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Measuring the Development Level of Chinese Regional Service Industry: An Empirical Analysis based on Entropy Weight and TOPSIS

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***Abstract*—**Using entropy weight and TOPSIS method, a comprehensive evaluation is done on the development level of Chinese regional service industry in this paper. Firstly, based on existing research results, an evaluation index system is constructed from the scale of development, the industrial structure and the economic benefits. An evaluation model is then built up based on entropy weight and TOPSIS, and an empirical analysis is conducted on the development level of service industries in 31 Chinese provinces during 2006 and 2009 from the two dimensions or time series and cross section, which provides new idea for assessing regional service industry. Furthermore, the 31 provinces are classified into four categories based on the evaluation results, and deep analysis is carried out on the evaluation results.

***Keywords*—**Chinese regional service industry, Development level, Entropy weight, TOPSIS Evaluation Method

I. Introduction

NOWADAYS, service economy has been widely regarded as a natural process which should be gone through by the developing economies towards the developed or industrial economy (Cheng, 2008[1]), and the development level of service industry has also become the main index to evaluate and compare their economic development degree. Usually, the service development level can be measured from the three different dimensions of national, regional and specific service sector. Because regional discrepancies almost exist in every country, exploring the regularity of distribution in different countries is one of the hot spot in research (Grubel & Walker, 1988[2]; Daniels, 1989[3]). With the development of Chinese service economy and due to the large discrepancies in different regions, more attention is also paid into the research on Chinese regional service industry, especially the evaluation of its development level. Effective evaluation can help to understand the comprehensive development level and evolution trend of regional service industry more accurately, and have important meaning in upgrading the service industry's development level.

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II. Literature review

Regional service development level evaluation involves three important problems, the division of regions, the index system of evaluation, and the use of evaluation method. The division of regions can be cities (Wei & Han, 2010[4]), provinces (Cheng, 2003[5]) and areas (Gu, 2006[6]) in China, and studying from the 31 provinces (including provinces, municipalities directly under the central government and autonomous regions) in Chinese mainland is one of the most important dividing method, since this classification method can not only be more easily to obtain the research data, but also reveal the regional disparities in China's service industries. On this basis, the researchers designed different evaluation system, and mainly used principal component analysis method to assess the development level of Chinese regional service industry (Project Group of Service Research Center in CNBS, 2009[7]; Feng & Sun, 2010[8]).

The existing research results provided a solid foundation for this paper, but from the evaluation index system and evaluation method, we can find two obvious shortcomings. Firstly, although scholars followed the comparability principle to construct the evaluation index system, some indicators need to be discussed further. We can take the "Value-added of the Service Industry" as an example. This index is an important index to measure the absolute scale of service industry, which is significant in judging the development and change of service industry in a typical region from the dimension of time series. If we want to compare the service industry development level in different areas, then the relative scale index would be more appropriate to use, since the absolute scale of regional service industry is decided by many factors including geographic conditions and administrative regional scale, which can not reflect the service development level of a certain region in comparison. Secondly, the most commonly used evaluation method is principal component analysis, but revealed larger difference in the evaluation results. For example, Project Group of Service Research Center in CNBS (2009) and Feng & Sun (2010) both used the principal component analysis to evaluate the service industry development level of China's 31 provinces in 2007. In the former's research results, Tianjing ranked No. 6, belonging to relatively developed area of service industry, and Tibet ranked No. 25, belonging to underdeveloped area of service industry. While in the latter's research results, Tianjing ranked No. 3, belonging to developed area of service industry, and Tibet ranked No. 7, belonging to relatively developed area of service industry. Thus it can be seen, further evaluation needs to be done on the development level of Chinese regional service industry.

This paper will build up a new evaluation index system and use entropy weight and TOPSIS method to empirically analyze the service industry development level of 31 Chinese provinces.The reminder of this paper is organized as follows. Section III introduces the TOPSIS method and its applications and then constructs the evaluation model. Section IV sets up the evaluation index system and does the empirical analysis. Section V develops the conclusions and discussions.

