

Study on the differences in economic development among cities in Jiangxi Province

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Abstract. Since the reform and opening-up policy, China has shown a clear east-west economic pattern. Jiangxi Province is one of the underdeveloped provinces. Based on the backward, the economy of Jiangxi Province has been developing at a fast pace entering the 21st century. However, while the overall economy has increased, it has also led to increasing inequality in the economy within itself. This paper evaluates the economic development of different cities in Jiangxi Province through various evaluation methods like location quotient and principal component analysis. The results show that: ① The economic gap between cities is widening. ② Jiangxi Province presents a development situation of strong north but weak south ③ The dominant position of the secondary industry is declining, and tertiary industry is rising. ④ Each city should combine its actual strengths and complement its weaknesses for comprehensive development.

Keywords: Economic development, Location quotient, Principal component analysis, Jiangxi province, spatial pattern.

1. Introduction

Since the reform and opening-up policy, the differences in development bases and policy factors have led to a clear trend of divergence in economic development among different regions of China. Such divergence is manifested in three aspects: on the one hand, the differences in development between different provinces and cities in the eastern, central, and western regions; on the other hand, the differences in development between different cities within the same province; and finally, the differences in development between towns and villages within the same city.

However, most existing studies of this kind have focused on the developed provinces or cities. Therefore, this paper takes Jiangxi Province as the research area and evaluates the economic development of 11 cities within it, which has an important impact on promoting balanced development within Jiangxi Province and can provide some basis for the government to better policies.

2. Study area and methodology

2.1 Study area

Jiangxi Province, located on the south bank of the junction of the Yangtze River, belongs to the eastern region in administration and the six central provinces. It is surrounded by mountains on three sides, with extensive internal hills and a wide plain in the center[1].

After the reform and opening-up policy, the development of coastal cities such as Fuzhou has caused severe population loss in Jiangxi Province. Coupled with the naturally closed environment and weak economic basis, it causes underdevelopment of transportation and the economy.

Besides, Jiangxi Province's internal development was highly uneven. In general, the per capita GDP of the south is lower than that of the north, and the overall economic development of the southern area is much weaker[2]. However, the development of northern areas differs greatly between cities, even forming a situation where Nanchang is the "only city," which further exacerbates regional development imbalances.

Because of the above problems, it is of great significance to study the differences in economic development and the trend among cities and regions within Jiangxi Province to better balance the development, improve the development level and promote common prosperity.

2.2 Methodology

2.2.1. Location quotient

The location quotient (LQ) is the ratio of the output value of a particular sector in a region to the total output value of the region to that sector's output value to the country's total output value. Its expression is as follows:

$$LQ_{ij} = \frac{L_{ij} / \sum_{i=1}^n L_{ij}}{\sum_{i=1}^m L_{ij} / \sum_{i=1}^n \sum_{j=1}^m L_{ij}} \quad (1)$$

In formula (1), i presents the region, and j presents the industry. L_{ij} presents the output of the industry j in the region i . LQ_{ij} presents LQ of the industry j in the region i .

LQ is usually used to measure the degree of development of a specific sector in a specific region. When LQ is greater than 1, we define it as an advantageous industry in the region. When LQ is equal to 1, we define it as an average industry; when LQ is less than 1, we define it as a disadvantaged industry.

2.2.2. Principal component analysis

The principal component analysis is a statistical method that converts a set of potentially correlated variables into a set of linearly uncorrelated ones by orthogonal transformation. The principal component analysis method can reduce the dimensionality of multiple sets of new variables with mutually uncorrelated characteristics and obtain new variables representative of the set to respond to the comprehensive index of the problem through processing. In this paper, I selected 22 mutually independent variables and used principal component analysis to evaluate the economic development of cities in Jiangxi Province.

2.3 Study Data

The data used in the article are obtained from Jiangxi Statistical Yearbook 2011-2021, China City Statistical Yearbook 2006-2019, statistical bulletins on national economic and social development released by cities in 2017, and China Statistical Yearbook 2021.

3. Analysis and evaluation

3.1 Evaluation by Location quotient

3.1.1. Three major and segmented industries in 2020

This part will be based on the data in the Jiangxi Statistical Yearbook 2021 and the China Economic Yearbook 2021. By formula 1 to calculate the LQ of the three major industry categories and each subdivision of industry types in Jiangxi Province in 2020.

