# Comprehensive Evaluation and Improvement Suggestions on the Level of Common Prosperity in the Yangtze River Delta Region

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## Abstract

Common prosperity is an important aspect of people's need for a better life, and the quantification of common prosperity in the Yangtze River Delta, as the most comprehensive economic center in China, is of great significance. This article first reviews domestic research literature, clarifying the research background and current situation; Further analyze the meaning of common prosperity and clarify its statistical connotations, and establish an evaluation index system for the level of common prosperity from four dimensions: development, sharing, sustainability, and people-oriented; Using the entropy weight TOPSIS comprehensive evaluation model to evaluate the level of common prosperity in the Yangtze River Delta, and calculating the development obstacle factors through the obstacle degree model and proposing relevant suggestions.

## Keywords

Common prosperity; Yangtze River Delta; Entropy Weight TOPSIS; Obstacle degree.

## 1. Introduction

Since the reform and opening up in 1978, the Yangtze River Delta region located along the eastern coast has been in an environment of rapid economic development, ranking first among the three major economic zones in China. In 2022, the GDP of the Yangtze River Delta region accounted for 24.1% of the national GDP, and the permanent population accounted for 16% of the total population. In addition, the Yangtze River Delta has two comprehensive national science centers, Shanghai Zhangjiang and Anhui Hefei, and its economic output is in an unshakable position, attracting talents from all aspects. With its advantages of outstanding talents, developed economy, advanced technology, etc., it fully promotes integrated construction, regional coordination, and urban-rural integration development, However, even though the Yangtze River Delta region is the most economically developed region in China, there still exists the problem of imbalanced development. The underdeveloped economy in northern Jiangsu and northern Anhui due to their late industrial start and relatively lagging manufacturing development is an important issue for the Yangtze River Delta region to achieve common prosperity. In 2021, the National Development and Reform Commission issued an implementation plan related to the Yangtze River Delta, which clearly proposed assistance work. Each province should develop its own advantages and fulfill its responsibilities to narrow the economic development gap in the Yangtze River Delta region.

Common prosperity refers to the general prosperity achieved by all people through hard work and mutual assistance to achieve a standard of living that is abundant in clothing and food,

which is based on eliminating polarization and poverty. The connotation of common prosperity is reflected in the following four dimensions: first, the developmental dimension, which reflects the overall growth of social wealth, people's income, and the level of material infrastructure construction. It measures the narrowing of the wealth gap between groups, urban and rural areas, and regions. Specifically, it is reflected in the high total factor productivity, relatively high levels of per capita GDP and per capita disposable income, reasonable proportion of labor remuneration to GDP, significant decrease in Engel's coefficient, unemployment rate, etc., and strong sense of gain among the people. The second dimension is the sharing dimension, which measures the narrowing of the gap between people's expectations for a better life and existing development from the perspective of reflecting whether the achievements of economic development fairly benefit all people, including education, healthcare, social security, and spiritual aspects. Specifically, this is reflected in the continuous expansion of the middle-income group, the narrowing of the income and living standards gap between urban and rural residents, the narrowing of the income gap within industries and urban and rural residents, the equal sharing of basic public services by everyone, and significant improvement in regional development disparities. The third dimension is sustainability, which reflects the degree to which economic and social development is coordinated and adapted to the carrying capacity of population, resources, and environment. It measures the long-term development potential of economic development, fiscal expenditure, social environment, and ecological environment. This is reflected in the continuous appreciation of natural resource assets, the continuous growth of human capital, and social security and stability. The fourth dimension is the people-oriented approach. Adhering to common prosperity is centered around the people, achieving comprehensive development and prosperity of humanity, and measuring the gap in cultural literacy and moral civilization at the individual level. Specifically, the proportion of cultural consumption expenditure is relatively high, the national physique continues to improve, personal hobbies and specialties are generally developed, and the happiness index of the people is high.

