Industrial Structure and Competitive Strength of 31 Provincial Districts ——A GIS-based Dynamic Shift-Share Analysis

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Abstract By using the dynamic shift-share analysis, the industrial structure and competitive strength of 31 provincial districts except Taiwan, Hong Kong and Macau are studied by taking the GDP of the three industries as the research entrance and the whole nation as the reference district. The industrial structure and competitive strength of each provincial district is measured. Through the analysis of pertinence, the correlation degree of industrial structure and industrial competitive strength to economic growth is analyzed. The results show that the industrial competitive strength is closely related to the economic growth of the 31 provincial districts, but the contribution made by the industrial structure to economic growth is insufficient and the effect of industrial structure does not match with that of industrial competitive strength. According to industrial competitiveness and industrial structure effect, 31 provincial districts of the whole nation are divided into 4 types and the relevant countermeasures of the four types are put forward.

Key words Dynamic shift-share analysis, Industrial structure, Competitive strength, Strategy, China

Regional industrial structure and competitiveness are hot topic in recent years and the appearance of shift-share model put forward by Creamer D in 1943[1] has provided a powerful tool for the research of industrial structure and industrial competitiveness. There are many researches on them both at home and abroad, the foreign researches mainly focus on interpreting the theory of model[2-5] and the application research[6-9]. Among the scholars, Daniel Z. Sui[9] introduced GIS, which strengthens the expressive force and persuasive power of model; the domestic researches mainly focus on the application of shift-share model in the research of industrial structure[10-14]. For example, LI Yan[12] and LIU Zhen-ling[13] introduced into shift-share method to study the evolution of industrial structure. The above analyses mainly focus on the provincial areas or cities, but none of the analyses is from the perspective of the whole nation to study the industrial structure and competitiveness. In the paper, taking the whole nation as reference and the years from 1998 to 2008 as time period for the research, the industrial structure, competitiveness, economic growth and their relations of the 31 provincial districts are analyzed.

1 Data source and research method

1.1 Data source The data come from *China Statistical Yearbook*.

1.2 Research method By using the Dynamic Shift-share Method[13] established by LIU Zhen-ling, taking the GDP of the three industries as the entrance of the research and taking the whole nation as the reference, the industrial structure and competeiveness of 31 provincial districts except Taiwan, Hong Kong and Macau is analyzed and the industrial structure effect and the competitiveness level of each provincial districts are measured. After that, the correlation degree of industrial structure and industrial competitiveness to the relative economic growth level are analyzed.

1.2.1 Dynamic model SSM.

$$G^r_{i,t} = N^r_{i,t} + S^r_{i,t} + D^r_{i,t}$$

$$N^r_{i,t} = P^r_{i,t} g^n_t$$

$$S^r_{i,t} = P^r_{i,t}(g^n_{i,t} - g^n_t)$$

$$D^r_{i,t} = P^r_{i,t}(g^r_{i,t} - g^n_{i,t})$$

In the equation, $G^r_{i,t}$ is the total growth volume of i industry in t time period in r research area; $N^r_{i,t}$ is the regional share volume of the references zone of the i industry in t time period of r zone; $S^r_{i,t}$ is the regional structure deviation volume of the i industry in the t time period at the r area; $D^r_{i,t}$ refers to the regional competitive deviation volume in the reference zone of i industry in the t time period of the r area; $P^r_{i,t}$ means the output value of i industry in the t time period of r area; g^n_t means the growth rate of the total output value in t time period of n area; $g^n_{i,t}$ refers to the output growth rate of i industry in the t time period of n reference zone; $g^r_{i,t}$ is the output growth value of i industry in t time period of r area.

1.2.2 The structural effect index W, competition index U and relative level of economic growth R.

$$R_t = \frac{1+g^r_t}{1+g^n_t} = \frac{\sum_i P^r_{i,t_0}(1+g^n_{i,t})}{(1+g^n_t)\sum_i P^r_{i,t_0}} \times \frac{\sum_i P^r_{i,t_0}(1+g^r_{i,t})}{\sum_i P^r_{i,t_0}(1+g^n_{i,t})}$$

$$W_t = \frac{\sum_i P^r_{i,t_0}(1+g^n_{i,t})}{(1+g^n_t)\sum_i P^r_{i,t_0}}$$

$$U_t = \frac{\sum_i P^r_{i,t_0}(1+g^r_{i,t})}{\sum_i P^r_{i,t_0}(1+g^n_{i,t})}$$

In the equation, R is the ratio of the growth of research area r to the growth of reference zone n; W is the structural effect index of r region and U refers to the competitive index. The three index measures the growth scale and growth speed of industries in r region[13]. The relative economic growth level R is bigger than 1, which indicates that the growth rate of regional e-

Received: September 9, 2010 Accepted: December 6, 2010

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conomy is faster than that of the reference zone; if the structural effect index is bigger than 1, it indicates that the economic growth in the research area is faster than that in the reference area; if the structural effect W is bigger than 1, it shows that the three industries in the research area has relatively good structural effect; if the index U is bigger than 1, it shows that the industries in the research area has strong competitiveness.

2 Results and analysis

2.1 The DSSM analysis of the 31 provincial districts

Taking the whole nation as the reference area and the 31 provincial districts as the research area, the industrial structural effect index, competitiveness index and relative economic growth level are measured by using the dynamic shift-share analysis to analyze the provincial districts at each level from 1998 to 2008.

