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# A Study on Measuring the Level of High-Quality Development of Chinese Cities

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**Abstract:** Based on the connotation of high-quality development and the five new development concepts of "innovation, coordination, greenness, openness, and sharing", this paper constructs a three-level indicator measurement system for the level of high-quality development of cities. Using the respective advantages of the entropy value method and CRITIC method, the weights of indicators are assigned at different levels. At the same time, the TOPSIS method is combined to measure the level of urban development and get the ranking of national cities in terms of high-quality development level. By analyzing the weights of the indicators, the direction that should be emphasized in the high-quality development of Chinese cities is further analyzed.

**Keywords:** Cities; High-quality development; Development measurement system

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## 1. Introduction

China has experienced a phase of high growth in the past decades, especially the rapid development since the reform and opening up. The main goal of this phase was to pursue growth and rapid expansion of the total economy to improve people's living standards and the country's overall strength. As economic development enters a new stage, people have begun to realize that merely pursuing the speed of economic growth does not fully reflect the quality of development. The report of the 19th CPC National Congress puts forward "adhering to the new development concept", and points out that it is necessary to promote quality change, efficiency change, and power change in economic development. For the first time, the judgment that "China's economy has shifted from a stage of rapid growth to a stage of high-quality development" was clearly made. The Fifth Plenary Session of the Nineteenth Central Committee proposed that during the Fourteenth Five-Year Plan period, China's economic and social development should be based on the theme of promoting high-quality development. The requirement for high-quality development has gradually expanded from the economic sphere to all areas of the economy and society. The evolutionary change in this concept reflects an adjustment in the approach to economic development, emphasizing the quality, effectiveness, and sustainability of economic growth to achieve coordinated development of the economy, society, and the environment.

## 2. Literature review

Economic growth refers to the increase in the total amount of goods and services produced, which is the growth of social wealth. In terms of research on the measurement of economic growth, it is mainly divided into the measurement of growth rate and quality of growth. The measurement of economic growth rate mainly uses gross domestic product (GDP) as the most comprehensive indicator of a country's total economic output. Most of the traditional theories of economic growth focus only on output, ignoring the cost and price of economic growth performance. It is not enough to analyze the problem of economic growth only in terms of the quantity of economic growth, but should also take into account the efficiency of the use of productive and unproductive resources [1]. The quality of economic growth is based on the input-output efficiency of economic growth, which is a comparison between the factor inputs and the total results of economic activity. Influenced by the economic model of Solow and others, scholars usually use total factor productivity (TFP) to measure the quality of economic growth [2]. The current methods of estimating TFP include the algebraic index method, the Solow residual method, the hidden variable method, and the potential output method. Some studies have pointed out that total factor productivity measured by different methods is not comparable [3]. However, the use of a single indicator is too one-sided and limited, as it cannot reveal the whole picture of the quality of regional economic growth [4].

The quality of economic growth and high-quality economic development are closely related and somewhat different concepts. Both evaluate economic development from a qualitative perspective. The emphasis on the importance of quality is an effective improvement on the previous focus on the quantity of economic growth. The difference is that the quality of economic growth emphasizes quality from the perspective of "growth", highlighting the effectiveness of inputs and outputs of growth. On the other hand, high-quality economic development emphasizes quality from the perspective of "development", highlighting the overall quality improvement brought about by the effectiveness of the economy. "Development" is richer than "growth", and the concept of development is constantly evolving. The term socio-economic development is currently used when referring to the most comprehensive concept of development. It covers all aspects from an economic, social, demographic, and environmental perspective [5]. The high-quality development highlights the extent to which the country aims for a qualitative level of development, reflecting the new concepts and requirements of China in the new era.

