

Comprehensive Evaluation of Modern Service Industry in Anhui Province based on Entropy Weight TOPSIS Method

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Abstract

Modern service industry, as a significant symbol of modernization level, is an important engine to promote the upgrading of industrial structure and economic and social development, and has important practical significance for Anhui to achieve all-round high-quality development. This paper takes the modern service industry of Anhui province as the research object, constructs a comprehensive evaluation index system of modern service industry from four dimensions of development environment, development scale, development benefit and development potential, uses the entropy weight TOPSIS method to measure the development level of modern service industry of Anhui province, compares it with other provinces in central China, and identifies the problems and deficiencies in the development of modern service industry of Anhui province. And carry on the obstacle degree analysis, clear each index to Anhui modern service industry development level of the obstacle degree, and put forward the corresponding countermeasures and suggestions.

Keywords

Modern Service Industry; Comprehensive Evaluation; Entropy; TOPSIS; Obstacle Degree Analysis.

1. Introduction

The essence of modern service industry is to realize the modernization of service industry. It integrates new technologies, new business forms and new growth modes, reflects the level of regional economic development, economic vitality and competitiveness, and is a significant symbol of the level of modernization. At present, the service industry has become the main driving force for the economic development of Anhui Province, with obvious supporting and leading role and remarkable development results. However, compared with other provinces in China, the development of Anhui's service industry is relatively backward on the whole, especially the development of modern service industry lags behind, and there is still a big development gap between Anhui and advanced areas. Faced with this situation, only by actively exploring the path of improving the quality and efficiency of modern service industry, can we give full play to the great promoting role of modern service industry in economic development and structural adjustment, and help Anhui to achieve all-round high-quality development.

2. Literature Review

At present, Chinese academic circles' research perspectives on the development level evaluation of modern service industry are abundant and diverse, and the research differences are mainly reflected in the selection of evaluation index system and evaluation method. The research perspective of the development level evaluation of modern service industry can be roughly divided into two categories: one is the comprehensive evaluation and analysis of the

development of modern service industry; the other is the evaluation and analysis of the subsector or single field of modern service industry.

From the perspective of comprehensive evaluation analysis, Yang Keling et al. (2014) constructed a development potential evaluation index system focusing on development basis, input level, development level and sustainable level, and used the weighted principal component TOPSIS potential evaluation model for empirical analysis. Zhang Shaojie et al. (2016) established an evaluation index system from the six dimensions of service industry development level, industrial structure, economic environment, scientific and technological environment, cultural environment and basic conditions, and calculated the comprehensive competitiveness score by using factor analysis method. Hong Guobin et al. (2017) classified the indicators of the same criterion layer through R clustering, calculated the index content by using the coefficient of variation, screened the indicators with the largest information, and finally constructed an evaluation index system with four dimensions of development basis, development environment, development scale and development potential of the modern service industry. Zhang Haibo et al. (2018) constructed an index system including development basis, economic contribution and growth potential, and used a combination evaluation model based on analytic hierarchy process and entropy method to evaluate the modern service industry in Hubei Province. Wang Yu et al. (2018) constructed an evaluation index system for the development of the service industry from four dimensions, including macroeconomic environment, development scale of the service industry, industrial structure and growth rate, and made a comprehensive evaluation by using factor analysis method. Cui Hongqiao et al. (2022), based on the perspective of high-quality development, proposed that the four indexes of structure optimization, innovation-driven, coordination and integration, and economies of scale are the main indexes to evaluate the high-quality development level of China's service industry in the new era, and used qualitative and quantitative analytic hierarchy process to give weight. Chen Jinghua et al. (2022) constructed an evaluation index system including innovative development, coordinated development, sustainable development, open development and shared development from the perspective of the new development concept, and used the entropy weight method to measure the index.

From the perspective of subdivision, Wei Jiang et al. (2015) constructed an evaluation index body reflecting the diversity of innovation forms of high-tech service enterprises by comprehensively using exploratory case analysis, questionnaire survey, stratification analysis, expert review and other research methods.

It not only examines the innovation factors of input and output, but also includes the process factors of service industry innovation. Sun Peng et al. (2018) evaluated the modern service industry in various regions of Anhui from the perspective of investment environment, built an index system including infrastructure, economic environment and scientific research and innovation environment, and used factor analysis and cluster analysis to comprehensively evaluate the investment environment of modern service industry in various regions. Lu Chaoyun et al. (2019), based on two perspectives of input efficiency and output quality, adopted analytic hierarchy process (AHP) to construct a high-quality development evaluation index system for modern service industry from six dimensions: industrial scale, technical structure, organizational performance, product structure, degree of openness and ecological civilization.

