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Study on China's Electronic Information Industrial Agglomeration and Regional Industrial Competitiveness

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Abstract

Spatial agglomeration and industrial competitiveness are currently two key issues in the study of China's electronic information industrial development. Based on the data for 1995 - 2010, this paper establishes the indicator system to evaluate the competitiveness of regional electronic information industry. In this paper, location Gini coefficient and the indicator of concentration rate are applied to analyze the characteristics and historical evolution of China's electronic information industrial agglomeration, while benchmarking analysis is also applied to evaluate the competitiveness of provincial regional electronic information industry. The correlation between industrial agglomeration and industrial competitiveness is analyzed in this study. There is a significant positive correlation between them at present.

Keywords*: China's Electronic Information Industry, Spatial Agglomeration, Industrial Competitiveness*

1. Status of Research on Electronic Information Agglomeration and Industrial Competitiveness

Over the past two decades, with the advancement of computer technology, network technology and communications technology, the electronic information industry has been booming around the world. International organizations, such as, OECD have now incorporated the industry as one of the important high-tech industries.This industry has accounted for more than 70% of shares in high-tech industries in China, not only in terms of employment but also the production scale. In terms of historical literatures, (1) Foreign scholars focused on research on industrial spatial distribution and agglomeration. For example, Krugman analyzed the interrelationship among space structure, economic growth and scale on the basis of the traditional theory of increasing returns. [1] According to the research by Fujita, there is an inverted-U curve relationship between industrial concentration rate and stages of the integration process. [2] Some other scholars have researched the industry cluster from Geographical Agglomeration. [3-4] Some researchers study the industry cluster from innovation. [5-7] (2) In China some scholars research the industrial cluster from information environment, technological capability, and knowledge management. [8-12] LU Minghua pointed out that electronic information industry is one of the most globalized industries, and each section of its value activity does not only widespread globally but also centralize in some particular regions. From the point of economic capability, technological innovation, dispersive capability, environmental supporting capability and sustainable development capability. [13] YANG Jianhua established the indicator system to evaluate the electronic information industrial development. [14] Based on the AHP theory, KANG Canhua evaluated the current situation of innovation capability and developmental tendency of China's electronic information industry. In light of kurtosis and skewness. [15] LIU Rong constructed the industry agglomeration index which can undertake significance test. On this basis, LIU Rong also measured and analyzed the aggregation level of China's electronic information industry between the year 1987 and 2007. These showed that the phenomenon of China's electronic information industry is very obvious in accordance with the distribution of agglomeration which mainly concentrated in Guangdong, Jiangsu, Shanghai and other eastern coastal areas, and the degree of concentration is continually improved. [16] TAO

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Xiaohong used spatial metrological method to do the research on effects of China's electronic information industrial agglomeration from 2000 to 2009 on regional economic integration, and figured out that the degree of electronic information industrial agglomeration was improved every single year and industry agglomeration only promoted the economic growth in the central region of China. [17] WANG Shen used the data from the statistics yearbook, enterprises questionnaires and depth interview to explore the impetus of electronic information industrial clusters for technological innovation. Studies indicated that the impetus of simple industry agglomeration for technological innovation is not obvious under the background of China's current social economy. [18]

Spatial agglomeration and industrial competitiveness are two key issues in the study of China's electronic information industrial development. Based on the long-term statistics of science and technology, this paper applies the theories and methods of systems engineering, regional economics and statistics to the study of the following three aspects: firstly, research on the characteristics and historical evolution of China's electronic information industrial agglomeration over the past 15 years since the existence of independent electronic information industrial statistics; secondly, analysis of the growth and decline of China's regional electronic information industrial competitiveness in accordance with provincial administrative regional scale; and thirdly, the analysis and evaluation of the correlation between China's electronic information industrial agglomeration and industrial competitiveness. The scope of electronic information industry of this paper coincides with classified standard of OECD electronic information industry, involving manufacture of office, accounting and computing machinery; manufacture of electronic valves and tubes and other electronic components; manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy; manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods.