III. Methodologies

A. TOPSIS Method and Its Applications

Technique for order preference by similarity to ideal solution (TOPSIS) was put forward for the first time by Hwang & Yoon in 1981[9], which is a multiple criteria method to identify solutions from a finite set of alternatives based upon simultaneous minimization of distance from an ideal point. Its basic idea is as follows: based on weighted standardized decision matrix, determine the positive ideal solution and the negative ideal solution, and separately calculate out the distance between each scheme and the positive ideal solution and the negative ideal solution, then get the relative closeness of each scheme to the ideal solution, which served as the basis for evaluating each scheme. Since TOPSIS does not have strict limit on data distribution and index size, makes use of the original data comparatively sufficiently, losses less information in calculation, and has a solid mathematical basis and the precise calculation process, it is widely used in decision making, performance evaluation and social economic assessment. Representative literatures are as follows. Yurdakul & Ic (2005)[10] adopted TOPSIS method to build up model so as to evaluate the performance of manufacturing enterprises. Hsu & Hsu (2008)[11] took into consideration the demand of medical clinic information outsourcing, and used TOPSIS method to objectively evaluate of the quality of information technology suppliers, which provides basis for clinic's decision-making. Pal & Choudhury (2009)[12] obtained data through survey, and applied TOPSIS method to evaluate the service quality of Indian banking industry. Yuan, Zhong & Guo (2010)[13] utilized TOPSIS method to measure the economic development level of 31 Chinese provinces during 1997 and 2007 and analyzed the variation tendency of regional economic discrepancies. Liu, Gong & Chi (2010)[14] used TOPSIS method to build up a society evaluation model, and assessed the social development conditions of 14 Chinese provinces. Nan, Wang & Li (2010)[15] assessed and compared the level of the equalization of basic public services in 31 Chinese provinces based on TOPSIS method. Torlak, Sevkli & Sanal (2011)[16] analyzed the business competition of Turkish domestic airline industry by using TOPSIS method. And Zhang, Gu & Gu (2011)[17] also used TOPSIS method to assess the tourism destination competitiveness in the Yangtze River Delta of China.

These literatures show that TOPSIS method is applicable to the comprehensive evaluation of finite objects.

If we take 31 Chinese provinces as evaluation objects, we can also adopt TOPSIS method to measure their development levels of service industries, and then classify these provinces into different categories.

B. The Evaluation Model

Based on the research results of Chen & Wang (2003)[18], Yu & Tan (2005)[19], Jiang et al. (2010)[20], and Das (2010)[21], we follow the next eight steps to build up the evaluation model.

Step 1: building up the raw data matrix

Suppose we evaluate the service industry development level of m regions, and the development level of each region can be measured by n indexes, i.e., we have m evaluation objects and n evaluation indexes, then the raw data matrix of evaluation can be $X = (x_{ij})_{m \times n}$.

Step 2: building up standardized matrix

Due to the differences between the evaluation indexes, we first need to use appropriate methods to do dimensionless processing. According to relationship and characteristics between the actual value and the dimensionless results, the dimensionless methods can be divided into three categories, say line dimensionless method, fold line dimensionless method and curve dimensionless method. And line dimensionless method is the most commonly used method, which can be further divided into standardized treatment method, extremum treatment method, linear proportion method, normalized processing method, vector standard method, efficacy coefficient method, and etc (Guo & Yi, 2008[22]). Since this paper treats each region's development level of service industry as a vector in the target space, the vector standard method will be used to do the dimensionless processing of original data, then we can get the standardized matrix $Y = (y_{ij})_{m \times n}$. And the formula is

$$y_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}$$

$$i = 1,2,\cdots,m;\ j = 1,2,\cdots,n \qquad (1)$$

Step 3: determining the entropy weight of each index

Deciding the weight of each index is an important step in evaluation. Subjective weighting and objective weighing are two main weighting methods. This paper adopts the entropy weight method to determine the indexes weights, which belongs to objective weighing. According to the basic principle of information theory, information is a measurement of system order degree, while entropy is a measurement of system disorder degree. The smaller the information entropy of an index is, the more information it provides, the larger its function in the evaluation is, and the higher the weight should be.

