Strategic Selection of Recycling Industrial Clusters in Less Developed Regions: Take Guizhou Province of China as an Example

Fu Jing

School of Economics, Wuhan University of Technology, Wuhan, P.R.China, 430070

(E-mail: Wangrx@whut.edu.cn)

Abstract   Starting from the history of recycling industrial cluster in less developed regions, this paper puts forward the embryonic development of industrial clusters based on different industrial background in different forms. Then it brings forward the selection principles of cluster industries in less developed regions and establishes model for industrial cluster choosing according to the principles. Considering the social benefit of the industries, the model choose location quotient L_i and the average growth rate of total industrial added value in latest three years g_i as the main basis to determine the cluster industries in less developed regions. Finally, with analyzing data and situation of Guizhou Province of China, the paper identifies the optimal choice industry($L_i > 2$、$g_i > 1.5g_0$)，sub-optimal select industry($L_i > 1$、$g_i > 0.75 g_0$)and Problem industry .

Key words   Recycling industry; Industrial cluster; Location quotient; Industrial added value

1 Introduction

Drive economic growth through industry clusters in less developed areas is an internal rule for industrial development under the conditions of modern market economy and a good way to industrialization. Cultivate industrial clusters accompanied by selecting an industry with a good foundation and development prospect and implement related supporting policies, is a necessary requirement for the construction of less developed areas. It is also the impetus to enhance competitiveness in less developed areas and promote overall economic development. Local governments should first determine the key support target when vigorously promoting the cluster development of industries (hereinafter referred to as industrial cluster).

Compared to typical eastern cluster, China's less developed regions lack industrial cluster with competitive advantage, but a variety of different background made embryonic form of industrial clusters possible.

First, industrial cluster based on historical and cultural tradition.

Some provinces and municipalities which are in less developed regions in China, have a long history and splendid culture such as the fireworks industry, Liuyang City in Hunan Province. It has 1,300 years of history. At present, there are more than 800 fireworks companies in city Liuyang, assisted more than 1,000 enterprises, employing more than 40 million people, accounting for one third of the city's population. Another example, Jingdezhen, which has gained fame as a famous porcelain both at home and abroad, has became the largest and complete ceramic industry cluster, due to its long history and deep culture

Secondly, industrial cluster based on natural resources conditions

China's less developed regions have natural resources such as rich land, mineral, hydropower and biological resources, which has formed many industrial clusters surrounding them such as equipment and machinery industry district in Deyang，Sichuan province, the tourism, tobacco products, flower industry in Yunnan, dairy production in Heilongjiang Province. Wenliu town in Puyang, Henan Province, where the formation of glassworks clusters is benefitted from the cheap oil and gas resources, produced 70% of Puyang gas. It has attracted a large number of foreign enterprises enter into and a lot of money and advanced technology has been infused, which promoted the rapid development of the glass products industry with high energy consumption.

Thirdly, industrial cluster based on government support.

With the success of industrial clusters in developed regions, the government in less developed areas began paying more emphasis on the application of industry cluster strategies. Lipu County, which is in Guangxi Province, had a relatively poor economic condition. At present, it has become the largest cluster of small wooden hangers which is due to government's direct promotion of private economic development.

2 Principles of Cluster Industry in Less Developed Region

A region has to obey the three following principles when it chooses a particular cluster industry.
(1) Comparative advantage principle.

When you choose a particular industrial cluster in a region, you should first consider about the comparative advantage based on the actual conditions. If we confirm some industry has comparative advantage, we mean that this industry has advantages not only in this area, but also in the wider region (for example in the whole country) in that field. Comparative advantage usually can be denoted by using location quotient (output location quotient or employment location quotient). If the location quotient is more than 1, it shows that this industry has a higher professional degree, and it has a comparative advantage in the country. If the location quotient is more than 2, it shows that the comparative advantage is very clear.
(2) Growth potential principle.