2. Research Methodology and Model Construction

2.1. Research Methodology and Model Of Spatial Agglomeration

Industrial agglomeration is an important phenomenon of economic geography that industries, assets and population clustered in a region. The research on the industrial agglomeration has existed for a long time. In the 1980s, A. Weber and A. Marshall attached importance to the issues in this field. The worldwide industrial agglomeration was noticeably accelerated and many famous economists started to get themselves involved in the study of the spatial or regional issues of industrial agglomeration after 1980s. "New economic geography" represented by Paul Krugman has paid particular attention to the issue of industrial agglomeration. Krugman applied economics of impetus competition, increasing returns, path dependence and cumulative causation to explain industrial agglomeration. Porter [19] placed emphasis on the role of industrial agglomeration in the international competitiveness of regional industries in the process of studying on the national competitive advantage. He also believed that industrial agglomeration can not only promote regional competition, but also maintain or accelerate the rate of economic growth. The experts who study on industrial agglomeration have provided a series of approaches of measuring the degree of industrial agglomeration, such as coefficient of standard deviation, concentration indicator, concentration rate, location Gini coefficient and so on. The most representative one is location Gini coefficient. Its formula is as follows:

$$G_i = \frac{1}{2n^2 \bar{s}} \sum_{j=1}^{n} \sum_{m=1}^{n} \left| s_j^i - s_m^i \right| \quad (1)$$

In this formula, G_i represents the location Gini coefficient of Industry *i*, S_j^i represents the national share of Industry *i* of Region *j*; S_m^i represents the national share of Industry *i* of Region *m*; *n* is the number of areas; $\bar{S}$ is the national average share of Industry *i*. Location Gini coefficient values range from 0 to 2. The nearer location Gini coefficient approximates to 0, the

evener spatial distribution of Industry *i*. And conversely, the nearer location Gini coefficient approximates to 2, the more compact spatial distribution of Industry *i*.

Krugman [20] used location Gini coefficient to measure the level of spatial agglomeration of 106 manufacturing industries which were in the United States in 1991; LIANG Qi [21] calculated the location Gini coefficient of 24 extractive industries and manufacturing industries which were in China in the year of 1994, 1996 and 2000, involving 30 administrative division units.

However, location Gini coefficient is only used to measure the trend of industrial agglomeration. There is no absolute numerical value judging its quality. It is an issue that determines whether balance or non-balance is more favorable to economic development by experience. Location Gini coefficient is just the relative measurement of industrial agglomeration degree. And it cannot reflect the absolute level of industrial agglomeration. Therefore, its use should be in conjunction with the indicator which reflects the absolute amount of industry for remedying this defect, such as concentration rate. This paper attempts to survey the spatial agglomeration level and historical evolution of this industry in China by measuring the location Gini coefficient of electronic information industry of 30 provincial administrative regions (excl. Tibet). Meanwhile, the indicator of concentration rate (CR) is used to inspect the absolute concentration level of electronic information industry.

2.2. Research Method and Model of Regional Industrial Competitiveness

Industrial competitiveness is that the comprehensive capability of the industry of a region is superior to the industry of other regions in the market competition. From the perspective of international competitiveness of industrial product, JIN Bei [22] discussed the theories and methods of the international competitiveness of Chinese industries. This literature is relatively overall and systematic. MU Rongping [23] proposed the overall analytical framework of international competitiveness of China's high-tech industry. This framework consists of competitive potential indicator, competitive strength indicator, competitive situation indicator and competitive environmental indicator. Based on the synergy theory, XIE Zhangshu [24] established the indicator system to evaluate the high-tech industrial competitiveness from the division of industrial endogenous competitive indicator and exogenous competitive indicator. However, most research on the indicator system to evaluate industrial competitiveness doesn't measure the results. The reason is very simple. The more perfect the indicator system is, the more difficult the acquisition of available data is. This paper attempts to propose the indicator system to evaluate China's electronic information industrial competitiveness and measure it. At present, benchmarking analysis is an evaluation method that is widely used internationally. Its principle is as follows: setting a benchmark value for evaluated object; using this standard to measure evaluated object so as to Figure out the gap between each other and present the ranking results. This paper uses the benchmarking analysis to do evaluation. Its measurement model is as follows:

(1) Using provincial administrative region as sample for the evaluation of regional electronic information industrial competitiveness. Region $i = 1, 2, ..., n$.