How to determine the entropy weight of each index?

Firstly, use linear proportion method to do standardization processing on raw data matrix $X = (x_{ij})_{m \times n}$, then get matrix $R = (r_{ij})_{m \times n}$.

$$r_{ij} = \frac{x_{ij}}{\max(x_{ij})},\ j = 1,2,\cdots,n \quad (2)$$

Secondly, do normalization processing on $R = (r_{ij})_{m\times n}$, then get $P = (p_{ij})_{m\times n}$.

$$p_{ij} = \frac{r_{ij}}{\sum_{i=1}^{m} r_{ij}},\ j = 1,2,\cdots,n \quad (3)$$

Thirdly, calculate out the entropy value e_j, which represents the importance of evaluation index j.

$$e_j = -\frac{1}{\ln m}\sum_{i=1}^{m} p_{ij}\ln p_{ij}$$
$$j = 1,2,\cdots,n \quad (4)$$

Finally, figure out the objective weight w_j of index j.

$$w_j = \frac{1-e_j}{n-\sum_{j=1}^{n} e_j},\ j = 1,2,\cdots,n \quad (5)$$

Step 4: computing the weighted matrix $V = (v_{ij})_{m\times n}$

$$v_{ij} = w_j \times y_{ij}$$
$$i = 1,2,\cdots,m;\ j = 1,2,\cdots,n \quad (6)$$

Step 5: determining the positive ideal solution A^* and the negative ideal solution A^-

$$A^* = \left\{\left[\max_i v_{ij}\middle| j\in J\right],\left[\min_i v_{ij}\middle| j\in J'\right]\middle| i = 1,2,\cdots,m\right\} = \left\{v_1^*, v_2^*,\cdots,v_n^*\right\} \quad (7)$$

$$A^- = \left\{\left[\min_i v_{ij}\middle| j\in J\right],\left[\max_i v_{ij}\middle| j\in J'\right]\middle| i = 1,2,\cdots,m\right\} = \left\{v_1^-, v_2^-,\cdots,v_n^-\right\} \quad (8)$$

Where $j\in J$ means the evaluation indexes are positive, $j\in J'$ means the evaluation indexes are negative.

Step 6: calculating the Euclidean distance between each evaluation object and A^* and A^-

$$S_i^* = \sqrt{\sum_{j=1}^{n}(v_{ij}-v_j^*)^2},\ i = 1,2,\cdots,m \quad (9)$$

$$S_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij}-v_j^-)^2},\ i = 1,2,\cdots,m \quad (10)$$

Step 7: calculating the relative closeness of each evaluation object to the ideal solution

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^*} \quad (11)$$

Step 8: sorting the evaluation objects according to C_i^*

According to formula (11), the value of C_i^* should be between 0 and 1. The bigger value means the evaluation object is closer to the optimal level, and the service industry development level of this region is higher, and of course the vice versa.

IV. Empirical Analysis

It is shown that China's service industries demonstrated rapid developing trend and entered into a new stage in the Eleventh Five-Year, or from 2006 to 2010, with continuous expansion in service scale and gradual improvement in service quality. It has important practical significance in evaluating the regional service industry development level of China in this stage. Because of lacking in statistical data of 2010, we will only comprehensively assess the service industry development level of 31 Chinese provinces from 2006 to 2009.

A. Building Up the Evaluation Index System

According to the research results of current literatures, we may assess the development level of service industry from different aspects, such as service scale, increasing speed, service structure, and service potential, and each aspect can be further measured by different indexes. We use the current research results as reference, and follow the principles of scientificalness, completeness, comparability and feasibility, so as to choose appropriate indexes to measure service industry development level.

