Competitiveness Evaluation of Service Industry in Guangxi Based on the Factor Analysis

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Abstract—**The goal of this paper is to evaluate the competitiveness of service industry in Guangxi. Firstly, we make an introduction about the situation of service industry in Guangxi, and construct the index system to measure the level of development of competitiveness evaluation. Secondly, we conduct an empirical analysis on the competitiveness evaluation of service industry in 31 major provinces and cities nationwide using factor analysis method. Finally, we make a discussion about the ranking results between Guangxi and other provinces, and put forward the strategic routes and corresponding suggestions for the improvement of competitiveness of service industry for Guangxi.**

Keywords-   services industry; competitiveness evaluation; factor analysis

I.   INTRODUCTION

With the development of commodity economy and social production, service industry is the specialized industry which separates from the production areas and living areas [1]. As the increasing of the social and economic development, all kinds of industrial structures are received higher request accordingly. To promote the optimization of the industrial structure and strengthen the development of service industry is becoming the main direction of economic development. "The twelfth five plan of the economic and social development in Guangxi" puts forward lots of important requirements. For example, to optimize the structure of service industry, improve the layout of it, innovative service system and mechanism, guide the development of service industry cluster, expand service scale and improve the development level of service industry, especially modern service industry. Under this trend, the overall competitiveness of the region not only depends on the development of single industry, but also relies on a joint decision of all industries.

Therefore, if the service industry is uncompetitive, then the overall competitiveness of the industry will be greatly reduced. Guangxi's development level of economy, science and technology is behindhand, and service level is also not high around the country. In general, comparing with strategic requirements of the social and economic development in Guangxi and national average level, Guangxi has a big gap, such as insufficient supply of service industry, irrational structure, indifferent service, weak competitiveness and unbalanced development between urban and rural. In 2011, the added value of service industry in Guangxi account for

34.1% of the proportion of GDP, lower than the whole country (39.5%). Service industry in Guangxi is still at lower level and the degree of marketization, industrialization, socialization is not high at all. Guangxi traditional service industry is the major service industry, which relies mainly on traditional commerce and transportation. The development of modern service industry comes behindhand and the structure of service industry is still irrational.

In order to achieve Guangxi service industry's economic output and speed synchronism growth, brand and benefit synchronous lifting, quality and structure optimization, we must pay more attention to speed up the development of service industry [2]. How to correctly evaluate the competitiveness of the service industry in various regions, accurately grasp Guangxi service industry status in domestic market, and set down reasonable development decisions, which is an important task we faced. This is the reason we study on competitiveness of service industry in Guangxi.

II.   CONSTRUCTION OF EVALUATION INDEX FOR COMPETITIVENESS OF SERVICE INDUSTRY

Service industry has many characteristics, such as a lot of points, wide used, long lines. In addition, service products have many traits of immaterial quality, intangibility, non-storability, simultaneous production and consumption, which will undoubtedly increase the difficulties of competitiveness evaluation and controllability of service industry [3]. To evaluate the competitiveness of service industry, we must first accurately identify different factors which are closely related to competitiveness of service industry. Changing these dominant or recessive influence into relevant and quantifiable indicators, and then through the certain scientific and quantitative measurement to calculate the level of competitiveness of service industry.

For scientific and comprehensive evaluation on the level of competitiveness of Guangxi services, this paper follows the basic principles of empirical analysis, including comprehensiveness, operability, intuitive and scientific quality. Based on taking full account of the availability of data, the evaluation index system of service industry competitiveness is designed into a five-item system which includes eighteen indicators [4]. It is used to synthetically study the competitiveness of Guangxi service industry. The index system is shown in table 1 as follow.

First index	Second index
Basic conditions	The per capita GDP(X_1)
	The per capita disposable income(X_2)
	The per capita income(X_3)
Development scale	The per capita added value of service industry(X_4)
	The per capita the amount of fixed asset investment in the service industry(X_5)
Structure factor	The proportion of service industry's added value to GDP(X_6)
	The proportion of employees of service industry to the total number of employees(X_7)
	The proportion of the fixed asset investment in the service industry to total investment(X_8)
	The proportion of the modern service industry added value to the service industry added value(X_9)
	The proportion of the number of modern service industry to the total number of service industry(X_{10})
Growth ability	Service industry added value growth rate(X_{11})
	Service industry labor productivity(X_{12})
	Modern service industry growth rate(X_{13})
Science and technology ability	The proportion of science and technology expenditures to GDP(X_{14})
	The proportion of the number of professional and technical personnel to overall number of people(X_{15})
	The number of patents per million people(X_{16})
	The proportion of educational expenditure to budget expenditure(X_{17})
	The proportion of financial technology funding to financial expenditure(X_{18})

