conclusion, the results show that FDI has strong impetus function to Chongqing in the second industry and the third industry growth and the growth of the first industry is not obvious. The hypothesis has been proved.

But the Durbin-Watson D values are below the determination coefficient in the regression results ($d < R^2$). According to the method proposed by Newbold and Granger, there may be a spurious regression with $d < R^2$. Therefore, the residuals of regression equation would be tested for unit root tests.

Residual stability test: Unit root test (ADF) is a common data stationary test. E_i is the residual values for $\ln GDP_i$ and $\ln FDI_i$ regression models, unit root test is carried out on the residual value by the Eviews6.0, the test results in the following tab.2 and Table 3:

The Table 2 and 3 shows that ADF test of second industry and the third industry are able to reject the null hypothesis of the presence of a unit root in the 5% level of significance, With the whole relationship in Second Industry between $\ln GDP2$ and $\ln FDI2$ and in third industry between $\ln GDP3$ and $\ln FDI3$, they have a long-term stable equilibrium relationship. In the regression results that D values are below the determination coefficient may be too little explanatory variables.

Conclusion and Suggestion: At first, this study uses shift-share analysis to analyze the industrial structure of Chongqing since the Crown relative to the country's development. That the first industry of Chongqing lags behind the country, the second industry is same as the

Table 2: Results the level of sequence second ADF test industry regression residuals

Augmented dickey-fuller test statistic	t-statistic	Prob.*
	-2.140896	0.0365
Test critical values		
1% level	-2.792154	
5% level	-1.977738	
10% level	-1.602074	

Table 3: Results the level of sequence third ADF test industry regression residuals

Augmented dickey-fuller test statistic	t-statistic	Prob.*
	-2.676474	0.0126
Test critical values		
1% level	-2.792154	
5% level	-1.977738	
10% level	-1.602074	

development level of the country, the third industry development level is higher than the national average. Secondly, the effect of the industry is proved that FDI had a positive effect on the economic development of Chongqing that amount foreign investment have actually been utilized in the industry of Chongqing.

Combined with the conclusions of empirical analysis, on the Chongqing to attract FDI policy recommendations this article suggests: Tegulation foreign investment in the field will promote to optimize and upgrade the industrial structure. Firstly, deepen the adjustment of agricultural structure and the development of three-dimensional mountain economy encourage foreign investment in the primary industry; secondly, the largest notebook computer production base and the offshore development data and processing center will be built by the use of foreign capital; finally, the Government should continue to promote foreign investment in the financial industry, logistics industry and the mountain tourism.

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