When you choose an industrial cluster in a region, you have also focus on the future, from the industry growth potential. Growth potential refers to an industry has a wider development than any other industries in the near future and is more correspondent with market demand nowadays. Sometimes we can use recent 3 to 5 years' growth to measure it.
(3) Comprehensive benefit principle.

Other than the points we have mentioned before, we have also need to pay attention to the whole region's development, starting from the comprehensive benefit. That's to say, we have to think about the benefits of economic, society, ecological environment and make them develop together. The cluster industry we want to choose must be benefit to the development of the region, employment and environment problem and so on. In this way, it can promote the region's development of all kinds.

3 Mode Establishment

Based on the above selection principle, we believe that region's industry cluster choice should use the two indicators, location quotient of overall output and the average growth rate of total output value-added in the last three years, as the main bases and consider the social benefits of that industry. The two indicators are calculated as follows:

$$ L_i = \dfrac{e_i / \sum_{i=1}^{n} e_i}{E_i / \sum_{i=1}^{n} E_i} \qquad g_i = \sqrt[3]{\dfrac{R_{it}}{R_{(t-3)i}}} - 1 $$

In the formula, L_i represents the location quotient of industry i in a region, e_i represents the total industrial added value of industry i while $\sum_{i=1}^{n} e_i$ means the total industrial added value of all industries E_i represents the country's total industrial added value of industry i while $\sum_{i=1}^{n} E_i$ means the total industrial added value of all industries in the whole country. g_i means the average growth rate of total industrial added value of industry i in last three years, R_{it} represents the total industrial added value in the tth year of industry i in the region while $R_{(t-3)i}$ said the total industrial added value in the (t-3)th year of industry i in the region.

Choose the location quotient of overall output as horizontal axis and the growth rate of total industrial added value as vertical axis to establish coordinate system. Take in the vertical axis two points $(0, 0.75g_0)$ and $(0, 1.5g_0)$ (represents the average growth rate of local industry), lead out two radial lines right which is parallel to the horizontal axis and take in the horizontal axis two points $(1, 0)$ and $(2, 0)$ lead out two radial lines up which is parallel to the vertical axis. Then the first quadrant of this coordinate system is divided into nine spaces I、II、III、IV、V、VI、VII、VIII、IX as seen in Figure 1.
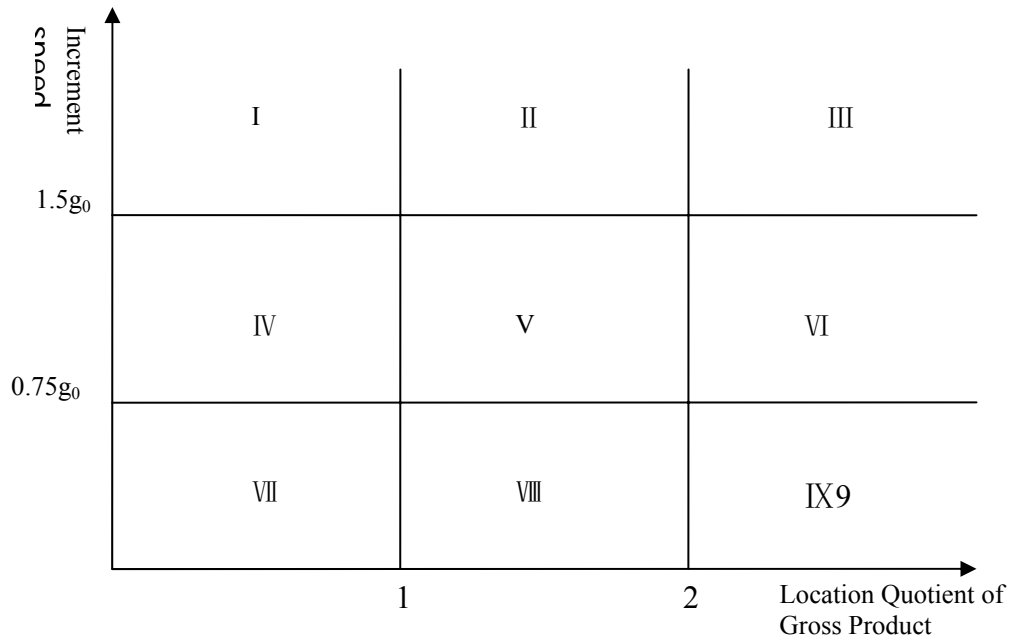
Figure 1　Industry Selection

