

The Economic and Social Development of Fujian Province: Based on Factor Analysis Method

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Abstract: Based on the data of the 2020 Fujian Provincial Statistical Annual Report, eight indicators were selected from the perspective of economic development and people's life, and factor analysis was used to evaluate the nine prefecture-level cities in Fujian Province. First, the development status of the 9 prefecture-level cities in Fujian Province in 2019 was derived based on the factor analysis ranking and divided into 3 echelons based on the ranking. The cities in the first echelon are Xiamen, Fuzhou and Zhangzhou; the cities in the second echelon are Zhangzhou, Longyan and Putian; and the cities in the third echelon are Sanming, Ningde and Nanping. Secondly, the development of nine prefecture-level cities in Fujian Province proposed to seize the policy advantages, strengthen infrastructure and give full play to the development of special advantages.

Keywords: Fujian province, Economic and social development, Factor analysis method.

1. Introduction

Fujian Province is located on the southeastern coast of China, with a number of high-quality coastal harbors, backed by the Wuyi Mountains and connected to the Pearl River Delta and Yangtze River Delta regions, the geographical position is favorable. 2021 GDP of Fujian Province is 4.88 trillion yuan, ranking eighth in China. Fujian is known as the "Land of Eight Min", and after years of administrative reform, there are currently nine prefecture-level cities in Fujian Province. In general, the economic and social development of the nine prefecture-level cities is uneven. Considering the level of economic development, Fuzhou, Xiamen, Quanzhou and Zhangzhou rely on the coastal location advantage has been maintaining a good momentum of development, maintaining the first echelon of position. Ningde, Longyan and other cities that used to lag behind in economic development, in recent years through the development of batteries, metallurgy and other special industries, the level of economic development has been rising, catching up with Putian rose to the second echelon position. While the same coastal Putian is not as well developed as it should be, the development is sluggish. Nanping City development has always been located in the bottom position in Fujian Province. But nowadays, in addition to the level of economic development, the development level of a city needs to be considered in terms of people's lives. Therefore, this paper constructs a comprehensive index system to measure the economic development and people's life, and uses factor analysis in order to have a more comprehensive measurement and analysis of the economic and social development of each prefecture-level city in Fujian Province.

2. Principle of Factor Analysis

Factor Analysis (FA) was introduced in 1904 by Charles Spearman, beginning with his study of student test scores. The basic idea of factor analysis is to group the original variables according to the magnitude of the correlation, so that the correlation between variables within the same group is higher, while the correlation between variables in different groups is lower. The common factor, i.e., an underlying

structure represented by each group of variables, is an unmeasured composite variable[1]. For the problem under study, the original variables that can be decomposed into several unmeasured public factors and special factors, and the basic logic of the research problem can be reflected by analyzing the public factors. For the level of economic and social development of a city, there are so many factors affecting its development that it is impossible to exhaust them all in the actual study. Therefore, in practice, the public factors affecting the economic and social development of a city can be identified through factor analysis, so that clear influencing factors can be identified from the complex research relationships and a comprehensive evaluation of the city development can be made[2].

3. Method

3.1. Data Source

The text data are mainly from the 2020 Fujian Provincial Statistical Annual Report and the 2020 Statistical Annual Report of each prefecture-level city in Fujian Province. Some of the data were collated by hand. Economic development is an important factor reflecting the development of a city, but not its entire content. In October 2017, the 19th Party Congress report put forward that China's economic development has entered the stage of high-quality development, and the development of cities needs to focus more on qualitative development and pay attention to the improvement of people's quality of life. This paper combines the research results of scholar Yang Yang[3] to construct a total of two primary indicators and eight secondary indicators to comprehensively evaluate the level of economic and social development of each prefecture-level city in Fujian Province, and the specific indicators are selected as shown in Table 1. In terms of economic development, four indicators were selected, namely GDP per capita, added value of tertiary industry, total foreign trade import and export, and actual foreign direct investment, to reflect the basic situation of economic development and foreign development level of cities. In terms of people's life, four indicators are selected, namely total retail sales of social consumer goods, per capita consumption expenditure of urban residents, number of full-