(2) Establishing the indicator system to evaluate the regional electronic information competitiveness. Evaluation Indicator $j = 1, 2, ..., m$. The data matrix of $X = (x_{ij})_{n \times m}$ can be formed.

(3) Non-dimensionalization. x_{ij} can be handled dimensionless with the following formula so that standardization matrix can be obtained X'.

$$x_{ij}^{'} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (2)$$

$x_{ij}^{'}$ The adoption of this dimensionless method can not only eliminate the effect of dimension and order of magnitude, but also ensure that even if the value of evaluation is negative, $x_{ij}^{'}$ can value range from 0 to 1.

(4) To calculate the comprehensive evaluation score of *i* region Y_i, the formula is as follows:

$$Y_i = \frac{\sum_{j=1}^{m} \beta_j x_{ij}^{'}}{m} \quad (3)$$

β_j represents the weighting of Indicator j. This paper adopts equal weighting.

3. The Selection of Data Source and Evaluation Indicator and Data Processing

3.1. Selection of Evaluation Indicator of Spatial Agglomeration

When location Gini coefficient is used to measure the issues of industrial agglomeration and the number of enterprises is large enough to ignore the difference of enterprise scale, the indicator of enterprise quantity can be adopted to do the measurement. The western economists like Krugman et al. often use the indicator of employment. Chinese scholars like LIANG Qi et al. generally adopted the indicator of output value or value-added. The adoption of indicator is closely related with the characteristics and data availability of industry and enterprise. We believe that, for electronic information industry with the relatively complex enterprise scale and ownership type, using multiple indicators simultaneously to do the measurement can reflect more clearly the real situation of industrial agglomeration. Hence, this paper used enterprise quantity, gross output value and employees' quantity of electronic information industry as 3 indicators to measure location Gini coefficient.

The past 15 years have witnessed rapid development of China's electronic information industry. The number of this industry increased from about 8,000 in 1995 to over 15,000 in 2010. The gross output value increased about 20 times more than $30 billion. The number of employees increased triple more than nearly 2 million. According to the type of enterprises registration, most of the time, the number of Chinese funded enterprise is higher than that of foreign funded enterprise. But foreign funded enterprise has more advantages in production scale and the resolution of employment. Its share of gross output value and employees is now over 70%.

Table 1. Major economic indicators of China's electronic information industry

	1995	2000	2005	2006	2007	2008	2009	2010
Enterprise Quantity (Thousand)	**7.9**	**4.5**	**9.0**	**9.9**	**11.4**	**14.6**	**14.5**	**15.1**
Foreign Funded Enterprise	2.9	2.1	4.7	5.1	5.9	7.0	6.8	6.8
Chinese Funded Enterprise	5.0	2.3	4.3	4.8	5.5	7.6	7.7	8.3
Gross Output Value (Billion US Dollars)	**30.4**	**92.5**	**336.1**	**423.1**	**525.3**	**642.8**	**662.3**	**823.6**
Foreign Funded Enterprise	18.2	66.6	283.5	348.5	442.3	523.3	516.8	638.3
Chinese Funded Enterprise	12.1	25.9	52.6	74.6	83.1	119.5	145.5	185.2
Employee(Thousand)	**1957**	**1976**	**4478**	**5149**	**5984**	**6882**	**6733**	**7830**
Foreign Funded Enterprise	530	1001	3248	3827	4515	5083	4848	5638
Chinese Funded Enterprise	1427	975	1230	1322	1469	1799	1885	2193

SOURCES: STATS, SDPC, MOST. China *Statistics Yearbook on High Technology Industry 2009, 2011*. Beijing: China Statistics Press, 2009, 2011. STATS. *China Statistical Yearbook 2011*. Beijing: China Statistics Press, 2011.