III. EMPIRICAL STUDY ON THE EVALUATION OF THE COMPETITIVENESS OF SERVICE INDUSTRY

In order to understand the relative level of competitiveness in Guangxi service industry better, this paper selects 31 provinces and cities as samples and analyses along with established index system in detail. According to the different types of indicators determined by the above evaluation index system, this paper obtains the corresponding data from "2012 China Statistical Yearbook", "2011 China Statistical Yearbook" and "China Science and Technology Yearbook", so as to avoid the errors caused by different data types. In this paper, when we collect relevant data of various provinces, some data are obtained from the Yearbook; others are obtained through the rigorous calculation. In the actual statistics, this paper makes some modifications and adjustments for several statistical indicators because of data limitations.

Because the number of evaluation index is high in this paper, we use the factor analysis method, base on the original data and use economic statistical software SPSS19.0 to calculate. This paper uses the factor analysis to reduce the dimension of the original data, which can condense data information effectively and use minimal comprehensive index to reflect the most information of the original variables.

A. Correlation Matrix and the Analysis of the Communality of Variable

We carry out empirical analysis to the above eighteen secondary indicators' data and get the correlation matrix of indicators and the table of the communality of variable. Most of the correlation coefficient in the correlation matrix is greater than 0.3, which indicates the strong correlation between variables. In this paper, the common degree values of selected variables are high, showing that the majority of variables' information can be extracted. So the result of the factor analysis is effective.

B. KMO and Bartlett's Test

We know that KMO value is 0.715, greater than 0.7, which means it is more suitable to use factor analysis. Bartlett spherical test's null hypothesis is that the correlation coefficient matrix is the identity matrix, the Sig. is 0.000 which is less than the significance level (0.05). So we reject the null hypothesis, which indicates the presence of correlation between variables and is suitable to use factor analysis.

C. Determining the Number of Factors

According to the principle that the variable eigenvalue is greater than 1, so the correlation coefficient matrix has four eigenvalues, respectively 8.680, 2.911, 1.712, 1.551.Meanwhile, based on the principle that the cumulative contribution rate of four factors is more than 80 percent, the table shows that the cumulative contribution rate of former four factors is 82.523 percent. It can be argued that the former four factors have basically reflected all the evaluation index contents, thereby they significantly reflects the 31 provinces and cities service industry competitive situation.

D. Extracting Common Factors and Naming

Establish the initial factor loading matrix for the above extracted four common factors F1, F2, F3, F4, due to non-rotated factor loading matrix hierarchy is vague, it is difficult to represent the public meaning of initial variable and analysis and interpretation. So, this paper uses the maximum variance orthogonal rotation method to rotate the original factor loading matrix and obtain the varimax orthogonal rotation matrix.

The first main factor has high load and the ability of explanation on the proportion of service industry's added value to GDP(X6), the proportion of financial technology funding to financial expenditure(X18), the proportion of science and technology expenditures to GDP(X14), the proportion of the fixed asset investment in the service industry to total investment(X8), the per capita added value of service industry(X4), the per capita income(X3), the per capita disposable income(X2), the number of patents per million people(X16) and other indicators. Indicators X6、X8、X4、X3、X2 mainly reflect the economic foundation of the development of service industry, and indicators X18、X14、X16 mainly reflect the situation of the investment in science and technology, so the first main factor can be named economic foundation and technological strength factor.

The second main factor has high load on the service industry labor productivity(X12), the proportion of employees of service industry to the total number of employees(X7), the per capita GDP(X1), the per capita the amount of fixed asset investment in the service industry(X5), the proportion of the modern service industry added value to the service industry added value(X9) and other indicators. These indicators mainly reflect the structure of service industry development, and then the second mainly factor named structure factor.

The third main factor has high load on the proportion of the number of professional and technical personnel to overall number of people(X15), the proportion of educational expenditure to budget expenditure(X17), the proportion of the number of modern service industry to the total number of service industry(X10) and other indicators. These indicators mainly reflect the scale of development of the service industry, so it can be named development scale factor.