time teachers in general education, and per capita park area, to reflect the income, education, and living environment of people in each prefecture-level city[4]. The selection of indicators here is mainly influenced by two factors: first, the sample size of nine prefectures in Fujian Province prevents the selection of more than eight indicators, so only two

aspects of economic development and people's life are evaluated in this paper; second, through standardized analysis and correlation analysis of the 23 indicators of the original alternative data, the eight indicators with the highest correlation and the highest KMO coefficient are selected for analysis.

Table 1. Index System for Measuring the Level of Economic and Social Development

Level 1	Level 2	Indicator
Economic Development	GDP per capita	X ₁
	Value added of tertiary industry	X ₂
	Total foreign trade import and export	X ₃
	Amount of actual utilization of foreign direct investment	X ₄
	Total retail sales of social consumer goods	X ₅
People's Life	Per capita living consumption expenditure of urban residents	X ₆
	Number of full-time teachers in general education	X ₇
	Green space per capita	X ₈

3.2. Data Testing.

The KMO and Bartlett tests were performed on the standardized data using SPSS 26.0 analysis software. The KMO statistic was found to be 0.718, indicating that the data were suitable for factor analysis, and the Bartlett test, with a

Sig value of 0.000, was significantly smaller than the significance level, so the original hypothesis was rejected, indicating that the variables were significantly correlated with each other and met the conditions for doing factor analysis. In general, a KMO test greater than 0.6 is suitable for factor analysis.

Table 2. KMO and Bartlett's test

KMO Sampling suitability quantity		.718
Bartlett's sphericity test	Pseudo Chi-square	79.359
	degree of freedom	28
	Significance	.000

3.3. Principal Component Extraction.

In order to be able to extract and classify the indicators that measure the economic and social development of cities, it is necessary to extract all indicators within the evaluation system and specify the number of public factors. First, Table 3 shows the eigenvalues and cumulative variance contribution rates of each factor for evaluating the level of urban

development. The cumulative variance contribution rate of the first two factors reaches 87.359%, which meets the criterion of greater than 85%. Therefore, it is considered that the first two factors can replace 87.359% of the information of all variables. Secondly, according to Figure 1, the eigenvalues of the first two factors are > 1, so two common factors are identified.

Table 3. Explanation of total variance of economic and social development evaluation

Factors	Initial eigenvalue			Extraction sums of squared loadings			Sum of the squares of rotating loadings		
	Total	Percentage of variance	Accumulation%	Total	Percentage of variance	Accumulation%	Total	Percentage of variance	Accumulation%
1	5.436	67.946	67.946	5.436	67.946	67.946	3.971	49.644	49.644
2	1.553	19.413	87.359	1.553	19.413	87.359	3.017	37.716	87.359
3	.794	9.928	97.287						
4	.129	1.617	98.904						
5	.061	.766	99.669						
6	.016	.205	99.875						
7	.005	.065	99.939						
8	.005	.061	100.000						