## 2. Literature Review

The research on the evaluation system of common prosperity indicators in the academic community is still in its initial stage, and there are few systematic studies on it, and there is no literature to measure the level of regional common prosperity. In terms of the construction and methods of the indicator system for common prosperity, Liu Peilin et al. (2021) proposed an indicator system from two dimensions: overall prosperity and sharing of development achievements, by analyzing the political and economic connotations of common prosperity; Tian Yajuan et al. (2020) view the realization of common prosperity as a consistent and orderly development of the social system in three dimensions: income distribution pattern, level of prosperity, and income gap among residents; Yang Yiyong and Wang Mingji (2021) proposed a three-dimensional indicator system based on the analysis of the multi-level connotation of common prosperity, which includes material prosperity, spiritual prosperity, and livable living environment; Wan Haiyuan and Chen Jiping (2021) believe that common prosperity is a balancing choice between overall prosperity and shared prosperity, and draw on consumer choice theory in economics to establish an incomplete substitution function relationship between the two; Chen Lijun et al. (2021) constructed a model of the Common Prosperity Index using the Analytic Hierarchy Process (AHP) based on the three characteristics of development, sharing, and sustainability of common prosperity; Li Jinchang and Yu Wei (2022) developed a common prosperity evaluation index system by combining process indicators and outcome indicators using the coefficient of variation method [6].

Based on the above literature review, research on the level of common prosperity mainly presents the following characteristics: firstly, constructing evaluation indicators based on the evolution of the connotation of common prosperity; The second is to adhere to multidimensional measurement of the level of common prosperity. However, in existing literature, the indicator system for the level of common prosperity focuses more on the economic and social livelihood fields, with less attention to politics and ecological environment, and the evaluation system is brief. The focus is on the selection of indicator systems, but neglects the selection of methods and evaluation of results. Therefore, the innovation of this article is reflected in the improvement of the evaluation system, which applies the mathematical model of entropy weight TOPSIS comprehensive evaluation to the study of the level of common prosperity, Build an evaluation model for the level of common prosperity.

## 3. Empirical Research

### 3.1. Research Methods

#### 3.1.1. Entropy Weight TOPSIS

The entropy weight TOPSIS method is used to study the distance between the evaluation object and the ideal solution, and combined with the ideal solution to obtain the final degree of closeness C value, which can flexibly characterize the comprehensive impact of multiple influencing indicators. That is, the entropy method is first used to determine the weight, and then the TOPSIS method is used to calculate the comprehensive evaluation value.

The first step is to normalize the indicators. According to different types of indicators, different formulas need to be used for forward and backward processing. The formula for handling different indicators is as follows:

Positive indicator:

$$x_{ij} = \frac{X_{ij} - minX_{ij}}{maxX_{ij} - minX_{ij}} \tag{1}$$

Negative indicator:

$$x_{ij} = \frac{maxX_{ij} - X_{ij}}{maxX_{ij} - minX_{ij}} \tag{2}$$

The second step is to construct a standardized matrix. A major principle of applying the TOPSIS model is to use a weighted normalized decision matrix. Due to differences in various indicators, it is necessary to standardize the original data.

$$Z_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} X_{ij}^2}} \quad j=(1,2,...,n) \tag{3}$$

Step three, determine the entropy weight. The formula for determining entropy weight is as follows:

$$P_{ij} = \frac{Z_{ij}}{\sum_{i=1}^{n} Z_{ij}} \tag{4}$$

$$e_j = -\frac{1}{lnn} \sum_{i=1}^{n} P_{ij} \, ln(p_{ij}) \tag{5}$$

$$w_j = \frac{1 - e_j}{\sum_{j=1}^{n} 1 - e_j} \tag{6}$$

Step 4, calculate the score.

