

Analysis of the Evolution of the High-Quality Development of China's Service Industry: **Empirical Evidence Based on 15 Sub-Provincial Cities**

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Introduction

Since the reform and opening-up, China's service industry has made a historic leap forward. Not only has its scale continued to expand, but its contribution to economic growth has also increased year by year. However, compared with developed countries, China's service industry still has a large gap in terms of service quality, industrial scale, and scientific and technological level, and faces many challenges to high-quality development. General Secretary Xi Jinping emphasized in the report of the 20th Party Congress that "high-quality development is the primary task of comprehensively building a modern socialist country". Combined with this background, the scientific construction of China's service industry high-quality development index system, objectively analyze the evolution trend, solve the problems in the development of a more comprehensive grasp of the real situation of the development of the service industry in the sub-provincial cities, to create a new pattern of high-quality development of the service industry, and to promote the coordinated development of the region is of great theoretical and practical significance.



Figure 1. Value added of services in 15 sub-provincial cities in 2022



Figure 2. Number of new entrants to the service sector in 15 sub-provincial cities, 2013-2022

Mathematical Formulas

Standardized treatment:

$$r_{ij} = \frac{x_{ij} - \min\{x_{ij}\}}{\max\{x_{ij}\} - \min\{x_{ij}\}}$$

nula for e_j is

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$$e_{j} = -k \sum_{i=1}^{k} \left(\frac{\Gamma_{ij}}{\sum_{i=1}^{n} r_{ij}} \right) \ln \left(\frac{1}{\sum_{i=1}^{k} r_{ij}} \right)$$
formula for w_{j} is

$$w_j = \frac{(1-e_j)}{\sum_{j=1}^m (1-e_j)}$$

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Composite index:

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$$I = \sum_{i=1}^{m} r_{ij} w_j$$

The Kernel density estimation method:

$$f(x) = \frac{1}{Nb} \sum_{i=1}^{N} k\left(\frac{x_i - x}{h}\right)$$
$$k(x) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{x^2}{2}\right)$$

Methodologies

Entropy weight method: Entropy weight method is a method of objective assignment of decision-making indicators, and can effectively overcome the influence of subjective factors on the evaluation system, so that the evaluation results are more objective and reliable.

Kernel density estimation: The Kernel density estimation method is capable of estimating the probability density of a random variable and describing its distributional pattern with a continuous density profile, which is highly stable.

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Figure 3. Degree of service industry agglomeration in 15 sub-provincial cities, 2013-2022



Figure 4. High-quality development trend of China's service industry from 2013 to 2022



Figure 5. Evolution of high-quality services development in four geographic regions



Figure 6. Characteristics of the dynamic evolution of high-quality development of the service sector in four geographic regions

Conclusion

First, the overall level of high-quality development of China's service industry is not high, but is on a slow upward trend. From the perspective of the country as a whole, the average value of the high-quality development level of China's service industry from 2013 to 2022 increased from 0.222 to 0.618, with a large improvement.

From the perspective of the four major geographical regions, the region with the highest level of high-quality development of the service industry is the Northeastern region, followed by the Eastern region.

The results of the second kernel density estimation show that the level of high-quality development of the service industry in the country as a whole and in the four major geographic regions has experienced small fluctuations. The level of high-quality development of the service industry in the central region has risen relatively quickly, while the western region has risen relatively slowly. The absolute differences in the high-quality development of the service industry in the central region have widened slightly, while the absolute differences in the high-quality development of the service industry in other regions have not changed much or have narrowed. At the same time, there is no obvious polarization in the level of high-quality development of the service industry in the country as a whole and in each region.