We collected and processed the statistic data on 30 provincial administrative regions of China (excl. Tibet) since 1995. We also calculated the location Gini coefficient and concentration rates on the number of enterprises, gross output value and the number of employees in the electronic industry for 1995, 2000, 2005, and 2010, so as to arrived at the characteristics and historical evolution of China's electronic information industrial agglomeration. (specific data omitted)

3.2. Selection of the Evaluation Indicator of Regional Industrial Competitiveness

The evaluation of the industrial competitiveness of a certain region within a country is to evaluate its performance in domestic market competition. As a component of high-tech industry, electronic information industry has key characteristics of high profitability and high innovation. Meanwhile, China has abundant labor force. As an emerging industry, electronic information industry should play a very important role in solving the problem of employment. Consequently, economic return, innovative capability and employment effect are three criteria for measuring industrial competitiveness of regional electronic information industry. The fundamental of analytic hierarchy process is used to establish the indicator system to evaluate the regional electronic information industrial competitiveness. This system is made up of 8 basic indicators.

Table 2. The indicator system to evaluate the regional electronic information industrial competitiveness

Objective Layer	Criteria Layer	Indicator Layer
Electronic Information Industrial Competitiveness (A)	Economic Return(B1)	The Rate of Return on Net Sales(C1)
		The Rate of Asset Profit and Tax(C2)
		The Rate of Labor Productivity(C3)
	Innovative Capability(B2)	R&D Personnel Input Intensity(C4)
		R&D Funds Input Intensity (C5)
		Proportion of Output Value of New Product(C6)
		The Rate of Patent Output(C7)
	Employment Effect(B3)	Proportion of Employees(C8)

Table 3. Indicators and data for the evaluation of China's electronic information industry competitiveness

	1995	2000	2005	2006	2007	2008	2009	2010
The Rate of Return on Net Sales(%)	**4.8**	**6.7**	**3.3**	**3.4**	**3.7**	**3.6**	**4.0**	**5.2**
Foreign Funded Enterprise	5.5	6.5	3.3	3.3	3.4	3.3	3.1	4.1
Chinese Funded Enterprise	3.7	7.2	3.8	4.0	5.2	5.0	7.1	8.9
The Rate of Asset Profit and Tax(%)	**—**	**39.1**	**20.2**	**22.5**	**22.1**	**21.4**	**—**	**—**
Foreign Funded Enterprise	—	46.9	18.5	20.1	18.4	17.8	—	—
Chinese Funded Enterprise	—	29.3	27.5	32.6	42.3	38.0	—	—
The Rate of Labor Productivity (Thousands of US Dollars Per Capita)	**15.5**	**46.8**	**75.1**	**82.2**	**87.8**	**93.4**	**98.4**	**105.2**
Foreign Funded Enterprise	34.4	66.5	87.3	91.1	98.0	103.0	106.6	113.2
Chinese Funded Enterprise	8.5	26.6	42.8	56.5	56.5	66.4	77.2	84.5
R&D Personnel Input Intensity (Person-year Per Thousand People)	**8.6**	**20.5**	**25.1**	**23.8**	**28.8**	**29.5**	**32.5**	**35.8**
Foreign Funded Enterprise	3.0	9.7	14.3	13.8	15.4	15.7	21.0	25.6
Chinese Funded Enterprise	10.6	31.6	53.7	52.6	69.8	68.7	61.8	61.8
R&D Funds Input Intensity(%)	**0.23**	**1.06**	**1.02**	**1.04**	**1.02**	**1.10**	**1.50**	**1.23**
Foreign Funded Enterprise	0.08	0.51	0.60	0.65	0.63	0.66	1.06	0.72
Chinese Funded Enterprise	0.45	2.53	3.14	2.82	3.02	3.01	2.99	2.92
Proportion of Output Value of New Product(%)	**—**	**30.0**	**21.7**	**21.6**	**22.7**	**24.7**	**22.7**	**24.2**
Foreign Funded Enterprise	—	26.7	19.5	20.4	21.2	23.7	19.6	23.1
Chinese Funded Enterprise	—	38.6	33.3	27.3	31.1	29.0	33.6	28.0
The Rate of Patent Output (Piece Per Thousand Person-years)	**9.4**	**33.6**	**114.5**	**162.8**	**162.4**	**149.8**	**184.9**	**165.6**
Foreign Funded Enterprise	13.9	49.5	110.2	147.5	121.8	125.1	152.1	148.3
Chinese Funded Enterprise	8.9	28.5	117.5	174.4	189.9	165.7	213.6	184.1
Proportion of Employees in Manufacturing(%)	**3.6**	**6.1**	**13.9**	**15.4**	**17.3**	**20.0**	**19.3**	**21.5**