To sum up, indicators selected in previous studies mainly reflect the total volume level of modern service industry, proportion of structure, development speed, capital input, green development and other aspects. It can be seen that the development level of modern service industry is a complex system containing multiple factors and involving multiple fields. The index system to measure the development level of modern service industry should be combined with the actual situation of the local area, and the relationship between various factors should be considered comprehensively. However, the existing researches pay more attention to the

level of the total development of modern service industry, but ignore the quality and benefit of modern service industry development. Therefore, on the basis of previous studies, this paper constructs an index system of development environment, development scale, development benefit and development potential, uses entropy weight TOPSIS method to evaluate the development level of modern service industry in Anhui province scientifically and objectively, and analyzes the advantages and disadvantages of the development of modern service industry in Anhui Province. Put forward corresponding countermeasures and suggestions for improving the quality and efficiency of Anhui modern service industry.

3. Empirical Analysis of Comprehensive Evaluation

3.1. Index System Construction

On the basis of referring to the existing research, this paper combines the characteristics of advanced nature, innovation, technology intensive, human capital intensive and high aggregation of modern service industry, and constructs the development environment, development scale and development, benefit and development potential of primary indicators and 20 secondary indicators.

In terms of development environment, this paper mainly considers three dimensions: regional economic development level, urbanization process and consumption power, and selects five indicators: per capita gross regional product, total retail sales of consumer goods, urbanization rate, per capita consumption level and per capita disposable income. In terms of the scale of development, the proportion of employment in modern service industry, the proportion of added value in modern service industry, the density of service, the proportion of people in modern service industry law and the per capita occupancy of service products are selected. Among them, service density is the ratio between the added value of modern service industry and the built-up area of the city, and the per capita service product occupancy is calculated by dividing the added value of modern service industry by the total population of the region. In the aspect of development benefit, it selects the labor productivity of modern service industry, the contribution rate of modern service industry, the profit rate of modern service industry, the tax proportion and the average wage. Where, the labor productivity of modern service industry is the value added of modern service industry divided by the number of employment in the service industry, the contribution rate of modern service industry is the ratio of the increment of value added of modern service industry to the increment of gross regional product, and the profit rate of modern service industry is the ratio of operating profit to main business income. In terms of development potential, this paper mainly considers the influence of scientific research and innovation ability on the development quality of modern service industry, and selects the proportion of population with college degree or above, sustainable growth rate, ratio of R&D to total output value, number of patent applications per 10,000 people and growth rate of modern service industry. The sustainable development rate is measured by the proportion of expenditure on science and education in government expenditure. In view of the availability of data, this paper takes 2020 as the evaluation year, with data mainly derived from China Statistical Yearbook, China Tertiary Industry Statistical Yearbook and China Population and Employment Statistical Yearbook.

Index weight calculation. From the perspective of research methods, the existing researches mainly apply the index weighting and evaluation methods such as principal component analysis, factor analysis, hierarchical analysis, entropy method and grey cluster analysis. In order to effectively avoid the bias brought by the subjective weighting method, this paper selects the entropy weight method to determine the index weight. First, standardize the raw data. The indicators selected in this paper are all positive indicators, but there are still differences in dimensions, orders of magnitude and other aspects. Therefore, this paper normalized the index

data to eliminate the impact of different dimensions on the evaluation results. Finally, the weight of the index system constructed in this paper is calculated using the entropy weight method, as shown in Table 1.

Table 1. Evaluation index system and weight distribution of modern service industry

First-order index	Secondary index	direction	Index weight
Development Environment (18.84)	Per capita consumption level of residents	Positive index	4.37
	Per capita disposable income	Positive index	4.01
	Total retail sales of consumer goods	Positive index	3.21
	Gross regional product per capita	Positive index	4.23
	Urbanization rate	Positive index	3.02
Development Scale(30.44)	The proportion of employment in modern services	Positive index	4.45
	Proportion of value added of modern service industry	Positive index	6.02
	Service density	Positive index	5.54
	The proportion of people in modern service law	Positive index	7.47
	Per capita consumption of service products	Positive index	6.96
Development Benefit(27.63)	Modern service industry labor productivity	Positive index	2.95
	Contribution rate of modern service industry	Positive index	8.18
	Profit rate of modern service industry	Positive index	7.97
	Tax share	Positive index	3.77
	Average wage	Positive index	4.76
Development Potential(23.1)	The proportion of the population with a college degree or above	Positive index	7.34
	Sustainable development rate	Positive index	3.22
	Ratio of R&D to total output value	Positive index	3.06
	Patent applications per 10,000 people	Positive index	3.3
	Growth rate of modern service industry	Positive index	6.18

3.2. Comprehensive Evaluation and Analysis

In this paper, TOPSIS method is used to comprehensively evaluate and analyze the development level of modern service industry. TOPSIS method is a kind of ranking method according to the close degree of evaluation objects and idealized targets, which can reflect the quality of evaluation objects. Firstly, the positive and negative ideal solutions are calculated on the basis of the weighted matrix. Secondly, the weighted Euclidean distance from the evaluation object to the positive and negative ideal values is calculated. Finally, the close degree of the evaluation image to the optimal value is obtained and sorted according to it. After the above steps, the development index of modern service industry in each region and its ranking are calculated, as shown in Table.