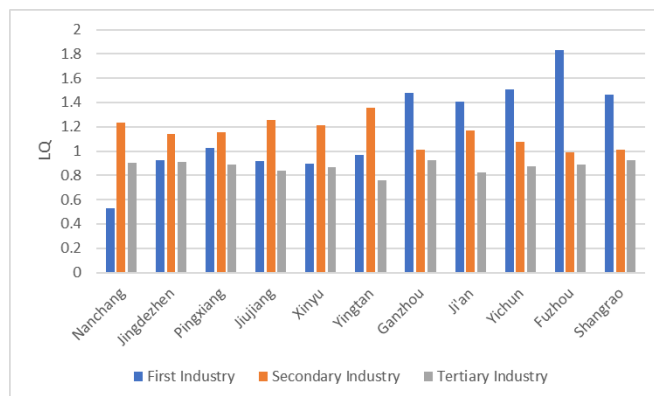


Figure 1 Location quotients of 3 major industries in 2020

From Figure 1, we can analyze that the first industry in Nanchang, Jingdezhen, Pingxiang, Jiujiang, Xinyu, and Yingtan are disadvantaged industries; on the contrary, the first industry in Ganzhou, Yingtan, Ji'an, Yichun, Fuzhou, and Shangrao is advantageous industry. Besides, the LQ of the first industry in Fuzhou is close to 2, which means that its development is great. LQ of the secondary industry in all cities is close to or greater than 1, and LQ of the tertiary industry is less than 1, indicating that the secondary industry in Jiangxi province has better development than the tertiary industry.

Considering GDP, it is easy to find that the first six cities are in a better economic situation than the second five cities. What is more, the LQ of the secondary industry in these cities is generally greater than the other five cities, indicating that when the first industry is too developed may bring obstacles to the development of the secondary industry and affect the overall economic development. It is easy to find that the secondary industry is the most advantageous in Jiangxi Province and plays a major role in economic development.

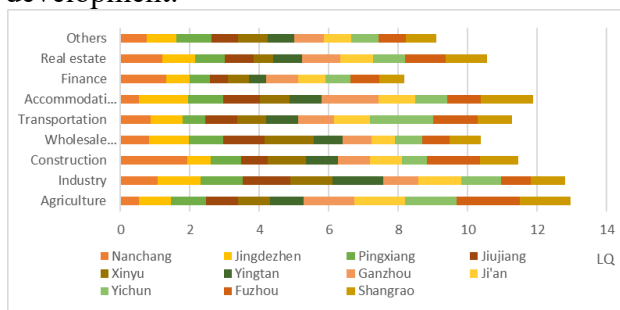


Figure 2 Location quotients of segmented industries in 2020

The analysis of the segmented industries reveals the existence of some profitable industries in certain cities, such as construction in Nanchang and Fuzhou, accommodation and catering in Ganzhou, industry in Jiujiang and Yingtan, etc. These areas have certain advantages in these specific industries and can play a certain siphoning and growth pole role in neighboring areas.

Compared to the first industry, the secondary and tertiary industries can create higher economic value, so the proportion of the three industrial categories in developed regions usually presents an inverted triangle shape. It is easy to see that industries such as real estate and finance in Nanchang and accommodation and catering in Jingdezhen have an important role in developing the city's economy and upgrading its industrial structure. In terms of GDP per capita, it is the most direct indicator of the economy. The development of the service industry is also one of the reasons for the relative economic development of these regions.

3.1.2. Three major industries in 2010-2020

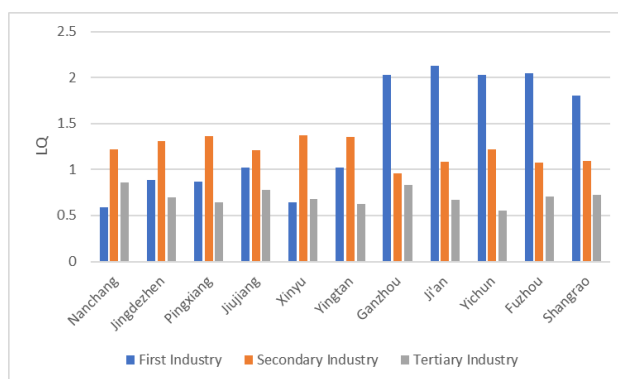


Figure 3 Location quotients of 3 major industries in 2010

Combining Figure 1 and Figure 3 for analysis, it is evident that the general pattern of dominant industries in Jiangxi Province did not change from 2010 to 2020.