Due to the complexity of the concept of development and the diversity of influencing factors, most studies will construct a measurement system for the level of high-quality development from multiple levels or aspects when conducting measurement and evaluation. Shi and Ren construct an indicator system from the dimensions of growth fundamentals and social outcomes, but in essence, the system measures the quality of economic growth rather than the quality of economic development [6]. Wei and Li constructed a measurement level system covering 10 aspects such as optimization of economic structure, innovation-driven development, efficient resource allocation, and improvement of market mechanism, and used the entropy weight TOPSIS method to measure the indicators [4]. Ma Ru et al. constructed an indicator system to measure 30 provinces in China based on the connotation of high-quality development from five aspects: high-quality supply, high-quality demand, development efficiency, economic operation, and opening up to the outside world [7]. Yang and Zhang constructed a theoretical model from the perspective of welfare and governance modernization and selected representative basic indicators in each aspect to construct a hierarchical indicator system from five aspects, such as the distribution of economic results, human capital and its distribution, economic efficiency, and stability [8]. Based on the perspectives of innovation, greenness, sharing, efficiency, risk prevention, and control, Zhang Tao built a macro and micro-integrated measurement system containing three levels of enterprises, industries, and regions, expanding the traditional sources of obtaining data and introducing data support at the level of big data [9]. Wang Wan et al. constructed an indicator system that embodies the five development concepts of innovation, coordination, greenness, openness, and sharing, and explored the path of China's high-quality development of the economy by using group analysis [10]. Song Yan et al. constructed an indicator system based on the three dimensions of development dynamics, development process, and development results [11]. They used the synergistic development model to calculate the level of regional high-quality development and the Dagum Gini coefficient to measure the level of regional relative differences. Xiu Zhang et al. measured the Chinese economic quality development index based on the five development concepts and analyzed the regional differences and the sources of the differences by using the layer-by-layer longitudinal and transversal spreading objective weighting method [12]. Li and Wu used AHP hierarchical analysis combined with the CRITIC-entropy method to assign subjective and objective weights to the indicators [13]. Wei et al. used the spatio-temporal entropy weighted TOPSIS evaluation method to complete the measurement of the indicator system of high-quality economic development of cities in Guangdong Province [14]. At the present stage, research mainly focuses on different interpretations of the meaning of high-quality development and the construction of a multi-dimensional and multi-indicator comprehensive system. The differences lie in the selection of specific indicators, how they are related to each other, and the method of treatment adopted when assigning weights.

Assigning weights is key to the evaluation system. Existing comprehensive evaluation index system in terms of weight assignment mainly adopts subjective assignment methods such as expert assignment method and equal weight assignment objective assignment methods such as entropy weight method and CRITIC method, subjective-objective combination assignment method, and so on [4, 6–7, 9–10, 15]. The entropy weight method determines the objective weights based on the size of the variability of the indicators as reflected by the degree of dispersion of the indicators, and the greater the degree of dispersion indicates that the more information is provided, the greater the weights. However, the entropy weight method only considers the degree of dispersion within the indicators, but not the correlation between the indicators, and the CRITIC method incorporates the correlation and volatility between the indicators into the weight allocation decision, but does not take into account the degree of dispersion of the indicators. Based on the connotation of high-quality development and the five new development concepts of "innovation, coordination, greenness, openness, and sharing", this paper will construct a high-quality development indicator system for cities in China, adopt the entropy weight method and the CRITIC method to combine the weights and use the TOPSIS method to evaluate the high-quality development of cities in China.

## 3. Research design

### 3.1. Construction of an indicator system for high-quality urban development

Drawing on the indicator systems constructed in the studies of Zhang Xiu and Huang Jie, and taking into account the availability of measurement indicators, this paper constructs a system of evaluation indicators for high-quality development of the city, which includes 5 level 1 indicators, 15 level 2 indicators, and 33 level 3 indicators (**Table 1**) [12, 16].