The fourth main factor has high load on two indicators, one is the service industry added value growth rate(X11) and the other one is modern service industry growth rate(X13). These indicators mainly reflect the supporting ability of service industry growth, so the fourth main factor named growth factor.

E. Calculation of Each Factor Score and Comprehensive Factor Score

The table II shows that Using regression method to get the factor score coefficient matrix of the competitiveness of service industry. According to this matrix and variable observation value which can calculate factor score. Rotated factor score expression as follows:

$$F_1 = -0.022X_1 + 0.092X_2 + \cdots + 0.206X_{18}$$
$$F_2 = 0.178X_1 + 0.077X_2 + \cdots - 0.105X_{18}$$
$$F_3 = 0.093X_1 - 0.096X_2 + \cdots - 0.028X_{18}$$
$$F_4 = -0.012X_1 - 0.032X_2 + \cdots + 0.001X_{18}$$

According to the data in Table 2, taking variance contribution rate of each factor in the table of rotated cumulative variance contribution as weighted weight, and calculating the synthesis score of provinces' competitiveness of service industry, namely,

$$F = 0.31859F_1 + 0.25716F_2 + 0.13169F_3 + 0.11779F_4$$

Combining the above formula with the data of various kinds of tables and through rigorous calculating to get the score and ranking of each factor and comprehensive evaluation which related to various provinces and cities' the competitiveness of service industry. The higher the value in the table is, the stronger competitiveness it can represent. A positive value indicates a dominant competitiveness, which is higher than the national average level; a negative value indicates competitive disadvantage, which is lower than national average level.

TABLE II.   COMPONENT SCORE COEFFICIENT MATRIX

	Component			
	1	2	3	4
The per capita GDP	-.022	.178	.093	-.012
The per capita disposable income	.092	.077	-.096	-.032
The per capita income	.075	.077	.096	.033
The per capita added value of service industry	.101	.058	.049	.019
The per capita the amount of fixed asset investment in the service industry	-.032	.161	.156	.039
The proportion of service industry's added value to GDP	.245	-.116	-.031	.098
The proportion of employees of service industry to the total number of employees	.096	-.258	.115	-.058
The proportion of the fixed asset investment in the service industry to total investment	.258	-.188	-.150	-.037
The proportion of the modern service industry added value to the service industry added value	.170	-.229	.007	.037
The proportion of the number of modern service industry to the total number of service industry	.058	-.025	.243	.082
Service industry added value growth rate	.039	.084	-.006	.515
Service industry labor productivity	-.068	.239	.099	.070
Modern service industry growth rate	.074	.028	-.003	.506
The proportion of science and technology expenditures to GDP	.156	-.003	-.054	.010
The proportion of the number of professional and technical personnel to overall number of people	-.121	.088	.408	-.070
The number of patents per million people	.109	.071	-.165	.010
The proportion of educational expenditure to budget expenditure	.081	.045	-.367	.012
The proportion of financial technology funding to financial expenditure	.206	-.105	-.028	.001

TABLE III.   THE SCORE AND RANKING

Province	Rank	Province	Rank
Chongqing	6	Jiangsu	4
Zhejiang	5	Jilin	19
Yunnan	16	Hunan	23
Xinjiang	9	Hubei	22
Xizang	26	Heilongjiang	24
Tianjin	2	Henan	27
Sichuan	31	Hebei	20
Shanghai	3	Hainan	15
Shanxi	18	Guizhou	8
Shanxi	25	Guangxi	29
Shandong	11	Guangdong	13
Qinghai	30	Gansu	12
Ningxia	17	Fujian	14
Inner Mongolia	10	Beijing	1
Liaoning	7	Anhui	28
Jiangxi	21		

IV. ANALYSIS OF EVALUATION RESULTS

A. Analysis of Comprehensive Ranking Results

The calculation results in Table III can be clearly observed that the top three of the competitiveness of the service industry in national provinces and cities are Beijing, Tianjin and Shanghai. There is no doubt that these three areas are China's most economically developed regions. It fully demonstrates the strength of service industry competitiveness is related to the economic development of provinces and cities. The more developed the economy become, the more service industry competitiveness will be strong. In this paper, the comprehensive ranking of Guangxi region's service competitiveness ranks 29 in 31 provinces and cities, and the comprehensive factor is negative, i.e. -0.45079. There is a large gap among Beijing, Tianjin and Shanghai which rank the top three. This fully shows that the level of economic development in Guangxi region really needs to be improved.