NOTE:"—" means data-free.

SOURCES: STATS, SDPC, MOST. *China Statistics Yearbook on High Technology Industry 2009, 2011*. Beijing: China Statistics Press, 2009, 2011. STATS. *China Statistical Yearbook 1996*, *2001, 2011*. Beijing: China Statistics Press, 1996, 2001, 2011.

In the aspect of economic return, there is continuous increase in the labor productivity of China's electronic information industry during the past 15 years, and the labor productivity of foreign funded enterprises is always higher than that of Chinese funded enterprises. But in the aspect of profitability, the labor productivity of foreign funded enterprises is lower than that of Chinese funded enterprises. One of the important reasons is that foreign funded enterprises

transfer production profit to overseas parent companies. In the aspect of innovative capability, there is stable improvement in the input and output of China's electronic information industrial innovation, and these levels of Chinese funded enterprises improved more obviously. The speed that foreign enterprises transfer innovation activities to China is still lower than that of transferring production activities. That's why the proportion of jobs which electronic information industry provides in all jobs that manufacturing provides increased rapidly from 3.6% to 21.5%. We selected and processed the data for 1995, 2000, 2005, and 2010 to measure the change of China's regional electronic information industrial competitiveness.

4. Result and analysis

4.1. Characteristics of Electronic Information Industrial Agglomeration

According to Formula 1, the result of measurement showed that the comprehensive location Gini coefficient of China's electronic information industry increased firstly and then decreased in the period of 1995-2010. The location Gini coefficients which are measured relatively by enterprise quantity, gross output value and employees also increased firstly and then decreased. This result indicated that the spatial distribution of China's electronic information industry appeared the trend from agglomeration to dispersion during the past 15 years. There are two features deserving concern. First, the spatial distribution of electronic information industry only appeared the trend from agglomeration to dispersion after 2005, and the spatial agglomeration had been in dominant position in the previous ten years. Second, the degree of China's electronic information industrial agglomeration in 2010 is lower than that in 2000, but is still higher than that in 1995.

Table 4. Calculation results of the location Gini coefficient of China's electronic information

	1995	2000	2005	2010
Synthesization	**0.84**	**1.43**	**1.61**	**1.31**
Enterprise Quantity	0.85	1.36	1.69	1.18
Gross Output Value	1.11	1.52	1.50	1.34
Employees	0.64	1.42	1.63	1.42

NOTE:The nearer location Gini coefficient approximates to 2, the higher agglomeration degree is; the nearer location Gini coefficient approximates to 0, the lower agglomeration degree is.