**Table 1.** System of indicators for evaluating high-quality urban development

| Level 1 indicators | Level 2 indicators | Level 3 indicators | Indicator measurement | Nature of the indicator |
|---|---|---|---|---|
| Innovations | Innovation output | Patent possession per capita | Ownership of invention patents/resident population | Positive |
| | | Level of new product output | New Product Sales Revenue/GDP of Industrial Enterprises Above Scale | Positive |
| | Innovation efficiency | Product Innovation Transformation Degree | Sales revenue of new products/industrial enterprises' main business income | Positive |
| | Resource allocation efficiency | Labor productivity | GDP/Employment | Positive |
| | | Land productivity | GDP/Regional Area | Positive |
| | | Energy productivity | GDP/Gas Consumption | Positive |
| Co-ordination | Regional coordination | Regional income level | GDP per capita in each region / national GDP per capita | Positive |
| | | Regional Consumption Level | Average Consumption of Residents by Region/National Average Consumption | Positive |
| | Urban-rural coordination | Comparison of Consumption Levels of Urban and Rural Residents | Consumption per Urban Resident / Consumption per Rural Resident | Medium |
| | | Comparison of Income Levels of Urban and Rural Residents | Disposable Income per Urban Resident / Disposable Income per Rural Resident | Medium |
| | Industrial Coordination | Industrial Structure Rationalisation Index | Thiel Index | Negative |
| | | Index of advanced industrial structure | Tertiary Industry Output / Secondary Industry Output | Positive |
| Green | Resource Consumption | Unit Electricity Consumption GDP Output | GDP/Electricity consumption | Positive |
| | Environmental Pollution | Sulfur dioxide emission per unit of GDP | Industrial sulfur dioxide emissions / GDP | Negative |
| | | Unit GDP Wastewater Emission | Industrial wastewater emission/GDP | Negative |
| | | GDP per unit Smoke and Dust Emission | Industrial soot emission/GDP | Negative |
| | Environmental Governance | Municipal wastewater treatment rate | The volume of treated sewage/total sewage discharge | Positive |
| | | Harmless treatment rate of domestic rubbish | Harmless treatment rate of domestic rubbish | Positive |
| | Greening Level | The greening coverage rate of built-up areas | Area covered by greening in built-up areas/area of built-up areas | Positive |
| Openness | Open Environment | Foreign-invested enterprises | Number of foreign-invested enterprises above scale | Positive |
| | Openness | Foreign Investment Dependency Rate | Actual utilization of foreign investment/Regional GDP | Positive |
| | | Foreign Trade Dependency Rate | Total Import and Export/Regional GDP | Positive |
| | Openness Achievement | Foreign exchange earnings from international tourism per capita | Total foreign exchange earnings from international tourism/total population | Positive |
| | | Per capita use of foreign capital | Actual utilization of foreign investment/total population | Positive |

**Table 1 (Continued)**

| Level 1 indicators | Level 2 indicators | Level 3 indicators | Indicator measurement | Nature of the indicator |
|---|---|---|---|---|
| Sharing | Improvement of People's Livelihood | Medical and Health Care Level | Number of beds in medical institutions per 10,000 population | Positive |
| | | Internet penetration rate | Internet penetration rate | Positive |
| | | Education Investment Guarantee | Education Expenditure/GDP | Positive |
| | Quality of Life | Average on-the-job wage | Total wages of all employees/number of all employees | Positive |
| | | Proportion of workers' remuneration | Compensation of laborers/Regional GDP | Positive |
| | | Urban registered unemployment rate | Number of urban registered unemployed (urban employees + real urban registered unemployed) | Negative |
| | | GDP per capita | Per capita GDP | Positive |

The innovation aspect is mainly examined in three dimensions: innovation output, innovation efficiency, and resource allocation efficiency. The dimensions of regional coordination, urban-rural coordination, and industrial coordination are used to constitute the evaluation indicators for the coordination aspect. The green aspect is composed of four evaluation dimensions: resource consumption, environmental pollution, environmental governance, and greening level. The openness aspect mainly examines the city's open environment, degree of openness, and achievements in openness. The sharing aspect mainly focuses on livelihood improvement and quality of life. The calculation of the Thiel index used to measure the rationalization of the industrial structure in **Table 1** can be found in Chunhui Gan's article [17]. A positive indicator means that a larger value of the indicator is better, and vice versa. The two indicators of urban-rural coordination are medium in nature, which means that neither bigger nor smaller is better. There is an optimal value for the urban-rural coordination indicator.

