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Employment Effect of the Resource-abundant Industrial Cluster in Southwestern Region of Guangxi Zhuang Autonomous Region of China

—A Case of Chongzuo City

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Abstract Taking Chongzuo City of Guangxi Zhuang Autonomous Region as an example, the employment effect of the resource-abundant industrial cluster in southwestern Guangxi Province is analyzed according to the data from the *Chongzuo Statistical Yearbook*, *Guangxi Statistical Yearbook* from 2003 to 2008 and the data from the relevant sections of Chongzuo City, and the four employment effects of industrial cluster—the spatial expansion effect of employment chain, optimizing effect of employment structure, the multiplier effect of employment absorption and the effect of improving the quality of labors and the degree of the intensity of employment and location quotient of employment. Results show that the employment absorption of sugar industry in Chongzuo City is stable and upward slightly, and it shows strong employment effect; the sugar industry in Chongzuo is not only competitive, but also has a great share of market in employment, so it owns strong absorption of employment. The countermeasures for improving the employment level of resource-abundant and industrial cluster in southwest of Guangxi Province are put forward, including elongating industrial chain and widening employment space; strengthening various kinds of formal and informal training to improve the employment capability of laborers; laying stress on industrial structure and optimizing the employment structure; strengthening the construction of the industrial economic zone towards ASEAN (Association of Southeast Asian Nations), and fully displaying the regional advantages of the offshore border.

Key words Resource abundant, Industrial cluster, Employment effect, Employment intensity, Location quotient of employment, China

Resource-abundant area refers to the area with abundant natural resources but its economy lays at the primary stage with underdeveloped economy and low per capital disposable income^[1]. While resource-abundant industrial cluster refers to the highly dense ecological community formed by local residences, processing enterprises, distribution firms and the industries related to the local resources in geographical and spatial forms. To be specific, resource-abundant industrial cluster region includes the residences of resource collecting and production, agro-product processing, transportation, marketing and various kinds of service institutions, such as financial institutes, scientific research institutions, guilds, and intermediaries and so on. Adam Smith, Marshall^[2] and Carlo Sabatini^[3] pointed out from their own research fields that industrial cluster has the tendency of gathering labor forces, with the development of cluster, the enterprises in the cluster need more and more labors^[4]. HUANG Jian-kang^[5] thinks that the cluster employment effects include expanding employment space effect, elongating employment chain effect, the effect of improving the quality of labors^[5-6] and the dynamic-balanced labor supply and demand structure effect. Besides, HUANG Hai-ping *et*

al^[6] put forward the upgrading employment structure effect, employment attracting and gathering effect, employment multiplier effect and the demonstration and process effect of the employment of local labors. They further pointed out that a higher level labour productivity in the industrial cluster leads to the gathering of a large amount of enterprises, which provides more job opportunities to residents and contributes to the transfer of rural labors. We thought that the employment effect of industrial cluster can be summarized into four effects, which are the spatial expansion effect of employment chain, the optimizing effect of employment structure, employment attracting and gathering effect and the effect of improving the quality of labors. In the research, the employment concentration degree, employment location quotient and some other indicators are chosen to measure the four effects. In addition, taking Chongzuo City as an example and selecting the effective data to analysis, the countermeasures on improving the employment level of the resource-abundant industrial cluster in southwestern Guangxi Province are propounded.

1 Indicator selection, data sources and research method

1.1 General knowledge of the study area In 2010, relying on the advantages of the offshore border and rich natural resources, Chongzuo City, located in the southwestern Guangxi Zhuang Autonomous Region, is listed as the major industrial base in the industrial developmental plan of making the industries bigger, stronger and better and it is determined as the in-

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dustrial base in the resource-abundant area. According to the statistics, in Chongzuo City the planted area of sugar cane takes nearly 0.2 million hm^2 with the annual output of white granulated sugar around 1.85 million t, which accounts for 20% of that of the whole China. Chongzuo City is the largest base of planting cane and producing sugar, so it is praised as the "sugar city" in China; the manganese ore reserve of it is 0.138 billion t, accounting for 19.41% of that in the whole China, ranking first in China, so it is also praised as the "manganese core city"; the bentonite reserve of it is 0.65 billion t, accounting for 20% of the world reserve, ranking first in the world; the tourism resources of it is characterized by various types, high ranks and special tastes, every year it receives more than 0.1 million foreign tourists and more than 3 million domestic tourists, which enjoying exotic touring by Chongzuo port, ranking second in Guangxi only after Guilin City. At the same time, the southwestern region locates in the convergent point of the harmonious coexistence of western minority ethnics and Han people; it borders on Vietnam with 533 km's boundary line; it belongs to the forward position of China-Asian free trade area. Besides, it is the bridgehead that leads to the big Asian and the inland thoroughfare; the important eastern crunodes of the sub regional economic cooperation of Great Mekong; the important step of implementing the strategies of "Two Corridors and One Circle" and "One Axis and Two Wings"; the indispensable part of Economic Region in Northern Gulf of the South China Sea, which is supported by the nation; the principal hub for western development; the crucial point of the Pan-Pearl River Delta in the west part; the major trade thoroughfare for the rise of central China; an economic great interface for connecting the eastern developed region and western backward region and it is the intersection for southern China, south-central China and south-western China.