In order to observe the specific distribution of China's electronic information industry above provincial region and evaluate the absolute agglomeration level of this industry, we used three indicators - the number of enterprises, gross output value and the number of employees to measure the relative comprehensive concentration rates (CCR) in 1995, 2000, 2005 and 2010. The results showed that China's electronic information industry is highly concentrated on Guangdong, Jiangsu, Shanghai and Zhejiang. The sum of comprehensive rates of these four provinces reached to 72.2% in 2010. In addition to these four places, China's electronic information industry is also highly focused on Shandong, Fujian, Tianjin and Beijing. The sum of CCR of these eight provincial regions reached to 87%. The above-mentioned provincial regions which can be called China's electronic information industrial concentration region are in China's eastern coastal region with developed economy. Besides, the CCR of electronic information industry in 10 provincial regions are between 0.6% and 2.2%. The regions that consists of China's midland provinces and few western provinces with strong economy belong to China's electronic information industrial balance region (Ten regions include Sichuan, Liaoning, Hubei, Anhui, Jiangxi, Hunan, Henan, Hebei, Guangxi and Shaanxi). Most of the rest 12 provincial regions that the CCR is below 0.5% are in the western and northeastern regions. These 12 regions are also called China's electronic information industrial rarefaction region (including Shanxi, Chongqing, Jilin, Guizhou, Heilongjiang, Inner Mongolia, Gansu, Yunnan, Hainan, Xinjiang, Qinghai and Ningxia).

China's electronic information industry is highly concentrated in the eastern coastal region for the following main reasons: the eastern region with developed education has science and technology human resources needed by a large number of knowledge-intense regions and electronic information industry; it has the conditions of being close to the harbor and excellent

transportation infrastructure; and it has good ecological environment of industrial supply chain and business environment. However, owing to the increase in various types of production cost in eastern region and the gradual improvement in industry, science and technology and policy environment in central and western regions, electronic information industry shows the tendency of transferring from the east to the west, thereby lowering its comprehensive location Gini coefficient.

4.2. Characteristics of Regional Electronic Information Industrial Competitiveness

According to the measurement method provided in 2.2 and the indicators and data proposed in 3.2, the results of the measurement showed that the industrial competitiveness indicator of Guangdong province with the highest comprehensive concentration rate of electronic information industry has been higher than other regions. The competitiveness of Jiangsu, Beijing and Shanghai is also in the leading position of the nation. These four regions are the predominant region of China's electronic information industry.

Table 5. The electronic information industrial competitiveness indicators of China's provincial regions