## 3.2. Methodology for measuring indicators of high-quality urban development

This paper adopts the entropy weight method-CRITIC-TOPSIS combination to measure the level of various subsystems and the comprehensive level of high-quality urban development in China. Based on the normalization of the measurement indicators, the entropy weighting method is used to assign weights to the level 3 indicators within each level of indicators. Then the CRITIC method is used to assign weights to the level 2 indicators, and finally, the TOPSIS method is used to quantitatively rank the high-quality development level of each city. Both the entropy weight method and CRITIC method are objective assignment methods, eliminating the human bias that may be brought by subjective assignment. At the same time, the article makes use of the different advantages of the entropy weight method based on the discrete degree of indicators and the CRITIC method based on the comparative strength of the evaluation indicators and the conflict between the indicators, which makes the measurement results more objective and reasonable. The specific implementation steps are as follows.

Step 1: To eliminate the inconsistency of units and orders of magnitude in the measurement of different indicators, the normalization method was used to quantify all level 3 indicators $x_{ij}$ within the system in a dimensionless manner.

Positive Indicator: $$z_{i,j} = \frac{x_{i,j} - \min(x_j)}{\max(x_j) - \min(x_j)} \quad (1)$$

Negative Indicator: $z_{i,j} = \frac{\max(x_j) - x_{i,j}}{\max(x_j) - \min(x_j)}$ (2)

Medium Indicator: $z_{i,j} = 1 - \frac{|x_{i,j} - x_{best}|}{M}$ (3)

Where, $z_{i,j}$ denotes the normalized score of indicator $i$ for city $j$. $x_{i,j}$ denotes the original observation of the indicator $i$ for city $j$. $\max(x_i)$ and $\min(x_i)$ denote the maximum and minimum values, respectively, of the observed values of the indicator i. $x_{best}$ refers to the best value in a set of indicator series, $M = \max\{|x_i\text{-}x_{best}|\}$. The two indicators of urban-rural coordination are used as intermediate-type indicators with the best value $x_{best} = 1$.

Step 2: The entropy weighting method is used within each level 1 indicator to assign weights to the subordinate level 3 indicators, the main process is as follows:

Construct the initial matrix $X(z_{i,j})_{m,n}$ of level 3 indicators within each level 1 indicator separately, where m is the number of cities and $n$ is the number of level 3 indicators within the corresponding level 1 indicator. Then calculate the entropy value $H_i$ of indicator $_i$ according to the following process.

$$H_i = -\frac{1}{lnm}\left(\sum_{j=1}^{m} f_{i,j} . lnf_{i,j}\right) \quad (4)$$

Where, $f_{i,j} = \frac{z_{i,j}}{\sum_{j=1}^{m} z_{i,j}}$, $f_{i,j}$ represents the weight of the indicator $i$ for city $j$. The entropy weight $w_i$ of the $i$-th indicator is calculated as follows:

$$w_i = \frac{1-H_i}{\sum_{i=1}^{n}(1-H_i)} = \frac{1-H_i}{n-\sum_{i=1}^{n} H_i} \quad (5)$$

Step 3: After completing the assignment of the three-level indicators, the composite score $q_{i,j}$ of the level 3 indicators of each city is calculated, where $q_{i,j} = w_i z_{i,j}$. Then the composite scores $q_{i,j}$ of the level 3 indicators are summed up to get $p_{k,j}$ respectively. $p_{k,j}$ denotes the scores of the level 2 indicators of each city before the CRITIC assignment, where $k = (1, 2, \ldots, l)$ and $l$ is the number of level 2 indicators of each city.

Step 4: Weights were assigned to the secondary indicators using the CRITIC method. Standard deviation and correlation coefficient were used to express the variability and conflict of the indicators, respectively.

$$\overline{\rho_k} = \frac{1}{m}\sum_{j=1}^{m} p_{k,j} \quad S_k = \sqrt{\frac{\sum_{j=1}^{m}(p_{k,j}-\bar{p}_k)^2}{m-1}} \quad (6)$$

where $S_k$ denotes the standard deviation of each secondary indicator.

$$R_k = \sum_{g=1}^{l}(1 - u_{g,k}) \quad (7)$$

Where $u_{g,k}$ represents the correlation coefficient between level 2 indicators $g$ and $k$, and $R_k$ represents the correlation coefficient of each secondary indicator.