1.2 Indicator selection In order to measure the employment effect of industrial cluster, two indicators are adopted: employment concentration degree and employment location quotient.

1.2.1 Employment concentration degree. The indicator reflects the employment opportunities created by the industrial cluster in a certain region and the status of improving employment rate, the equation is that:

Employment concentration degree = The number of people employed in the industrial cluster in a certain area / The number of people employed in the whole area (1)

The value of the scope ranges from 0 to 1, the value can tell the size of the employment effect of industrial cluster. When the value tends to 1, it shows that the industrial competitiveness and employment effect of the industrial cluster are strong; when the value tends to 0, it shows that the industrial cluster lays in the recession stage and its employment effect languishes or even has already exhausted^[7].

1.2.2 Employment location quotient. Primarily, location quotient just adopted the "output value" of an industry in a certain area as the indicator to measure, and then expanded to other single indicators such as "the total number of enterprises",

"the total number of people employed", "added value" and "aggregate sales". Therefore, the location quotient obtained by calculating single indicator can be called single indicator location quotient. The research still uses the location quotient to analyze the relative distribution of employment of a certain area. Employment location quotient is used to measure the relative concentration degree of the personnel from a certain industry in a special location. According to the employment location quotient, the status quo of the regional advantaged industry can be analyzed and the level of industrial cluster employment of the very area in the upper level area. Generally speaking, the bigger the value of the quotient and the bigger the rate of specialization and then industrial advantage will be more obvious and the employment distribution will be more concentrated. These reflect the opportunities created by industrial cluster and the capability of industrial cluster on improving local and national employment rate. The equation of location quotient (LQ_{ij}) is as follows^[8]:

$$LQ_{ij} = \left(\frac{\text{The number of people employed in an industrial cluster of a region}}{\text{The aggregate number of people employed in the whole region}} \right) / \left(\frac{\text{The number of people employed in the same industrial cluster of the upper region}}{\text{The total number of people employed in the upper region}} \right) \quad (2)$$

In the equation (2), the numerators reflect the share of employment in a certain region created by the industrial cluster in the regional employment structure, the denominators reflect the share of employment in the upper region creative by the same industrial cluster in the whole economic employment structure. When $LQ_{ij} > 1$, it means that the industrial cluster not only attracts local labors, but also has the capability of providing surplus jobs. When $LQ_{ij} < 1$, it means that the industrial cluster in the area does not have enough capability to create jobs, and even leads to the emigrant of employees. It is due to the reasons that the industrial cluster is in the primary forming stage or that the cluster is in languishing stage. Therefore, the government should propound distinctive policies to solve the problem.

Comparing with the employment concentration degree, the advantage of employment location quotient is that it puts the employment structure of each industrial cluster into a bigger space system; takes the economic employment structure of the whole region as reference system to judge the size of share of employment created by each industrial cluster, and then uses them to weigh the capability of certain local industrial cluster in creating jobs and the competitiveness of it, so as to reveal the spatial structure of economic industrial activities of the whole big region and the changing trend of the advantages of each industrial cluster.

1.3 Data source and data processing Among the distinctive resource-abundant industrial cluster in southwestern Guangxi, the employment effect of cluster of sugar is more prominent and that is the crucial point of this research. In order to keep the generality, the other clusters should be taken into consideration in specific analysis, the cluster of manganese industry in particular. The data of the research mainly come from two major parts. The data of employment concentration degree

and employment location quotient came mainly from the *Chongzuo Statistical Yearbook* and the *Guangxi Statistical Yearbook* in the years from 2003 to 2008. The data of the empirical analysis of the four effects came mainly from the Chongzuo Government report, office of sugar industry, social labor security bureau, development and reform commission and some other institutions.

In view of the profitability of the data, we made relevant adjustment for the employment concentration degree and employment location quotient, which are mentioned in "1.2":

Employment concentration degree^{*} = The number of people employed in the sugar industry of Chongzuo City / The number of people employed in the secondary industry of Chongzuo City (3)

LQ_i^* = (The number of people employed in the sugar industry of Chongzuo City / The number of people employed in the secondary industry of Chongzuo City) / (The number of people employed in the sugar industry of Guangxi / The number of people employed in the secondary industry of Guangxi) (4)

1.4 Research method The research took theoretical studies as the basis, empirical research as the key point; applied the combination of quantitative research (employment concentration degree and employment location quotient) and qualitative research (the analysis of the four effects); and adopted the thought tools such as synthetic method, analytical method, contractive method and exemplification.