1995		2000		2005		2010	
Region	**ICI**	**Region**	**ICI**	**Region**	**ICI**	**Region**	**ICI**
National Average	33.2	National Average	36.9	National Average	29.6	National Average	29.3
Guangdong	59.4	Guangdong	63.8	Guangdong	55.2	Guangdong	55.1
Tianjin	49.9	Beijing	52.6	Tianjin	40.6	Shanghai	41.7
Beijing	46.9	Tianjin	46.4	Shanghai	40.5	Beijing	37.1
Shanghai	43.3	Shanghai	44.5	Jiangsu	37.5	Shanghai	32.1
Jiangsu	39.4	Fujian	41.9	Beijing	35.3	Gansu	31.9
Sichuan	39.1	Sichuan	40.6	Xinjiang	33.6	Yunnan	31.8
Zhejiang	37.0	Zhejiang	39.8	Fujian	31.8	Tianjin	31.0
Fujian	36.7	Shaanxi	39.4	Sichuan	29.0	Fujian	30.4
Shaanxi	35.5	Jiangsu	39.1	Shandong	28.4	Hubei	29.1
Henan	34.8	Yunnan	37.8	Inner Mongolia	27.6	Anhui	27.3
Guizhou	31.8	Shandong	35.6	Chongqing	26.7	Xinjiang	26.1
Yunnan	31.4	Hubei	35.3	Zhejiang	26.5	Sichuan	26.0
Hubei	31.3	Hunan	32.7	Ningxia	25.3	Zhejiang	25.5
Inner Mongolia	31.0	Chongqing	30.8	Hubei	24.6	Guizhou	25.5
Jiangxi	30.8	Henan	29.1	Yunnan	24.4	Shandong	25.2
Gansu	30.1	Jiangxi	28.3	Jiangxi	21.0	Inner Mongolia	24.2
Guangxi	28.6	Gansu	27.7	Henan	20.7	Shaanxi	23.9
Shandong	27.7	Liaoning	27.3	Heilongjiang	20.3	Hainan	22.7
Hunan	26.8	Heilongjiang	24.7	Hainan	20.3	Heilongjiang	22.6
Shanxi	26.3	Guizhou	24.1	Liaoning	20.2	Guangxi	22.4
Jilin	26.2	Hebei	24.0	Anhui	19.3	Jilin	21.0
Heilongjiang	25.8	Jilin	22.3	Hunan	17.8	Jiangxi	19.7
Liaoning	22.8	Inner Mongolia	21.5	Gansu	17.8	Hunan	17.8
Hebei	22.1	Anhui	21.3	Guangxi	17.0	Chongqing	17.8
Anhui	20.5	Guangxi	21.1	Shanxi	16.9	Henan	17.7
Hainan	15.7	Hainan	14.3	Shaanxi	16.0	Liaoning	16.4
Ningxia	11.9	Shanxi	13.7	Hebei	14.1	Hebei	15.7
Xinjiang	8.4	Xinjiang	9.0	Guizhou	11.4	Shanxi	12.0
Qinghai	1.5	Qinghai	4.6	Jilin	10.5	Qinghai	11.1
Chongqing	—	Ningxia	2.3	Qinghai	0.0	Ningxia	0.0

NOTES: ICI: industrial competitiveness indicator, values from 0 to 100. The higher the score is, the more competitive the industry is. Because of the inherent characteristics of measurement methods, there is no comparability in the score between years.

They not only gain good economic returns and create jobs, but also have high innovation capability. In recent years, the electronic information industries of Gansu and Yunnan have good developmental potential because of high input in innovation. The indicator of industrial competitiveness of these two provinces in 2010 is not only second to predominant regions, but also exceeded the national average of the indicator of electronic information industrial competitiveness as well as Tianjin and Fujian in the east. These four provincial regions are currently China's electronic information industrial regions with good competitiveness. The industrial competitiveness indicators of 13 provinces including Zhejiang, Hubei, Sichuan, etc. are above 20 and beneath the national average. These thirteen provinces that the competitiveness is at the middle level belong to the developing regions of China's electronic information industry. The electronic information industry in Zhejiang has ordinary performance in the aspect of employment. The industrial competitiveness indicators of 9 regions which are the vulnerable regions of China's electronic information industry and include Liaoning, Jiangxi, Chongqing, etc. are below 20. The innovation capability of electronic information industry in Liaoning is relatively backward.

4.3. Analysis of the Correlation Between Industrial Agglomeration and Competitiveness

In order to analyze the correlation between CCR and ICI of China's electronic information industry, we used linear regression to analyze the CCR and ICI of 30 China's provincial regions in 2010. The result showed that the regression coefficient is 0.72. So there is obvious positive correlation between the spatial agglomeration and industrial competitiveness of the current China's electronic information industry. You can see in the following chart: presently, Guangdong, Jiangsu, Shanghai, Beijing, Fujian and Tianjin where the electronic information industries concentrate on, have strong industrial competitiveness. These regions are the core regions of China's electronic information industrial development. Zhejiang and Shandong are industrial concentration regions, but still lacking competitiveness. These two provinces can make efforts to evolve from industrial agglomeration to innovation cluster. The rise of China's electronic information industry is most likely to occur in the central and western regions including Sichuan, Hubei, Shaanxi etc. where the industries concentrate on. Few regions with poor economy including Gansu etc., has obtained the advantage of competitiveness by relatively high innovation input. These economically backward regions are expected to be the new regional growth points.