The CRITIC weight $\xi_k$ for the indicator $k$ is calculated below.

$$\xi_k = (S_k \times R_k)/\sum_{k=1}^{l}(S_k \times R_k) \quad (8)$$

Step 5: The TOPSIS evaluation model was used to calculate the scores of each city's level 2 indicators after the weighting of the CRITIC method. The distance of $m$ cities from the optimal solution and the worst solution were calculated.

$$D_j^+ = \sqrt{\sum_{k=1}^{l} \xi_k (P_k^+ - \rho_{k,j})^2} \quad (9)$$

$$D_j^- = \sqrt{\sum_{k=1}^{l} \xi_k (P_k^- - \rho_{k,j})^2} \quad (10)$$

where $D^+_j$ and $D^-_j$ denote the distance of the city *j* from the optimal and worst solutions, respectively, and $P^+_k$ and $P^-_k$ denote the maximum and minimum values of the level 2 indicators *k*, respectively.

Step 6: The city *j*'s composite score $G_j$ is calculated.

$$G_j = D^-_j / (D^+_j + D^-_j) \quad (11)$$

### 3.3. Data sources

The data are mainly from the China Urban Statistical Yearbook 2022, and some data are from the 2022 Statistical Yearbook of each city, the 2022 National Economic and Social Development Statistical Bulletin, and the CEIC China Economic Database. After removing the sample of cities with a percentage of missing data greater than 25%, 274 cities were finally identified as the study object. Multiple interpolation was used to interpolate for some of the missing data.

## 4. Measurement results

### 4.1. Results of weighting

**Table 2** shows the weights of the hierarchical indicators. According to the hierarchical weighting method adopted in this paper, the sum of the weights of the tertiary indicators in each level 1 indicator is 1, reflecting the importance of each tertiary indicator to the corresponding level 1 indicator. The sum of each second-level indicator gets the corresponding level 1 indicator weight.

Analyzing the weights of the indicators as a whole, the coordination indicator (0.306) has the largest proportion of weight in the high-quality evaluation system, followed closely by the sharing indicator (0.226). The weights of the green indicator (0.148) and the openness indicator (0.149) are comparable and lower, reflecting the fact that Chinese cities have achieved results in both green governance and opening up to the outside world in recent years, and the overall level is balanced. In terms of secondary indicators, regional coordination (0.168), energy consumption (0.110), and people's livelihood improvement (0.110) have a greater impact on the score of high-quality development of cities, and at the same time reflect that there are obvious differences in this aspect of the development of cities.

Weighting analysis of innovation indicators. Patents per capita (0.306) and energy productivity (0.394) account for nearly 70 percent of the weight of the three-level indicators in the innovation dimension, reflecting the importance of invention and innovation as well as the improvement of resource allocation efficiency.

Coordination indicator weight analysis. Regional income level (0.272), regional consumption level (0.287), and industrial structure advanced index (0.251) are assigned high weights in the coordination dimension. The city's economic development and the improvement of consumption capacity remain an important foundation for the city's high-quality development. Enhancing the degree of industrial sophistication and continuing to vigorously develop the service industry also has an important impact on the city's high-quality development.

Weighting analysis of green indicators. GDP output per unit of electricity consumption occupies 80% of the weight of the third-level indicators in the green dimension, reflecting the great differences in energy consumption among cities. It shows that the efficiency of inputs and outputs in China's cities in the process of high-quality development is still low. The situation of high input and high energy consumption still needs to be fundamentally improved.

Weighting analysis of openness indicators. The weights of the three-level indicators in the openness dimension are relatively balanced, showing that cities have achieved remarkable results in opening up to each other and using foreign investment.

Sharing indicator weighting analysis. Increasing the city's investment in education (0.297) and further enhancing the popularity of the Internet (0.128) can help improve the level of people's livelihood. Further enhancement of the sharing level of the people in the city will realize the goal of high-level development of the city.