We think that three indexes, or service scale, industrial structure and economic benefits, are most able to represent the development level of regional service industry directly, so we set these three indexes as the primary indexes. And the choice of the secondary indexes is mainly based on the following two considerations. Firstly, these indexes can be obtained from the National Bureau of Statistics of China, and the statistical calibers of these indexes should be consistent every year. Secondly, all the indexes are relative size or growth rate indexes, the absolute size indexes are not used in this paper, such as service industry value-added, service industry employees and service industry fixed investment, so as to increase the comparability of service industry development level among different regions.

The three primary indexes and eight secondary indexes to evaluate the development level of regional service industries are as follows (See Table I).

TABLE I
EVALUATION INDEX SYSTEM OF THE REGIONAL SERVICE INDUSTRY DEVELOPMENT LEVEL

Primary index	Secondary index	Calculating method

service scale	service industry value-added per capita (10 thousand Yuan / person)	service industry value-added / total regional population
	service industry Fixed investment per capita (10 thousand Yuan / person)	service industry fixed investment / total regional population
	growth rate of service industry value-added (%)	service industry value-added this year / service industry value-added last year - 1
industrial structure	proportion of service industry value-added to regional GDP (%)	service industry value-added / regional GDP
	proportion of service industry fixed investment to total fixed investment (%)	service industry fixed investment / total fixed investment
	proportion of service industry employees to total employees (%)	service industry employees / total employees
economic benefit	contribution rate of service industry (%)	increment of service industry value-added / increment of regional GDP
	labor productivity of service industry (10 thousand Yuan / person)	service industry value-added / service industry employees

B. The empirical Results

Based on the evaluation index system above, we collect raw data from China Statistical Yearbook and build up the raw data matrix $X = (x_{ij})_{m \times n}$, where $m = 31$, means that the evaluation will be done on the service industry development level of 31 Chinese provinces, and $n = 8$, represents the eight secondary indexes in TABLE Ⅰ .

This paper will assess the regional service industry development level from the two dimensions or time series and section during 2006 and 2009, or construct the raw data matrix $X = (x_{ij})_{m \times n}$ based on the cross section data of 2006, 2007, 2008 and 2009 separately, then figure out the relative closeness (or RC) of the 31 Chinese provinces in each year according to formula (1) ~(11), and finally place different provinces in order from the highest relative closeness to the lowest one. The empirical results are shown in TABLE Ⅱ and TABLE Ⅲ.

TABLE II
THE RELATIVE CLOSENESS AND ORDER OF EACH PROVINCE IN 2006 AND 2007

Order	2006		2007	
	Province	Relative closeness	Province	Relative closeness
1	Beijing	0.9242	Beijing	0.8969
2	Shanghai	0.8163	Shanghai	0.8290
3	Tianjin	0.4955	Tianjin	0.4947
4	Zhejiang	0.3764	Zhejiang	0.3734
5	Guangdong	0.3316	Guangdong	0.3425
6	Jiangsu	0.3103	Jiangsu	0.3232
7	Liaoning	0.2701	Fujian	0.2785
8	Inner Mongolia	0.2535	Inner Mongolia	0.2716
9	Fujian	0.2531	Liaoning	0.2666
10	Shandong	0.2309	Shandong	0.2393
11	Jilin	0.2023	Jilin	0.2168
12	Chongqing	0.1961	Chongqing	0.1885
13	Hebei	0.1803	Hebei	0.1854
14	Heilungkiang	0.1668	Hubei	0.1771
15	Xinjiang	0.1665	Heilungkiang	0.1742
16	Hubei	0.1604	Xinjiang	0.1633
17	Ningxia	0.1570	Hainan	0.1616
18	Hainan	0.1538	Shaanxi	0.1565
19	Shanxi	0.1498	Shanxi	0.1560
20	Shaanxi	0.1464	Ningxia	0.1515
21	Hunan	0.1439	Hunan	0.1484
22	Tsinghai	0.1337	Anhui	0.1339
23	Anhui	0.1282	Tsinghai	0.1337
24	Henan	0.1273	Henan	0.1336
25	Sichuan	0.1240	Guangxi	0.1304
26	Jiangxi	0.1229	Sichuan	0.1257
27	Guangxi	0.1196	Yunnan	0.1214
28	Yunnan	0.1167	Jiangxi	0.1145
29	Gansu	0.0987	Gansu	0.0994
30	Guizhou	0.0732	Guizhou	0.0839
31	Tibet	0.0000	Tibet	0.0000

Source: Calculating according to formula (1) ~(11), the raw data are drawn from China Statistical Yearbook.