2 Results and analysis

2.1 The employment effect of resource-abundant industrial cluster The resource-abundant region has long being regarded as "resource curse" region by western economists^[9], and it is another name of poverty. But if the region can form the cluster and develop, the curse will be broken effectively. At the same time, it can form its own competitive advantages, which can expand the employment, promote the local economic development and increase the income level of per capital national economy. ZHANG Bing-shen^[10] pointed out that the crucial effect of middle- and small-enterprises is that it facilitates the urbanization effectively and motivates the concentration of relevant industries and the development of infrastructure and urban construction. The development of urbanization expands the employment, which facilitates the rapid gathering of labors. Afterwards, the cluster of middle-and small-enterprises and the concentration of industries provide further support for urbanization, and after that the employment demand is amplified and the chain reaction and virtuous circle are formed.

2.1.1 The spatial expansion effect of employment chain. Generally speaking, prolonging cluster industrial chain means the expansion of employment chain. With the increase of the employment types, the employment space is enlarged correspondingly. Since 2004, with the involvement of Angel Yeast Co. Limited, East Asia Paper Co. Limited, French Kangmilao, Citic Dameng Mining Industries Limited, the Chongzuo has constructed the platform for the industrial development of sugar and manganese, the recycling economy become larger and larger

and the industrial chain expanded continuously. It has attracted many enterprises with large investment and distinctive characteristics, and then the economic growth cluster which plays a principal role in supporting local economy. The industrial cluster reuses the resources and elongates the industrial chain of cane. Thus, more job opportunities are supplied for local residences and migrant workers. At the same time of increasing farmers' income, the industrial cluster brings good economic and social benefits.

2.1.2 The optimizing effect of employment structure. For one thing, due to the present scale economy and externality, the industrial cluster can attract a large amount of enterprises by its advantages; for another thing, the competition and cooperation among the enterprises in the cluster often brings along the creation and upgrading of technology, and then the industrial structure will be optimized, as well as the employment structure. For example, the involvement of Angel Yeast and some other international well-known enterprises, which have form a group of pillar industries in the local place, have motivated the development of relevant industries. Thus, the economic growth group, which plays a major role in supporting local economic development, accelerates the upgrading pace of Chongzuo City and the employment structure of Chongzuo City will be optimized.

2.1.3 The multiplier effect of employment absorption. The formation and development of industrial structure has contributed greatly to the progress of regional industrialization. Besides, it has also created an effective spatial cluster model for middle-and small-enterprises, thus, the scale effect and population spatial aggregation effect are formed. What's more, due to the existence of cluster, substantive basic construction and relevant industries are stimulated, which causes evident multiplier effect. Relying on the "black and white" (manganese and sugar) industries, The Chongzuo City, which takes the comprehensive use of resource as the target, the deep processing and fine processing as the approaches to elongate the industrial chain, has gradually formed the four deep processing bases including manganese, cane, alcohol chemicals and building materials, and the industrial pattern of one zone more parks, including light industry park of food and candy, the industrial park of resource processing, industrial park of heavy industries, high-tech industrial park and so on. The bases and industrial parks not only lay sound foundation for the expansion of industrial chain of Chongzuo City, but also create many job opportunities, as well as bring obvious multiplier effect of employment absorption.

2.1.4 The effect of improving the quality of labors. The economic development of each country shows that learning has obvious function on output. Through various kinds of training and studies, the output level can be improved, as well as the quality of labors and the employment capability. Since 2009, each sector of Chongzuo City has launched the targeted job training activities, and the 18 training institutions have held 392 sessions of job training for rural labor forces and 25 500 migrant workers have accepted the training. Besides, Chongzuo City

also provides service platform and job opportunities for migrant workers through a series of job assistance activities such as " Employment Assistance Week ", " Private Enterprises Week " and so on. Many returning migrant workers are employed by the local sugar production enterprises and manganese processing enterprises. At the same time, the city seeks opportunities from the rapid development of its economy. In 2009, the newly launched items in the city provided more than 6 000 jobs for more than 8 000 people. The trainings greatly improved the quality of rural labor forces, as well as the capability of Chongzuo City in creating jobs^[11].

2.2 Analysis on employment concentration degree and on employment location quotient By using the original data and the equation(3) and (4), the employment effect indicator of the sugar industry in Chongzuo City can be worked out (Table 1)^[12-13].