However, all cities have decreased their first industry and upgraded their secondary and tertiary ones. Taking Ji'an as an example, it shows that during the development process from 2010 to 2020, the secondary and tertiary industries there have developed faster than the national average development rate, indicating that the industrial structure has been upgraded.

3.2 Evaluation by Principal component analysis

3.2.1. Evaluation system

In the previous paper, we have analyzed the development of advantageous sectors and industries by using LQ. However, the above way considers only one single sector and cannot make a comprehensive and objective consideration. Therefore, this paper adopts the principal component analysis method to construct the evaluation system. Based on the previous research[2][4][5], the system covers 3 categories and 22 elements. This system aims to evaluate each city's economic development in terms of the economic situation, social construction, economic environment, and ecological environment. The evaluation system is as follows:

Table 1. Evaluation System Of Economic Development Of Various Cities In Jiangxi

Category	Element	Symbol and Unit	Category	Element	Symbol and Unit
Urban Economy	Gross Regional Product	X1(million yuan)	Urban Operation	R&D Internal Expenses	X12(thousand yuan)
	Total Population	X2		Residential Electricity Consumption	X13(million kW·h)
	Percentage of Urban Population	X3(%)		Socially Employed people	X14(thousand)
	Percentage of Working-Age Population	X4(%)		Industrial Energy Consumption Above the Scale	X15(thousand tons of standard coal)
	Gross Regional Product Per Capita	X5(yuan)		Number of Industrial Enterprise Above the Scale	X16
	Disposable Income of Urban Residents Per Capita	X6(yuan)		General Public Budget Revenue	X17(thousand yuan)
Urban Operation	Road Mileage	X7(km)	Urban Vitality	Currency Deposits of Financial Institutions	X18(million yuan)
	Public Transport Passenger	X8(ten thousand man-time)		Household Deposit Year End	X19(million yuan)

	Health Institutions	X9		Domestic Sewage Discharge	X20(thousand ton)
	General Public Budget Expenditure	X10(thousand yuan)		Industrial Sewage Discharge	X21(thousand ton)
	Growth Rate of Fixed Asset Investment	X11(%)		Total Water Resources	X22(million m3)

3.2.2. Evaluation process

To ensure the timeliness and accuracy of the study, the article collects relevant statistics from the Jiangxi Statistical Yearbook 2021, where data are divided into 3 major categories and 22 elements to include as many relevant categories as possible. The article first performs descriptive statistics to convert the absolute values into relative values. After that, we perform label extraction, data rotation, and leave score setting to obtain the public factor variance table, factor matrix, and rotated factor matrix to calculate the public factor score and index contribution. We obtained the final scores of the 11 cities through weighted summation and standardization.

Table 2. Overall Score Of Economic Development

	Urban Economy		Urban Operation		Urban vitality		Overall raw score	Overall quantitative score	Overall Rank
	F-eco	Rank	F-ope	Rank	F-vit	Rank			
Nanchang	1.893	1	0.812	2	1.210	2	3.915	10	1
Jingdezhen	-0.375	7	-0.607	10	-0.901	8	-1.883	1.356	10
Pingxiang	-0.508	10	-0.110	7	-1.158	10	-1.776	1.515	9
Jiujiang	0.296	3	0.892	1	0.682	4	1.870	6.951	3
Xinyu	-0.300	6	-0.002	5	-1.093	9	-1.396	2.082	8
Yingtian	-0.597	11	-0.969	11	-1.226	11	-2.792	0	11
Ganzhou	0.549	2	0.152	4	1.576	1	2.278	7.559	2
Ji'an	-0.398	8	-0.436	9	0.140	6	-0.695	3.127	6
Yichun	-0.123	5	0.691	3	0.237	5	0.805	5.363	4
Fuzhou	-0.486	9	-0.320	8	-0.243	7	-1.048	2.600	7
Shangrao	0.050	4	-0.103	6	0.776	3	0.723	5.241	5

3.2.3. Evaluation results

3.2.3.1. analysis of evaluation results

Compared with LQ, the composite evaluation system of economic development used in the principal component analysis is more comprehensive and convincing.