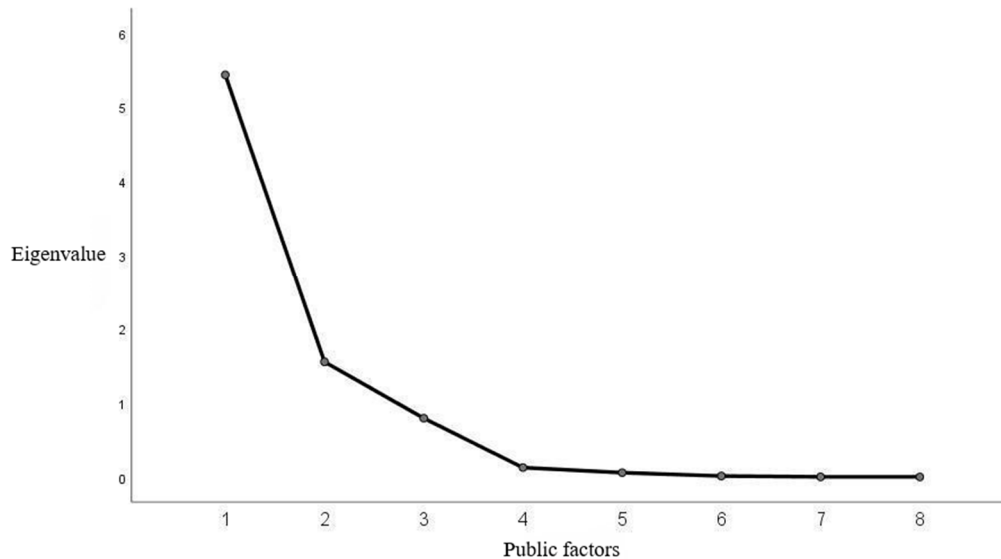


Figure 1. Scree Graph

3.4. Extraction, naming and analysis of common factors

3.4.1. Extraction and Naming of Common Factors.

As shown in Table 4 of the rotated component matrix, the first public factor has a high load coefficient in per capita GDP, total amount of foreign trade and import and export, actual utilization of foreign investment finance and per capita

consumption expenditure. It can be seen that the first factor mainly reflects economic factors and is called economic development factor. The second public factor has a high load coefficient on the added value of the tertiary industry, the total retail sales of social consumer goods, and the number of full-time teachers in general education. It can be seen that the second public factor mainly reflects that it is closely related to People's Daily life and is called the life development factor.

Table 4. Composition matrix and composition score table

	Public factor	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈
Component matrix	1	0.885	0.529	0.927	0.912	0.222	0.912	0.065	0.576
	2	0.383	0.822	0.250	0.300	0.963	0.390	0.980	-0.053
Ingredient score	F ₁	0.231	0.006	0.275	0.259	-0.135	0.239	-0.195	0.218
	F ₂	-0.017	0.269	-0.089	-0.062	0.404	-0.020	0.446	-0.154

3.4.2. Comprehensive Factor Score and Analysis.

The calculation of factor score is obtained by multiplying the factor score coefficient with the standardized data, which is automatically calculated by SPSS. The score of comprehensive factor is the weighted synthesis of two common factors. In this paper, the variance contribution rate

β_1 and β_2 after factor rotation is used as the weight value of the two common factors extracted, and the calculation formula is as follows:

$$F = \beta_1 F_1 + \beta_2 F_2$$

The results are shown in Table 5.

Table 5. Comprehensive factor scores of prefectural-level cities in Fujian province

Year	City	F	F ₁	F ₂	Order
2019	Xiamen	1.19	2.42940	-0.43913	1
2019	Fuzhou	0.85	.39836	1.43362	2
2019	Quanzhou	0.65	-.36886	1.99305	3
2019	Zhangzhou	-0.08	-.08565	-.07627	4
2019	Longyan	-0.36	-.14659	-.63553	5
2019	Putian	-0.37	-.28812	-.47864	6
2019	Sanming	-0.48	-.27859	-.73681	7
2019	Ningde	-0.56	-.48639	-.66402	8
2019	Nanping	-0.84	-1.17356	-.39626	9

According to Table 5, among the nine prefecture-level cities in Fujian Province in 2019, the nine cities can be roughly divided into three echelons. First of all, Xiamen, Fuzhou and Quanzhou rank among the top three in the first

echelon with great advantages, which is also in line with the development status of these three cities in Fujian Province. However, it can be seen that the scores of the three cities on the two common factors are quite different. Xiamen has a high

score on the economic development factor, but a low score on the social development factor; Fuzhou has a relatively balanced performance on the two factors, taking into account both economic development and life development; while Quanzhou has achieved a high score on the social development factor. higher score. Secondly, the second echelon is composed of Zhangzhou, Longyan and Putian. Among them, Zhangzhou is better developed than Zhangzhou and Longyan, while the development of Longyan and Putian is almost the same. Finally, the third echelon is composed of Sanming, Ningde, and Nanping. These three cities are located in the northwest of Fujian Province. They are mountainous, have relatively inconvenient transportation, and have poor location advantages. In particular, Nanping City is still far behind Sanming and Ningde in the third echelon, and its economic and social development level is relatively poor.