TABLE III
THE RELATIVE CLOSENESS AND ORDER OF EACH PROVINCE IN 2008 AND 2009

Order	2008		2009	
	Province	Relative closeness	Province	Relative closeness
1	Beijing	0.8898	Shanghai	0.7847
2	Shanghai	0.8641	Beijing	0.7596
3	Tianjin	0.5007	Tianjin	0.5697
4	Zhejiang	0.3899	Inner Mongolia	0.3666
5	Guangdong	0.3604	Guangdong	0.3616
6	Jiangsu	0.3537	Zhejiang	0.3613
7	Fujian	0.2857	Jiangsu	0.3420
8	Inner Mongolia	0.2815	Xinjiang	0.3349
9	Liaoning	0.2813	Heilungkiang	0.3250
10	Shandong	0.2669	Liaoning	0.3112
11	Jilin	0.2353	Fujian	0.2863
12	Chongqing	0.1990	Ningxia	0.2706
13	Hebei	0.1953	Shanxi	0.2665
14	Hubei	0.1901	Shaanxi	0.2657
15	Heilungkiang	0.1867	Shandong	0.2569
16	Hainan	0.1833	Hainan	0.2477
17	Xinjiang	0.1709	Guizhou	0.2253
18	Shanxi	0.1705	Hunan	0.2244
19	Shaanxi	0.1688	Jilin	0.2191
20	Ningxia	0.1667	Hebei	0.2055

21	Hunan	0.1594	Jiangxi	0.2014
22	Anhui	0.1459	Tsinghai	0.1926
23	Tsinghai	0.1438	Chongqing	0.1926
24	Guangxi	0.1425	Hubei	0.1809
25	Henan	0.1410	Sichuan	0.1725
26	Sichuan	0.1324	Yunnan	0.1562
27	Yunnan	0.1322	Guangxi	0.1412
28	Gansu	0.1208	Henan	0.1367
29	Jiangxi	0.1190	Anhui	0.1365
30	Guizhou	0.0946	Gansu	0.1351
31	Tibet	0.0000	Tibet	0.0000

Source: Calculating according to formula (1) -(11), the raw data are drawn from China Statistical Yearbook.

Based on Table II and III we can classify the 31 Chinese provinces into four classes according to their development level of service industries. Class 1 is the developed area of service industry, with the relative closeness above 0.5; class 2 is the relatively developed area of service industry, whose relative closeness is from 0.3 to 0.5; class 3 is the relatively underdeveloped area of service industry, whose relative closeness is from 0.2 to 0.3; class 4 is the underdeveloped area of service industry, with the relative closeness below 0.2. The classification results are shown in Table IV and V

TABLE IV
THE CLASSIFICATION OF 31 CHINESE PROVINCES IN 2006 AND 2007

Class	Name	2006	2007
1	developed area of service industry (RC≥0.5)	Beijing Shanghai	Beijing Shanghai
2	relatively developed area of service industry (0.3≤RC<0.5)	Tianjin Zhejiang Guangdong Jiangsu	Tianjin Zhejiang Guangdong Jiangsu
3	relatively underdeveloped area of service industry (0.2≤RC<0.3)	Liaoning Inner Mongolia Fujian Shandong Jilin	Fujian Inner Mongolia Liaoning Shandong Jilin
4	underdeveloped area of service industry (RC<0.2)	Chongqing Hebei Heilungkiang Xinjiang Hubei Ningxia Hainan Shanxi Shaanxi Hunan Tsinghai Anhui Henan Sichuan Jiangxi Guangxi Yunnan Gansu Guizhou Tibet	Chongqing Hebei Hubei Heilungkiang Xinjiang Hainan Shaanxi Shanxi Ningxia Hunan Anhui Tsinghai Henan Guangxi Sichuan Yunnan Jiangxi Gansu Guizhou Tibet