The evaluation of the city's economy is more oriented to the city's economic development. Nanchang is far ahead of other cities in terms of "gross regional product" and "total regional population," with a GDP per capita of 92,697 yuan in 2020 [1]. On the one hand, Nanchang, as the capital city of Jiangxi Province, enjoys a particular inclination in terms of capital and policies; on the other hand, Nanchang plays a key role in the economic development of Jiangxi Province in the middle reaches of the Yangtze River city cluster[6] and the construction of "one circle and two axes" and multiple clusters. Although Ganzhou does not have a high GDP per capita, it has become the fastest-growing city in Jiangxi Province due to its large population and vast area[7]. As the gateway to the outside world of Jiangxi province, Jiujiang has also developed rapidly in recent years in terms of industry and service industry, relying on the construction of the "one-hour economic circle" with Nanchang[8].

The evaluation indexes consider urban construction and urban development status in terms of urban operation. In recent years, Jiujiang has made great efforts to develop chemical, textile, material, and electronic information industries[9] and greatly strengthened industrial construction[10]. So the city has presented a good performance in this area.

Regarding urban vitality, local cities' financial capital status and ecological environment status are mainly considered. Thanks to its large area, Ganzhou City is rich in water resources, resulting in a relatively high score in urban vitality.

In terms of the overall score, Nanchang, as the capital city, is far ahead of other cities in terms of overall economic development, indicating that the economic development is more comprehensive and has a solid foundation. The second-tier cities include Ganzhou, Jiujiang, Yichun, and Shangrao. Due to the closed natural environment of Jiangxi Province, it is surrounded by mountains in the southeast and west. The northern cities are more externally connected, which has better transportation conditions than the southern cities, which also leads them to form a better economic base with a higher degree of economic development, a better foundation for urban construction, and a better urban financial and ecological environment with better development dynamics.

3.2.3.2. Cities development forecast

Taking Yingtan as an example, it has the lowest scores in all aspects: urban economy, urban operation, and urban vitality indicating that it has certain shortcomings in economic development and city construction, presenting lags far behind other cities. Considering Yingtan's geographical location and industrial structure, Yingtan is the only city in Jiangxi province without undergraduate colleges and universities, coupled with the fact that Yingtan's LQ of secondary in 2020 is only 0.759-- the lowest in the province, which all lead to the poor economic development. It indicates that Yingtan has severe problems of lagging industrial transformation and aging industrial structure in economic development. Therefore, it is suggested that Yingtan must actively introduce relevant policies in the development process in the future, cooperate with the status quo to implement industrial transformation and achieve rapid development of the tertiary industry.

Taking Jingdezhen as another example, Jingdezhen ranks 10th in terms of urban operation, indicating a certain lack of urban construction and urban development. The current situation of Jingdezhen, which is surrounded by mountains and trapped by inconvenient traffic, has led to a weak external link. What is more, especially the impact of the development of technology on the traditional hand-made porcelain industry in Jingdezhen in recent years caused a serious transformation crisis to the industry, which is crowned to be the dominant one here. In the subsequent development process, Jingdezhen should speed up the pace of industrial transformation, upgrade the handicraft industry and actively promote tourism-related supporting facilities. In this way, Jingdezhen can strengthen the "porcelain capital" sign and flourish to get a breakthrough in tourism.

4. Conclusion

The article takes eleven cities in Jiangxi province as the research areas. To evaluate the economic development, the location quotient is calculated to analyze the difference of industrial structure and construct an evaluation system to analyze the comprehensive economic development among different cities by principal component analysis. The article draws four conclusions.

The differences in economic development between different cities and regions in Jiangxi Province tend to expand, and there are still large gaps in the speed of economic development between different cities and regions.

The economic development pattern of Jiangxi Province shows that the north is developed and the south is lagging, resulting from various influences such as history, transportation, culture, and society.

The secondary industry dominates the economic structure of cities in Jiangxi Province, but its dominance is declining while the tertiary industry is taking its place.

Cities in Jiangxi Province should combine their development deficiencies selective development to enhance the comprehensive economic strength.

Authors' Contributions

Dejiang Wang concluded research, performed evaluation, analyzed data, and wrote the paper.

Acknowledgments

The author would like to thank my family for giving my sole support in my research.

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