In general, the economic and social development of the 9 prefecture-level cities in Fujian Province in 2019 showed that the east is strong and the west is weak, and the economic development is still unbalanced. The economic development of coastal cities has limited radiation ability to inland hinterland and mountainous cities. The level is significantly higher than that of inland cities[5]. The basic situation that the coast is strong and the inland is weak has not been effectively improved. Among the six cities on the eastern coast, apart from Ningde in the northwest, the other five cities, Fuzhou, Putian, Quanzhou, Xiamen and Zhangzhou, have relatively good economic and social development. The three cities in the west still need to seize opportunities for urban development. They must pay attention to both economic development and people's lives, and continuously improve the happiness of urban residents.

4. Development Suggestions for Prefectural-level Cities in Fujian Province

4.1. Seize the Policy Advantage and Grasp the Opportunity of the Times.

The prefecture-level cities in Fujian Province must grasp the policy advantages of the development of the Belt and Road Initiative and seize the opportunity of the development of the times[6]. Fujian Province now has five national strategic plans, including the 21st Century Maritime Silk Road Strategy, the Pingtan Comprehensive Experimental Zone, the West Coast Economic Zone, the Fujian Free Trade Zone, and the revitalization and development plan for the former Central Soviet Area of Jiangxi, Fujian, and Guangdong. The superposition of these five national strategic plans provides a broad platform and strong impetus for the rise and development of Fujian, and creates important opportunities for Fujian to deepen reforms, adapt to the new economic normal, and accelerate industrial restructuring. These five major strategies involve all prefecture-level cities in Fujian Province. Fujian has always shown a high degree of export-oriented economy, especially the Fujian overseas Chinese and Fujian businessmen at home and abroad who are Fujian's unique resources. They are an important link to promote the deep integration of the "Belt and Road". Under the tide of reform in the new era, Fujian should give full play to the overlapping advantages of multiple districts, let investors enjoy policy dividends, further expand the scope and level of opening up, promote reform deepening through

comprehensive opening up, and improve the quality of economic development. Among them, Quanzhou has been an important starting point of the "Maritime Silk Road" since ancient times. Today, in the "Belt and Road" initiative, once again ushered in a golden opportunity for development. Fuzhou, Xiamen and Putian should grasp the advantages of the coast, give full play to the potential of ports, seize opportunities in the current post-epidemic era of weak global economy, and vigorously support local enterprises to "go out" and enter the global market. The three cities located in the mountainous area grasped the revitalization and development plan of the former Central Soviet Area of Jiangxi, Fujian and Guangdong, grasped the regional characteristic industries, and got out of the development dilemma.