Firstly, determine the positive and negative ideal solutions.

$$V_{ij} = W_j Z_{ij} \tag{7}$$

Positive ideal solution:

$$V^+ = (V_1^+, V_1^+, \dots, \ V_m^+) = \{max V_{ij} \mid j = 1, 2, \dots, m\} \tag{8}$$

Negative ideal solution:

$$V^- = (V_1^-, V_1^-, \dots, \ V_m^-) = \{max V_{ij} \mid j = 1, 2, \dots, m\} \tag{9}$$

Next, calculate the distance $S_i^+$ from each solution to the ideal solution and the distance $S_i^-$ from the negative ideal solution, with the following equation form:

$$S_i^+ = \sqrt{\sum_{j=1}^m (V_j^+ - V_{ij})^2} \tag{10}$$

$$S_i^- = \sqrt{\sum_{j=1}^m (V_j^- - V_{ij})^2} \tag{11}$$

Finally, calculate the relative closeness of each scheme using the following formula:

$$C_i = \frac{S_i}{S_i^+ + S_i^-} \tag{12}$$

### 3.1.2. Obstacle model

To further diagnose the level of common prosperity through pathological analysis, the project uses factor contribution and indicator deviation to calculate the degree of obstacles, clarify the factors that affect the construction of common prosperity, and make targeted adjustments to the construction and policies of common prosperity.

$$O_i = \frac{I_j \times w_j}{\sum_{j=1}^n I_j \times w_j} \tag{13}$$

$$I_j = 1 - x_{ij} \tag{14}$$

Among them, $O_i$ is the degree of obstacle; $I_j$ is the deviation degree of the j-th indicator, indicating the gap between a single indicator and the optimal goal of common prosperity level.

### 3.2. Construction of evaluation index system

On the basis of referring to the indicator system of research on common prosperity such as Outlook, Li Jinchang, Chen Lijun, etc., this article formulates four dimensions of criterion layers and 16 indicator layers to measure the level of common prosperity in the Yangtze River Delta region based on principles of operability, scientificity, and representativeness.

Table 1. Evaluation indicators

| Target layer | Criterion layer | Indicator layer | Indicator Description | Weight |
|---|---|---|---|---|
| Common prosperity | Development | Per Capita GDP (A1) | GDP/Annual Average Resident Population | 7.9% |
| | | Resident consumption level (A2) | Statistical data | 7.7% |
| | | General public budget revenue (A3) | Statistical data | 8.5% |
| | | Advanced Industrial Structure Index (A4) | Third industry output value/Second industry output value | 9.6% |
| | | Registered urban unemployment rate (A5) | Statistical data | 4.6% |
| | Share | Urbanization (A6) | Urban permanent | 3.9% |

| | | population/total permanent population | |
|---|---|---|---|
| | income gap (A7) | Theil index | 5.8% |
| | Difference between the highest and lowest per capita GDP in a region (A8) | Regions with the highest/lowest per capita GDP | 6.1% |
| | The ratio of urban and rural consumption levels (A9) | Urban consumption level/rural consumption level | 4.4% |
| Sustainability | Forest coverage rate (A10) | Statistical data | 5.8% |
| | Wastewater discharge (A11) | Statistical data | 7.4% |
| | Solid waste discharge (A12) | Statistical data | 7.4% |
| | Per capita park green space area (A13) | Statistical data | 4.2% |
| Affinity to the people | Per capita public library collection (A14) | Public Library Collection/Total Population | 8.7% |
| | Comprehensive population coverage of radio programs (A15) | Statistical data | 2.9% |
| | Number of healthcare professionals per population (A16) | Number of health technicians/total population | 5.2% |

## 3.3.  Data sources

All indicator data are sourced from the China Economic Net database and the EPS global statistical data platform, and regression estimation method is used to process individual missing values.

## 4.  Result Analysis

According to the indicator system, the entropy weight TOPSIS model was used to calculate the comprehensive development index of common prosperity in the Yangtze River Delta. The overall level of common prosperity in the Yangtze River Delta showed a significant increasing trend from 2000 to 2022, but still had some fluctuations. The comprehensive development index increased from 0.328825 in 2000 to 0.704667 in 2022, with an annual growth rate of 3.76% (Figure 1).