It can be seen from Table 1 that the employment rate of sugar industry in Chongzuo City took more than 35% of that in the whole industry of Chongzuo City. In 2003, the rate even came to 43.1%. Besides, there are 1.30 million farmers who

produce sugar, but the total population in Chongzuo City in 2009 was 2.419 6 million and 2.011 8 million of them was rural population, which means that more than 55% of population or 65% of farmers in Chongzuo City worked in sugar production industry. From 2002 to 2007, the employment concentration rate in sugar industry increased slightly except the previous three years(from 2002 to 2004), among which the rate in sugar industry decreased due to the raise of other industries. But on the whole, except in 2006, the number of people employed in the sugar industry was increasing rather than decreasing, which indicated that the capability of sugar industry of attracting labors was still improved and the sugar industry showed strong employment effect.

From the perspective of employment location quotient, the employment location quotient of Chongzuo City is not only far bigger than 1, but also keeps the quotient of more than 5. The quotient has been increasing since 2004, which fully indicated that the cluster of sugar industry not only had strong competitiveness, but also had a large share of employment. The sugar industry has strong capability of absorbing labors.

Table 1 Employment effect indicator of sugar industry in Chongzuo City

Year	Employees in Guangxi Province//People		Employees in Chongzuo City//People		Employment concentration degree//%	Employment location quotient
	The secondary industry	Sugar industry	The secondary industry	Sugar industry		
2002	823 067	64 797	26 927	11 216	41.7	5.290 909 35
2003	829 338	66 081	26 721	11 526	43.1	5.413 533 98
2004	855 880	61 544	30 742	11 676	38.0	5.281 887 25
2005	912 102	62 609	33 015	12 037	36.5	5.311 456 14
2006	913 703	63 305	31 896	11 903	37.3	5.386 259 20
2007	995 245	65 160	32 562	12 174	37.4	5.710 460 79

3 Countermeasures and suggestions

The improvement of employment level of resource-abundant and industrial cluster of southwestern Guangxi Province mainly owns to taking the comprehensive use of resources as objective; the deep processing and fine processing as method; the ecological recycling economy as core; the sustainable development as purpose; the industrial structural improvement motivated by informatization and technicalization as the central link; the education training as intellectual support; and service industry as the backup force and gradually setting up the employment platform with wide bore, high starting point and high employment rate.

3.1 The government should elongate industrial chain and widen employment space The government should ground on its own resource advantages; surround the industrial chain; continue to innovate; realize the industrial upgrade and sustainable development; improve the comprehensive use rate of resource; increase added value; elongate industrial chain; strengthen the forward and backward connection of industries; develop the supporting industry and service system; form the complete industrial cluster system composed by cooperation, trading, production service, researching and training and public industrial services and provide wide employment space for rural labors from multi channels and wide bore.

3.2 The government should strengthen various kinds of formal and informal training to improve the working abilities of labor forces The competition and cooperation in the

cluster pushes forward the technological innovation and knowledge distribution of enterprises in the cluster, and puts forward much higher requirement for the quality of labors. The government should size up the situation and provide targeted training according to various posts in the industrial zone, so as to satisfy the demand on skills of labor forces and enlarge the employment capability of labor forces. At the same time, the government should not ignore the input on rudimentary education. From the long term perspective, increasing the input on rudimentary education, improving conditions for running a school and intensifying formal education, then the high-quality and application-oriented labors can be cultivated continually^[6].

3.3 The government should adjust the industrial structure and optimize employment structure In the first place, the mechanization pace of plantation and production of cane should be accelerated to achieve the aim of " high-production and high-glucose ". In the second place, the development of productive service should be further promoted and more external benefits of core industry should be obtained to produce more professional and competitive products. In the third place, the supporting industry and the tertiary industry should be developed to provide sustainability to the pillar industries to ensure no more problem in the future. At the same time of optimizing and improving industrial structure, the employment structure has also been greatly improved and optimized.

3.4 The government should strengthen the construction of industrial economic belt and fully display the location advantage of offshore border The government should rely

on the resource endowment of sugar and manganese; seize the opportunities of China-East Asia Free Trade region and the comprehensive trade free zone in Pingxiang, Guangxi Province set up by Chinese government; keep a firm grasp on the construction of "Nanning – Singapore" economic corridor, sugar city and green manganese city and the important logistics base of China-East Asia, so as to continuously expand the capacity of employment in southwestern Guangxi Province.

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3 Conclusion

(1) According to the sequencing result at layer C , criterion for the leading industry selection in Anshun Experimental District should be as follows: firstly, industry benefits, especially the economic benefits, should be considered. Secondly, market demand and long-term market potential should be taken into account. Thirdly, regional advantage should be exerted and the rational use of resources should be considered.

(2) According to the sequencing result at layer P , the priority order of the leading industry selection in Anshun Experimental District is tourism (P_9) > pharmacy (P_7) > transportation (P_2) > energy (P_1) > food processing (P_3) > characteristic agriculture (P_8) > package and printing (P_{10}) > automobile industry (P_4) > mining (P_5) > electric engineering (P_6).

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