4.2. Strengthen Infrastructure and Optimize Industrial Layout.

The prefecture-level cities in Fujian Province should strengthen infrastructure, realize interconnection, optimize industrial layout and achieve balanced development within the province. The topographic features of Fujian Province are known as "eight mountains, one water and one field", which shows the difficulties in developing transportation. At present, the transportation in Fujian Province is mainly based on the six coastal cities, and the ability to connect with the inland is relatively poor. But because of this, in order to further develop the economy of Fujian Province, it is necessary to break through the terrain restrictions, open up transportation within the province, connect with other provinces, and connect with the world. Fujian should take the port area as the center, connect roads and railways, and truly form a comprehensive transportation network connecting the north and the south, and entering from the west and exiting from the east. Do a good job in the construction of Xiamen Southeast International Shipping Center, explore the construction of a free trade port area; expand near-sea shipping routes such as Southeast Asia and the Middle East, as well as related ocean shipping routes[7]. Promote the construction of supporting public infrastructure for ports, improve the collection and distribution system, accelerate the development of the core port area as a whole, and develop specialized port groups in a global, large-scale, and intensive manner. Transportation is the main link between Fujian's inland mountainous areas and coastal economically developed areas. It is necessary to focus on improving the railway travel conditions in economically underdeveloped areas, adjust the layout of the road network in Fujian Province, and coordinate the strategic layout of "points, lines, and areas" to make the flow of people, logistics, The communication of capital flow is more efficient and smooth, laying a good and solid foundation for promoting the coordinated development of regional economy. Based on the advantageous industries of the various districts in Fujian, speed up the adjustment of industrial layout among the districts, and rationally optimize the spatial fields of the industrial structure between the districts. Transfer or eliminate industrial types with excess capacity, cultivate and develop new types of industries, and inject fresh blood into economic development.

4.3. Give Full Play to Characteristic Advantages and Develop Pillar Industries.

The prefecture-level cities in Fujian Province should adapt to the location, give full play to the advantages of each city, develop pillar industries, and form a good pattern of industrial

complementarity. Continue to give full play to the "leadership" role of leading industries, promote the leap-forward development of Fujian's traditional advantageous industries, adopt the form of project cooperation to expand to overseas markets, and accelerate the construction and improvement of a modern industrial system in the coordination zone. In addition, investment in industrial technology research and development should be effectively increased to promote the rapid transformation and upgrading of the industrial structure. Strengthen the synergistic effect of industrial driving among cities, effectively extend the central industrial chain to adjacent and backward areas, and improve the corresponding industrial supporting operation functions. Economically underdeveloped areas should rely on local resource endowment, rationally arrange industrial structure, maximize strengths and avoid weaknesses, and take a path of differentiated development. In terms of industrial interaction, Fuzhou and cities in northeastern Fujian have joined hands to build a tourism marketing platform, integrate superior agricultural resources, and promote leading enterprises in Fuzhou to build bases in inland urban areas to carry out technology promotion. Complementary advantages in other fields such as environmental protection and logistics, and work together. Give full play to the comparative advantages of Northeast Fujian, promote joint innovation and in-depth cooperation in the new energy vehicle industry, jointly build a new energy vehicle industry cluster, and seize the opportunities for the future development of new energy vehicles. Relying on the advantages of the new business card of the green industry, Sanming adheres to the combination of "bringing in" and "going out", develops economic and technological cooperation with countries and regions along the "Belt and Road", and forms an industrial supporting foundation to attract investment from countries such as Southeast Asia, and Drive the superior production capacity to "go out" and open up international emerging markets. Deeply promote the integration of Nanping's seven major green industries into the regional collaborative industrial chain, and open a new era of industrial chain cooperation. Focusing on the four leading industries in Ningde City, the upstream and downstream industrial chains will be extended at more levels in the five cities (districts) in Northeast Fujian. For the stainless steel new material industry, actively promote cooperation with downstream deep processing enterprises in Fuzhou to achieve a win-win situation in domestic and foreign markets. Join hands with Fuzhou and other places to jointly develop industrialized and large-scale deep-sea aquaculture, and promote the transformation and upgrading of the marine economy.

5. Summary

Among the many provinces along the coast, Fujian has always been a province with relatively embarrassing economic development. It is located on the wealthy southeast coast of my country, bordering Zhejiang in the north and Guangdong in the south, but its development is stuck between them. At the same time, from the analysis in this paper, it can be clearly seen that there are three stages of unbalanced economic and social development in nine prefecture-level cities in Fujian Province. The development within the province is relatively unbalanced and differentiated. The COVID-19 pandemic hit the world in 2020 and had a major impact on the development of prefecture-level cities in Fujian Province. The foreign trade industry has been hit and residents' consumption desires have been suppressed, but there are also cities such as Ningde City that rely on the rapid development of industries such as lithium batteries and go against the wind.

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