From the time series chart of the comprehensive score of the common prosperity level in the Yangtze River Delta in Figure 1, it can be seen that the overall development is divided into two stages. The first stage is from 2000 to 2007, where the growth rate of the common prosperity level is relatively slow and fluctuates up and down. The second stage is from 2008 to 2020, where the growth rate of the common prosperity level significantly increased and steadily increased to the highest value in 2020. From 2019 to 2022, it decreased due to the impact of the epidemic but still remains at a high level, It is expected that the level of common prosperity in the Yangtze River Delta will continue to improve in the future.
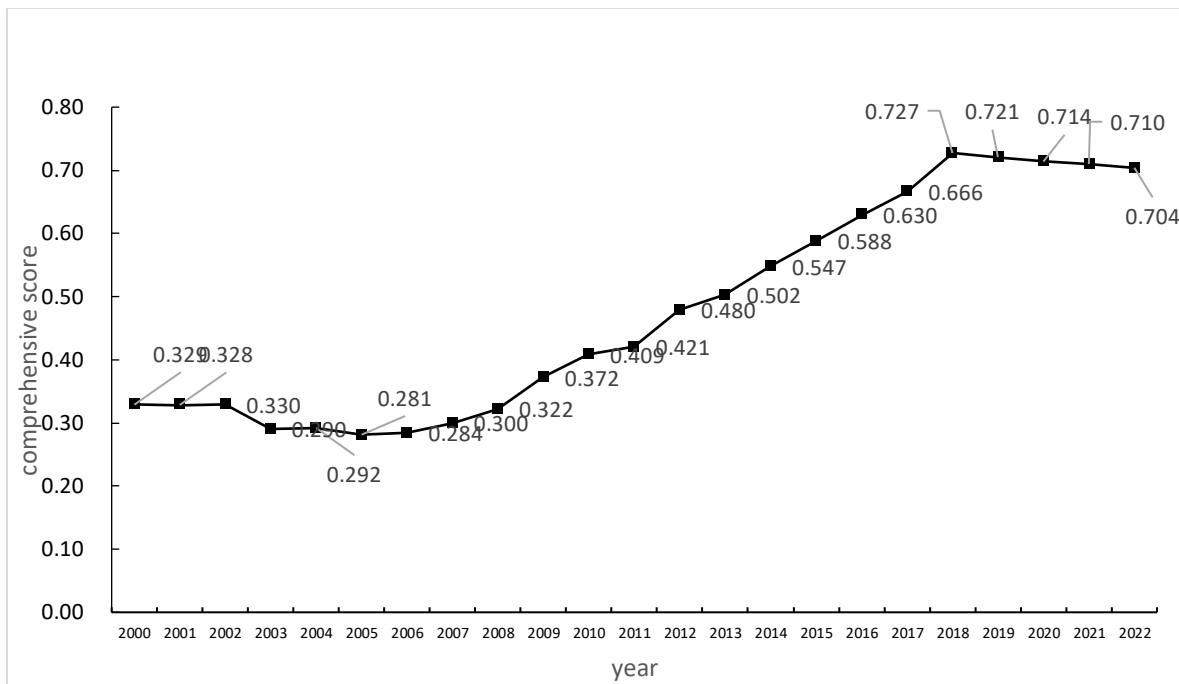
Figure 1. Comprehensive score of common prosperity level in the Yangtze River Delta from 2000 to 2022

## 5. Suggestions

Based on the research findings, the following suggestions are proposed

(1) Sustainable development. Integrating economic development with sustainability, common prosperity not only represents prosperity in daily life, but also means sustained and healthy prosperity. It is necessary to make reasonable use of natural resources and reduce pollution emissions. Measures to drive economic growth should be considered to determine whether they comply with the concept of sustainability

(2) Stimulate consumption. The current consumption level of residents has not kept up with the overall economic development. The Yangtze River Delta should fully leverage its population and technological advantages to stimulate residents' consumption. The government needs to take measures such as improving social welfare, gradually expanding the scope of social insurance and medical care, and encouraging citizens to participate in market investment.

(3) Pay attention to the distribution system. Common prosperity is difficult to achieve, and income inequality has become a bottleneck in building common prosperity. To break this bottleneck and enter the next stage, the government should strengthen macroeconomic regulation, comprehensively use economic and administrative means to promote fair income distribution, increase the proportion of labor remuneration in initial distribution, and improve the personal income tax system. A comprehensive and effective policy system should be formulated to regulate the integration of income distribution and property distribution.

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