B. Analysis of Each Factor Ranking Results

Through the above analysis, we can clearly see that the economic foundation and technological strength factor has the highest contribution rate. Therefore, it affects the competitiveness of the service industry a lot. In the first main factor, Beijing, Shanghai and Zhejiang rank in the top three. There is on doubt that these regions have the strongest economic foundation and technological strength. At the same time, Guangxi ranks 21 and get a score of -0.37394. It is still lower than the national level, but it is better than comprehensive ranking. Because the economic foundation plays important role in service industry competitiveness, some other reasons such as history and geography. Guangxi's economy starts late and shows weak; it always has lagged behind the national average level and worse than other provinces. Scientific and technological strength also reflects if a regional service industry has competitive advantages or not. There is insufficient investment of science and technology in Guangxi and the transformation ability is weaker than others.

In the development of service industry structure, Guangxi ranks 16 in the whole country. Compared with several other factors, the situation is much better. It indicates that the service industry of Guangxi turns to adjust corresponding structure and do better than others in recent years [5]. The proportion of traditional service industry declines and the proportion of modern service industry go up. Guangxi is gradually changing from the traditional service industry to modern service industry. The development of modern service industry has been gradually growing. For example, the financial industry, real estate, information transmission and computer services industry. However, the development of modern service industry is still insufficient; the system is not perfect, and the market competition is weak.

In the service industry development scale, Guangxi ranks 17 in the country and lies in a moderate position. The service industry in Guangxi has greatly increased the investment in education and research. In addition, enterprise starts to focus on training province's various talents, strengthening the building of human scale, which lays the foundation of expanding the development scale of the service industry.

Despite efforts have been increased and it has made some achievements [6]. When compared to other provinces, the scientific research institutions in Guangxi are still few, scientific research funds are relatively insufficient, and the construction of information network in service industry is behindhand, which restricts the expanding of the development scale of the service industry in Guangxi.

In the growth ability of the service industry, Guangxi ranks poorly and lays number 22, belongs to the middle and lower levels, which shows that the development ability of the service industry is insufficient. The economic base and the development scale of Guangxi decide the development level of service industry in a certain extent. Therefore, the growth ability of service industry needs to be strengthened. In addition, the innovation capability of Guangxi service industry is weak. So, it is difficult to promote the development of service industry, which leads to reducing its growth ability. Only the good service innovation can improve the potential development of the service industry.

V. CONCLUSION

This paper scientifically constructs index system of the competitiveness of Guangxi service industry and adopts the relevant data on the statistical yearbook. Through using factor analysis to extract four high reliability factors which convey more than 80 percent original information from eighteen indexes. Meanwhile, the correlation between these indexes has been eliminated, thus improving the accuracy and scientific nature of later evaluation. In reality, the study on the competitiveness of the service industry in provinces has the common characteristics of spatial correlation and development dynamics which exist in the provincial service industry competition. Therefore, factor analysis ignores the dynamics. This is the limitation of the current study, which needs to innovate in the future.

REFERENCES

[1] CHI Guo-tai, ZHENG Xing-guo, YANG Zhong-yuan. "Competitiveness Evaluation of Chinese State-owned Commercial Banks Based on Principal Component Analysis" [J]. Chinese Journal of Management, 2009(2):229~233.

[2] ZHOU Mei-hua, XU Jie, WANG Xiao-zhen. "Empirical Study on the Comprehensive Evaluation of Region Technology Service Industry Competitive Capability Level" [J]. Science & Technology Progress and Policy, 2010(8):137~140.

[3] HU Xiao-hui, DU De-bin. "The Niche Evaluation on Urban Science and Technology Competitiveness" [J]. Science & Technology Progress and Policy, 2012(12):36~40.

[4] LI Liang-cheng, YANG Guo-dong. "Research on the Index system and the Evaluation of the Competitiveness of Innovative Talents in Guangdong Province" [J].Science & Technology Progress and Policy, 2012(19):130~135.

[5] DUAN Jie, LIU Yong. "Study on the Evaluation of Technology Innovation Ability of Equipment Manufacturing in China Based on Factor Analysis" [J]. Science & Technology Progress and Policy, 2011(20):122~126.

[6] CHAI Guo-rong, XU Yu, DONG Shu-ning. "Research on comprehensive competence evaluation of large- scale research institutes" [J]. Science Research Management, 2006(03):110~115.