TABLE V
THE CLASSIFICATION OF 31 CHINESE PROVINCES IN 2008 AND 2009

Class	Name	2008	2009
1	developed area of service industry (RC≥0.5)	Beijing Shanghai Tianjin	Shanghai Beijing Tianjin
2	relatively developed area of service industry (0.3≤RC<0.5)	Zhejiang Guangdong Jiangsu	Inner Mongolia Guangdong Zhejiang Jiangsu Xinjiang Heilungkiang Liaoning
3	relatively underdeveloped area of service industry (0.2≤RC<0.3)	Fujian Inner Mongolia Liaoning Shandong Jilin	Fujian Ningxia Shanxi Shaanxi Shandong Hainan Guizhou Hunan Jilin Hebei Jiangxi
4	underdeveloped area of service industry (RC<0.2)	Chongqing Hebei Hubei Heilungkiang Hainan Xinjiang Shanxi Shaanxi Ningxia Hunan Anhui Tsinghai Guangxi Henan Sichuan Yunnan Gansu Jiangxi Guizhou Tibet	Tsinghai Chongqing Hubei Sichuan Yunnan Guangxi Henan Anhui Gansu Tibet

C. Analysis on the Empirical Results

We can sum up several obvious characteristics related to the changes in regional service industry development levels according to table II, III, IV and V

Firstly, in general, the service industry development level in each province presents a rising trend during 2006 and 2009, where the provinces included in each class are stable from 2006 to 2008 but experience great changes in 2009. Specifically, in 2006 and 2007, while the value of relative closeness and the order are different, the provinces included in each class are completely consistent, with Beijing and Shanghai in class 1, four provinces such as Tianjin and Zhejiang in class 2, five provinces including Fujian and Inner Mongolia in class 3, and other 20 provinces in class 4. In 2008, except for Tianjing further improving its service development level and entering into class 1 from class 2, other provinces belong to the same classes as in 2006 and 2007. However, in 2009, apart from class 1, provinces included in other three classes vary significantly. Among them, Xinjiang and Heilungkiang ascend in service industry development level to a larger extent, stepping into class 2 from class 4, Inner Mongolia and Liaoning enter into class 2 from class 3, while eight provinces such as Ningxia and Shanxi go into class 3 from class 4.

Secondly, there are obvious differences among the 31 provinces in their service industry development levels. For example, in 2009, the relative closeness of the top two provinces Shanghai and Beijing is 0.7847 and 0.7596 respectively, while the relative closeness of the last two provinces Gansu and Tibet is only 0.1351 and 0 respectively. As to the classes, we can know that the discrepancies within each class are not the same. The coefficient of variation can be further used to show these discrepancies. The coefficient of variation is equal to the standard deviation of a sample to be divided by its mean, which can be used to measure the variation degree and discrete degree of each observation. The greater the coefficient of variation is, the bigger the discrete degree is, and the larger the discrepancies are in the service industry development levels. The coefficients of variation of each class are shown in. (Fig. 1).

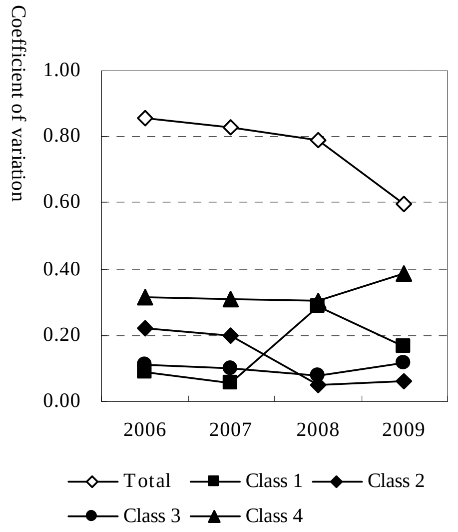

Fig. 1 Coefficients of variation of each class

According to Fig. 1 we can know that, as to the total provinces, the discrepancies of the service industry development level are declining gradually, the declining trend is especially obvious in 2009. However, as to the different classes, the variation tendencies of discrepancies are not the same. The discrepancies in class 1 are fluctuating, with rapid ascending in 2008 and obvious declining in 2009. The discrepancies in class 2 are falling in general, with slightly increase in 2009. The discrepancies in class 3 are relatively stable. While the discrepancies in class 4 are expanding entirely.