**Table 2.** Indicator weights

| Level 1 indicators | Level 2 indicators | Weights | Level 3 indicators | Weights |
|---|---|---|---|---|
| Innovation (0.194) | Innovation output | 0.079 | Patent possession per capita | 0.306 |
| | | | Level of new product output | 0.112 |
| | Innovation efficiency | 0.028 | Product innovation transformation degree | 0.074 |
| | Resource allocation efficiency | 0.087 | Labor productivity | 0.055 |
| | | | Land productivity | 0.059 |
| | | | Energy productivity | 0.394 |
| Coordination (0.306) | Regional coordination | 0.168 | Regional income level | 0.272 |
| | | | Regional consumption level | 0.287 |
| | Urban-rural coordination | 0.054 | Comparison of consumption levels of urban and rural residents | 0.077 |
| | | | Comparison of income levels of urban and rural residents | 0.073 |
| | Industrial coordination | 0.085 | Industrial structure rationalization index | 0.040 |
| | | | Index of advanced industrial structure | 0.251 |
| Green (0.148) | Energy consumption | 0.110 | Unit electricity consumption GDP output | 0.819 |
| | Environmental pollution | 0.010 | Sulfur dioxide emission per unit of GDP | 0.023 |
| | | | Unit GDP wastewater emission | 0.019 |
| | | | GDP per unit smoke and dust emission | 0.022 |
| | Environmental governance | 0.006 | Municipal wastewater treatment rate | 0.028 |
| | | | Harmless treatment rate of domestic rubbish | 0.012 |
| | Greening level | 0.022 | Greening coverage rate of built-up areas | 0.078 |
| Openness (0.149) | Open environment | 0.043 | Foreign-invested enterprises above scale | 0.258 |
| | Openness | 0.040 | Dependence on foreign investment | 0.193 |
| | | | Dependence on foreign trade | 0.113 |
| | Openness achievement | 0.065 | Per capita foreign exchange earnings from international tourism | 0.217 |
| | | | Per capita use of foreign capital | 0.219 |
| Sharing (0.203) | Improvement of people's livelihood | 0.110 | Medical and healthcare level | 0.093 |
| | | | Internet penetration rate | 0.128 |
| | | | Education investment guarantee | 0.297 |
| | Quality of life | 0.093 | Average on-the-job wage | 0.036 |
| | | | Proportion of workers' remuneration | 0.097 |
| | | | Urban registered unemployment rate | 0.080 |
| | | | GDP per capita | 0.270 |

## 4.2. Comprehensive score of cities

The average score of the comprehensive score of high-quality development of cities nationwide is 0.1822, with the highest score of 0.4488 and the lowest score of 0.0911. **Table 3** shows the top 20 cities in China with the comprehensive score of the level of high-quality development of cities. Beijing, Shanghai, and Shenzhen are in the top three, followed by Hangzhou, Suzhou, Nanjing, Zhuhai, Guangzhou, Wuxi, and Zhoushan. From the comprehensive score, the top 20 cities are also clearly separated, with Beijing and Shanghai in the leading group. Shenzhen, Hangzhou, and Suzhou are in the second tier. In terms of city distribution, the top 20 cities are mostly in the Yangtze River Delta, indicating that the Yangtze River Delta as a whole has a higher level of high-quality urban development.

**Table 3.** Top 20 cities in terms of overall score for high-quality development

| Ranking | City name | Overall score | Ranking | City name | Overall score |
|---|---|---|---|---|---|
| 1 | Beijing | 0.4488 | 11 | Ningbo | 0.3687 |
| 2 | Shanghai | 0.4309 | 12 | Ordos | 0.3547 |
| 3 | Shenzhen | 0.4173 | 13 | Changzhou | 0.3405 |
| 4 | Hangzhou | 0.4078 | 14 | Xiamen | 0.3394 |
| 5 | Suzhou | 0.4002 | 15 | Changsha | 0.3351 |
| 6 | Nanjing | 0.3943 | 16 | Foshan | 0.3293 |
| 7 | Zhuhai | 0.3929 | 17 | Jiaxing | 0.3286 |
| 8 | Guangzhou | 0.3838 | 18 | Shaoxing | 0.3202 |
| 9 | Wuxi | 0.3828 | 19 | Qingdao | 0.3201 |
| 10 | Zhoushan | 0.3769 | 20 | Wuhan | 0.3186 |