The optimization and upgrading tempo of industrial structure in eastern coastal area is accelerating, and the contribution made by industrial structure to economic growth is strong; the Hebei Province, Guangxi Zhuang Autonomous region and Hainan Province are also in the coastal area, but the optimization of their industrial structure is insufficient and its contribution to economy is insufficient. In addition, the structural effect index of Heilongjiang in northeastern area, Shanxi in the central area and Chongqing Municipality, Shanxi Province and Qinghai Province in the Western area is bigger than 1, which indicates that the industrial structure of these areas plays an important role in facilitating the industrial development. The central and western areas should pay attention to the optimization of their own industrial structure in the process of receiving the industrial transfer of eastern area.

From the perspective of industrial competitiveness of provincial district at each level, the whole industrial growth momentum of the eastern area is great; in the central area, the competiveness of Shanxi Province and Henan Province only is great; in western area, the growth momentum of industrial competitiveness is great except that of the Gansu Province, Sichuan Province, Chongqing Municipality and Yunnan Province. The strategy of developing western China has made great progress in promoting the industrial competitiveness, and the western region has lifted its whole competitiveness in the process of accepting the industrial transfer of eastern area; as for central regions, it has some problems in accepting the industrial transfer, so the whole industrial competitiveness is week, so the economy rising strategy of central areas should attaches great importance to improve the industrial competitiveness of the whole central areas.

In view of the differences of industrial structure index and competitive index among each provincial district and the industrial structure and actual competitiveness of each provincial district, the 31 provincial districts of the whole country can be divided into four classes according to the value of W and U: the first class $W>1$ and $U>1$, the second class $W>1$ and $U<1$, the third class $W<1$ and $U>1$, the forth class $W<1$ and $U<1$ (Fig. 1).

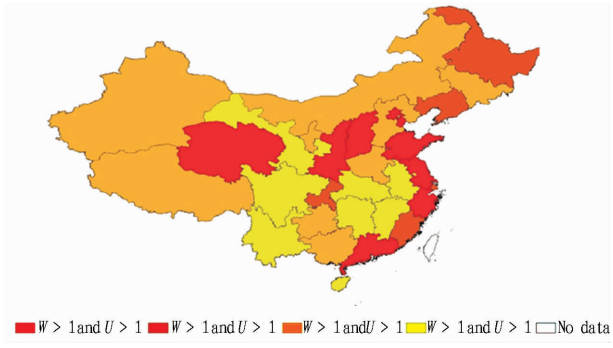

Fig. 1 Classification of industrial structure and competitive strength of 31 provincial districts

2.2 The analysis on relativity The relative growth of economy is the result of the comprehensive contribution of industrial structure effect and the competitive strength index. Through analysis and observation on the relativity, the correlation degree among relative economic growth, industrial structure effect and competitive strength index (Table 1).

Table 1 Correlation coefficient between relative economic growth level, industrial structure index and competitive strength index

Item	Structure effect W	Competitive strength index U	Relative economic growth level R
Structure effect W	1.000 000	−0.000 361	0.222 219
Competitive strength index U	−0.000 361	1.000 000	0.974 251
Relative economic growth level R	0.222 219	0.974 251	1.000 000

From the above table, it can be seen that the industrial competitive strength index has high correlation with the relative economic growth and the correlation degree has achieved 0.974; the correlation degree of industrial structure index to relative economic growth is only 0.22 and the correlation degree is small; the structure effect index is irrelevant with the competitive strength index and the correlation degree is less than 0.1%. Therefore, it can be seen that from 1998 to 2008, in the 31 provincial districts, the industrial competitive strength has made great contribution to economic growth level, but the contributions made by the industrial structure to relative economic growth level effect is low and the industrial structure is inharmonious with the competitive strength.

3 Conclusions and suggestions

From the perspective of industrial structure effect index, competitive strength index and indusial structure and competitive strength from 1998 to 2008, the 31 provincial districts of the whole country can be divided into four classes. Through the research on the relations among industrial structure index, competitive strength index and relative economic growth index, it can be detected that there are close relations between the industrial competitive strength of each provincial district and relative economic growth level. The industrial competitive strength

has made great contribution to economic growth level, but the industrial structure effect has made little contribution to economic growth and the industrial structure effect is inharmonious with the competitive strength. Therefore, at the same time of improving the industrial competitive strength, the provincial districts at each level should attach great importance to the optimization of industrial structure, so as to promote the construction of reasonable and high efficient industrial structure. The first class area should maintain the elevation of industrial structure and competitive strength and display its role in motivating other areas; the second class area should pay much attention to the combination of its own advantages as the time of adjusting and deepening its industrial structure; the third area should lay stress on the adjustment and optimization of its industrial structure at the same time of improving its own competitive strength in the process of accepting the industrial transfer of eastern coastal area, so as to promote the sustainable development of economy; the fourth class area should make use of the favorable policies, seize the opportunities of industrial development, facilitate the shift of industry from the east to the west, enhance its own industrial competitive strength and optimize the industrial structure.

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of back-feeding agriculture and benefiting the multitude, discover timely and solve the problems and contradictions effectively arising in the process of carrying out all the projects.

5.6 Propel the projects step by step and realize moderate centralized residence It is a very complicated system project to guide farmers to realize centralized residence. It needs a long-term incremental process, because it involves many aspects. All the behaviors of blindly pursuing achievements, contravening economic law of social development and forcibly propelling farmers' centralized residence will hinder farmer's production and life, damage the interests of farmers and make it difficult to achieve the actual effect of farmers' centralized residence. Therefore, we should not only make the full-fledged areas get higher life quality by the centralized residence, but also respect the wishes of farmers, protect the rights of farmers, follow the agricultural natural and economic law of social development, and propel the project steadily by the policy guidance and typical demonstration. We must not forcibly propel the projects that the farmers do not approved and accept or contravene the law of economic and social development[5-6].

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