Finally, the orders of service industry development levels are comparatively stable in some provinces, while changing significantly in others. We have known that the provinces included in each class are stable from 2006 to 2008 but experience great changes in 2009, hereinafter we only compare the orders in 2009 with those in 2008, so as to demonstrate this characteristic. We can divide the 31 provinces into three groups according to their changes in orders. Group 1 has minor changes in orders which are equal to or low than three positions, including 15 provinces, i.e., Shanghai, Beijing, Tianjin, Guangdong, Zhejiang, Jiangsu, Liaoning, Hainan, Hunan, Tsinghai, Sichuan, Yunnan, Guangxi, Gansu and Tibet. Group 2 is the ascending provinces whose increases in order are equal to or more than four positions, including 8 provinces, i.e., Inner Mongolia, Xinjiang, Heilungkiang, Ningxia, Shanxi, Shaanxi, Guizhou and Jiangxi. Within this group, Guizhou has the largest ascensional range, increasing to No. 17 in 2009 from No. 30 in 2008, rising 13 positions, next is Xinjiang, rising 9 positions, while Ningxia and Jiangxi have 8 positions increase. Group 3 is the descending provinces whose decreases in order are equal to or more than four positions, including 8 provinces, i.e., Fujian, Shandong, Jilin, Hebei, Chongqing, Hubei, Henan and Anhui. Within this group, Chongqing suffers the largest drop, decreasing to No. 23 in 2009 from No. 12 in 2008, falling 11 positions, followed by Hubei and Jilin, falling 10 positions and 8 positions respectively.

V. Conclusions and Discussion

The importance of service industry in the modern economy has been extensively cognized. As the largest developing economy in the world, China should boost up the development of its service industry. At the same time, we should also do researches, so as to provide references for the steady and rapid development of Chinese service economy.

This paper uses entropy weight and TOPSIS method to comprehensively evaluate the development level of Chinese regional service industry and gets four following empirical results.

(1) In general, the development level of Chinese service industry presents a rising trend. There are discrepancies existed in the service industry development level in different Chinese provinces, but these discrepancies are reducing as time goes on.

(2) The 31 Chinese provinces can be sorted into four classes according to their development level in service industries. The class structure is shifting from pyramid shape to olive shape during 2006 and 2009, with most provinces gradually in the middle.

(3) In class 1, or the developed area of service industry, the service industry levels of Beijing and Shanghai are far ahead of other provinces, the service industry level of Tianjin is continuously increasing. Although the provinces in class 2 are increased, they still have a larger gap compared with the provinces in class 1. The boundaries between class 2 and class 3 and between class 3 and class 4 are relatively vague. And Tibet's service development level is far behind other provinces.

(4) The order of each province in the service development level is different in each year. Some provinces rise strongly, such as Guizhou and Xinjiang, some provinces suffer obvious downturn, such as Chongqing and Hubei.

Of course, it should be noted that, the relative closeness calculated by entropy weight and TOPSIS can only be used to measure the regional development level of service industry in the same year, the relative closeness in different years could not be compared. For example, the relative closeness of Beijing is 0.8898 in 2008 and 0.7596 in 2009, but we can not draw the conclusion that the service development level of Beijing decreases in 2009. However, the relative closeness of different provinces in the same year can be compared. If two provinces have larger gap in their relative closeness, then these two provinces also have wider disparity in their development levels of service industry.

More researches also need to be done on the evaluation results. For example, we can further explore the key factors which affect the regional development levels of service industry in each class and then draw out related countermeasures for promoting the service development separately, which will be our next research emphasis.

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