The comprehensive development index of modern service industry of Anhui was 0.326, ranking the fifth among the six central provinces. The comprehensive score of Anhui was 0.248 lower than that of Hubei Province, which ranked the first, and only higher than that of Jiangxi Province, which ranked the sixth, by 0.016, indicating that the development level of modern service industry of Anhui province was relatively backward among the six central provinces. In terms of sub-indexes, Anhui scored 0.328, 0.204, 0.388 and 0.346 in the four dimensions of development environment, development scale, development benefit and development potential, among which the development benefit index was the highest, followed by the development potential and development environment, and the development scale index was the lowest. Compared with other provinces in central China, Anhui lags far behind in all first-level indexes. In terms of development environment and development potential, it ranked the bottom, less than half of the score of Hubei Province, which ranked first. Although the dimension of development scale ranks the fourth, its score is lower than 0.3, which is far from the optimal value. The development efficiency ranked fifth, 0.196 lower than that of Jiangxi Province, which ranked first. It was the first-level index with the smallest gap between it and other provinces in central China.

Table 2. Scores and ranking of comprehensive evaluation of development level of modern service industry in six central provinces

Area	Development Environment	Sort	Scale Of Development	Sort	Development Benefit	Sort	Development Potential	Sort	Composite Score	Comprehensive Sort
Anhui	0.328	6	0.204	4	0.328	5	-0.346	6	0.326	5
Shanxi	0.583	3	0.205	5	0.584	1	0.639	2	0.444	3
Jiangxi	0.464	4	0.078	6	0.222	6	0.591	3	0.31	6
Henan	0.35	5	0.242	3	0.509	2	0.375	5	0.401	4
Hubei	0.771	1	0.649	2	0.506	3	0.705	1	0.574	1
Hunan	0.667	2	0.658	1	0.439	4	0.389	4	0.47	2

3.3. Obstacle Degree Analysis

In order to identify the influencing factors that restrict the evaluation results of the development level of modern service industry in Anhui province, this paper uses the obstacle degree model to calculate the obstacle degree of each index, and sorts the obstacle degree.

It can be seen from the calculation results that, among the first-level indicators, the highest obstacle degree of development scale is 32.7%, followed by the obstacle degree of development benefit and development potential, which are 25.7% and 21.6% respectively, and the lowest

obstacle degree of development environment is 20%. From the perspective of second-level indicators, the main indicators with a handicap degree higher than 10% are the growth rate of modern service industry and the contribution rate of modern service industry, which are 13.03% and 10.12% respectively. There are seven indicators with the obstacle degree between 5% and 10%, among which four are indicators reflecting the scale of development, two are secondary indicators reflecting the development environment, and one is the contribution rate of modern service industry reflecting the development benefits. There are 11 indicators of obstacle degree between 0% and 5%, among which 4 indicators reflect development potential, 3 indicators reflect development environment, and two secondary indicators of development environment and development benefit. Therefore, Anhui should focus on expanding the development scale of modern service industry, improving the development efficiency of modern service industry, strengthening the development potential and development environment simultaneously, so as to achieve the improvement of quality and efficiency of modern service industry.

4. Research Conclusions and Suggestions

Starting from the four dimensions of development environment, development scale, development benefit and development potential, this paper constructs the development level index system of modern service industry in Anhui province, uses entropy weight TOPSIS to conduct comprehensive evaluation and comparative analysis of the development level of modern service industry in Anhui Province, and calculates the obstacle degree of each index, and draws the following conclusions: First, the development of modern service industry in Anhui is relatively backward. The comprehensive development index of modern service industry in Anhui ranks the fifth among the six central provinces, which has a large room for improvement. Second, development scale and benefits are important dimensions affecting the development level of modern service industry in Anhui. Anhui should focus on the development of modern service industry to expand the scale of development, improve the benefit of development, but also pay attention to optimize the development environment and strengthen the development potential.

Based on the above research conclusions, this paper puts forward the following countermeasures and suggestions to promote the quality and efficiency of Anhui modern service industry: first, strengthen the cultivation of market players. We will expand the size of the modern service sector as a major market player, actively promote the reform of state-owned service enterprises, and stimulate private capital investment. Build influential service brands, cultivate leading enterprises in the service industry, and give full play to the leading role of leading enterprises. Second, we will improve the quality of service supply. We will accelerate the penetration of information technology into all sectors of the service industry, promote the extension of industries up the value chain, accelerate the shift from production and manufacturing to production and services, accelerate the leap-forward development of the consumer service industry, and expand the supply of quality service products. To reduce costs and increase efficiency and improve quality, optimize the layout of modern service industry clusters, further improve the supporting service functions of the clusters, and continuously enhance the comprehensive bearing function of the clusters. Third, we will increase support for innovation. We will strengthen the guidance of scientific and technological innovation, foster and build a digital industrial chain, and create new highlights, new forms and models of development of services through product innovation, platform innovation, enterprise innovation and regulatory innovation. We will promote the innovation of business forms and functional improvement of the modern service industry, and accelerate the formation of a new system and development model of the modern service industry that is mainly guided and supported by innovation.

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