Table 1　Industry Sector Data of Guizhou Province

Industry Type	Guizhou Province （100 million）			Whole Country （100 million）		
	Industrial Added Value(07)	Share of Industrial Added value	Average Growth Rate in Latest Three Years	Industrial Added Value(07)	Share of Industrial Added value	Average Growth Rate in Latest Three Years
Coal Mining and Washing	66.78	7.49	14.2	4696.33	4.012	27.556
Beverage Manufacturing	63.6	7.14	24.9	1883.66	1.61	27.22
Tobacco Products	91.11	10.23	14.2	2918.82	2.49	19.089
Medicine Products	44.95	5.05	15.44	2286.6	1.95	22.33
Electricity, Heat Production and Supply	203.83	22.89	18.8	8828.89	7.54	24.28
Agriculture	392.2	56.27	5.7	24658.1	52.35	10.81
Forestry	27.8	4	1	1861.6	3.95	11.99
Animal Husbandry	231.6	33.23	4.1	16124.9	34.23	11.18
Fisheries	9	1.29	14.5	4457.5	9.46	7.50

Wherein , typeⅢ is the best choice industry. The agglomeration level of such industry in the target areas is the highest ($L_i > 2$), which has a clear comparative advantage. In addition, growth rate of this type of industry in last three years is the fastest ($g_i > 1.5 \ g_0$), that is, it has a good potential for development. Such industry is the optimal choice object for the development of regional industrial clusters.

The Types Ⅱ、Ⅴ、Ⅵ are called second-best choice industry. The agglomeration level of such industries in the target areas are higher ($L_i > 1$), with faster growth rate ($g_i > 0.75 \ g_0$). However, compared with the optimal choice industries, a certain gap remains between them as concerns to comparative advantage and growth rate. They are the sub-optimal choice object for the development of regional industrial clusters.

Types Ⅰ、Ⅳ、Ⅷ、Ⅸ are treated as the problem industries. Such industries may have high level of agglomeration but grow slowly or grow fast, but with a low level of large-scale gathering. They are categorized as industries with problems, which can not be supported directly as a cluster industry as well as be directly ruled out its position as a cluster industry. The decision should be made after careful analysis with considering the actual situation. Industry Ⅷ is considered as non-selection industry. It is not suitable to be treated as the choice of target industry clusters because of its low industrial agglomeration and slow growth.

4 Conclusions

Statistics show that the GDP of Guizhou Province achieved 333.34 billion Yuan in 2008, up 10.2% over the same period last year. Its economic production ranked No. 8 in the western provinces (autonomous regions and municipalities), only 26.7% of the highest Sichuan Province and accounted for 1.1% of the national total production.