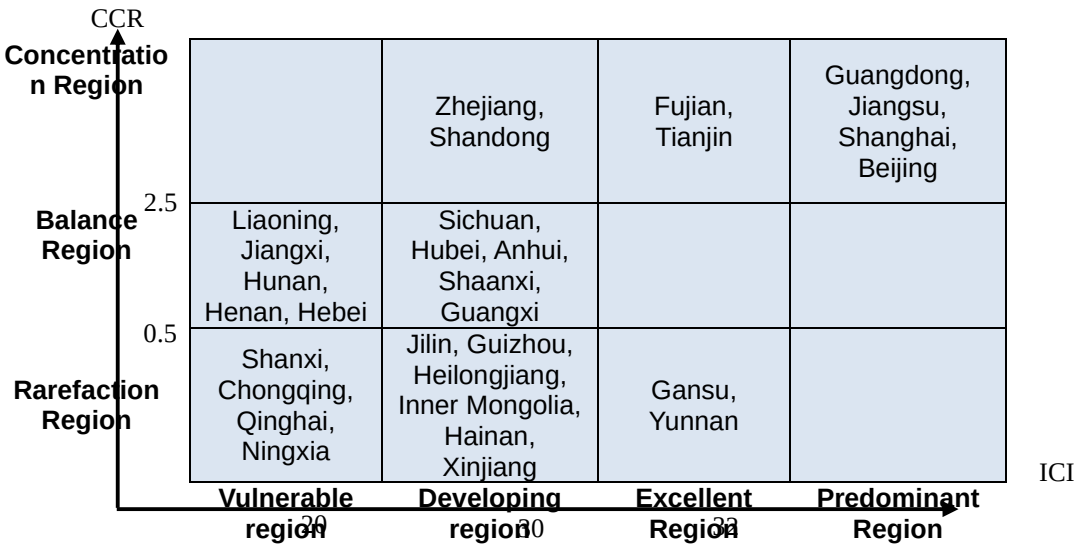

Figure 1. CCR and ICI of the electronic information Industry of Chinese various regions (2010)

5. Conclusion

China's electronic information industry has seen a rapid development over the period of 1995-2010. By measuring the location Gini coefficient, China's electronic information industry appears the trend from agglomeration to dispersion in the aspect of industrial space distribution. The spatial agglomeration effect has been in the dominant position in the previous 10 years; the industrial space distribution appeared the trend from agglomeration to dispersion after 2005. The degree of the spatial agglomeration of China's electronic information industry in 2010 is lower than that in 2000, but is still higher than that in 1995. The results of measuring the comprehensive concentration rate showed that 8 provincial regions including Guangdong etc. are the concentration regions of China's electronic information industry. Ten central and western regions with strong economy including Sichuan etc. are the balance regions of China's electronic information industry. Most of the rest 12 provincial regions that are in the west and the northeast are the rarefaction regions of China's electronic information industry.

This paper establishes the indicator system including three criteria of economic return, innovative capability and employment effect to evaluate the regional electronic information industrial competitiveness. The benchmarking analysis is used to evaluate the electronic information industrial competitiveness of provincial administrative regions. Results showed that the industrial competitiveness of Guangdong, Jiangsu, Beijing, and Shanghai which are predominant regions of China's electronic information industrial competitiveness. At present, Tianjin, Fujian, Gansu and Yunnan are excellent regions of China's electronic information industrial competitiveness. Thirteen provincial regions including Zhejiang, Hubei, Sichuan, etc. are developing regions of China's electronic information industry. Nine regions including Liaoning, Jiangxi, Chongqing, etc. are vulnerable regions of China's electronic information industry.

Currently, there is obvious positive correlation between the spatial agglomeration and industrial competitiveness of China's electronic information industry, both which interact as both causes and effects. We should pay attention to them in our research. This characteristic is of reference value to the investment decision of China's electronic information industry and formulation of management policies.

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