## 5. Conclusion

The overall level of high-quality development among China’s cities still differs greatly, and the phenomenon of imbalance still exists. At the same time, the regional concentration effect is more obvious, except for Beijing, Shanghai, Guangzhou, and Shenzhen, the top 20 cities are mainly concentrated in the Yangtze River Delta region. From the perspective of the five development concepts, China has achieved more balanced results in the green and open development dimension. The difference in the performance of cities in the green and openness dimensions is smaller than the other three dimensions. In the future, high-quality urban development should pay more attention to the improvement of cities in terms of the level of coordination and sharing. Improving regional coordination and people’s livelihoods will have an important and positive impact on high-quality urban development.

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## References


[1] Kamaev BD, 1983, Speed and Quality of Economic Growth. Hubei People's Publishing House, Wuhan.

[2] Solow RM, A Contribution to the Theory of Economic Growth. Quarterly Journal of Economics, 1983(1): 65–94.

[3] Yi F, Li Y, 2003, Theoretical Considerations on China's Economic Growth and Total Factor Productivity. Economic Research, 2003(8): 8.

[4] Wei M, Li SH, 2018, A Study on Measuring the Level of High-quality Development of China's Economy in the New Era. Research on Quantitative Economics and Technical Economics, 35(11): 3–20.

[5] Gonzalez MS, Rivero YR, Valladares ORD, 2020, Considerations on Local Development. Revista Universidad Y Sociedad, 12(4): 309–315.

[6] Shi B, Ren BP, 2018, Measurement and Analysis of High-quality Development of China's Interprovincial Economy. Economic Issues 2018(04): 1–6.

[7] Ma R, Luo H, Wang HW, et al., 2019, Research on Evaluation Index System and Measurement of High-quality Development of Chinese Regional Economy. China Soft Science, 2019(7): 8.

[8] Yang YW, Zhang P, 2021, The Logic, Measurement and Governance of China's High-Quality Economic Development. Economic Research, 56(1): 26–42.

[9] Zhang T, 2020, Research on the Theoretical Interpretation and Measurement Method of High-quality Development. Research on Quantitative and Technical Economics, 37(05): 23–43.

[10] Wang W, Fan CP, Qin, YG, 2022, Construction and Empirical Measurement of Economic High-quality Development Indicator System. Statistics and Decision Making, 38(03): 124–128.

[11] Yan S, Wang QY, Zhang L, et al., 2024, Evaluation of China's High-Quality Development Level and Analysis of Spatial and Temporal Characteristics. Statistics and Decision Making, 40(02): 111–117.

[12] Xiu Z, Zhang YF, Zhang ZG, 2024, The Level of High-quality Development of China's Economy: Measurement, Spatial and Temporal Evolution, and Dynamic Spatial Convergence. Explorations in Economic Issues 2024(01): 15–37.

[13] Li SY, Wu CC, 2023, Research on Evaluation Indicator System and Measurement of High-Quality Development in Qinghai. Qinghai Social Science 2023(03): 40–49.

[14] Wei YH, Wang BS, Zhu L, 2023, Measurement of High-Quality Economic Development based on Spatio-Temporal Entropy Weighted TOPSIS Evaluation Method: A Case Study of Guangdong Province. Statistics and Decision Making, 39(08): 91–95.

[15] Zhang Z, Liu XM, 2019, Construction and Measurement of Evaluation System for High-Quality Economic Development of 15 Sub-provincial Cities in China. New Era Exploration of Economic Issues, 2019(06): 20–31 + 70.

[16] Huang J, Lu HY, Sun ZM, 2024, Sources of Variation and Mechanisms of High-quality Development in China's Economy. Statistics and Decision Making, 40(03): 118–122.

[17] Gan CH, Zheng RG, Yu DF, 2011, The Impact of Industrial Structure Change on Economic Growth and Volatility in China. Economic Research, 2011(5): 14.