The summary of all industry sector data of Guizhou Province are seen in Table 1. Analyzing it with regional industrial classification matrix model, we get the results as shown in Figure 2
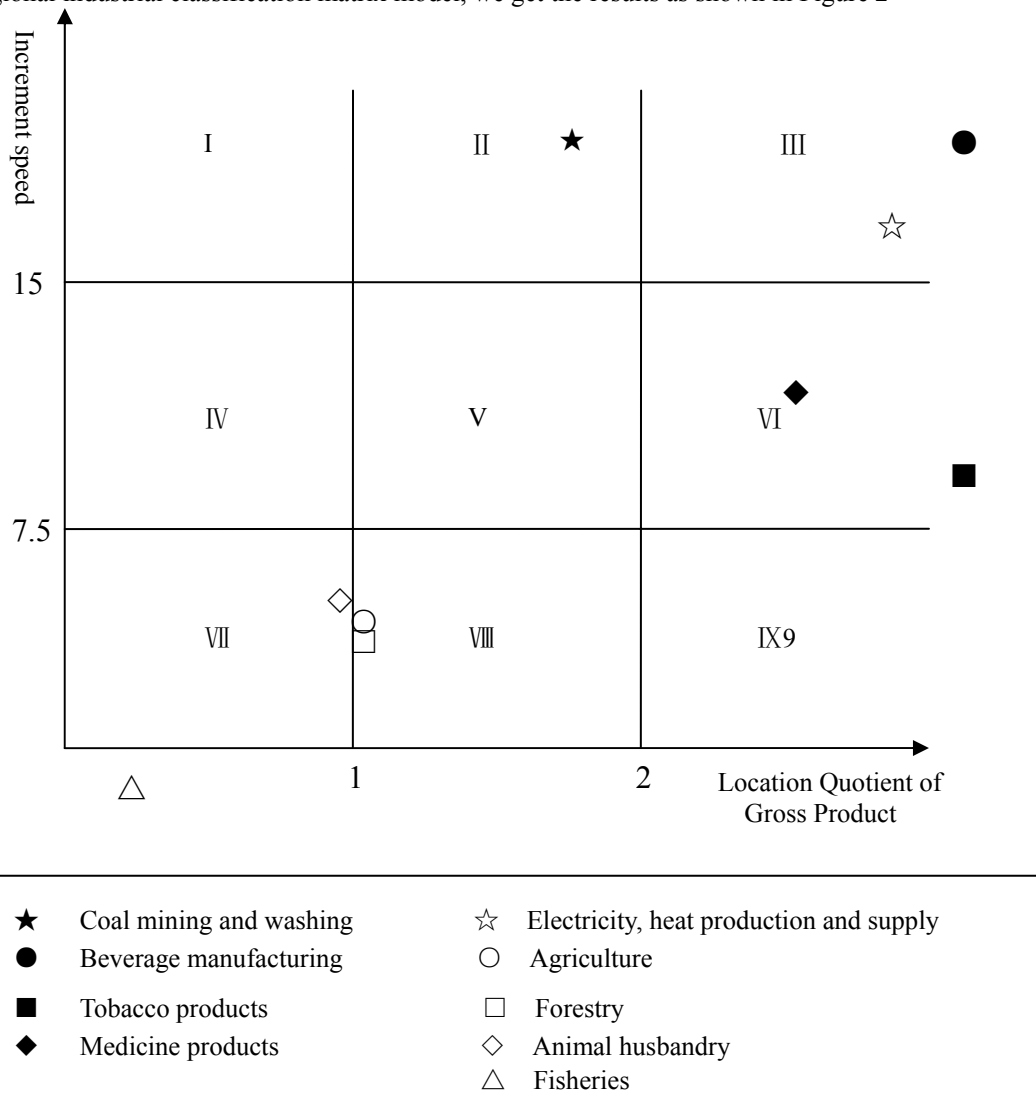

Figure 2　Industry Selection of Guizhou Province

(1) Optimal choice industry. As seen in Figure 1-2, the optimal choice of Guizhou Province exists, which including beverage manufacturing, electricity, heat production and supply industry.

(2) Sub-optimal select industry. As seen in Figure 1-2, the sub-optimal industries in Guizhou

Province include coal mining and washing industry, medicine industry, and tobacco industry.

(3) Problem industry. As can be seen from Figure 1-2, the problem industries include agriculture, forestry, and animal husbandry.

(4) Non-selection industry. As can be seen from Figure 1-2, the non-selection industries include fisheries industry.

Synthesizing the above analysis result and reexamining the current development situation of Guizhou Province, from the angle of strengthening traditional advantage and optimizing the industrial structure, We believe that the economic development in Guizhou Province may preferentially consider the following five priority industry clusters: beverage manufacturing, electricity, heat production and supply industry, coal mining and washing, pharmaceutical manufacturing, tobacco industry cluster

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