Study on the Factors Influencing the High-Quality Economic Development of Beijing

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Abstract: *The 19th National Congress of the CPC first introduced the concept of high-quality development. This paper constructs an evaluation system of Beijing's high-quality economic development based on relevant data from 2016 to 2020, which contains five dimensions: overall economic profile, innovation capability, openness, urban construction and sustainability, then integrates the entropy method and CRITIC weighting method to determine the weights. From 2016 to 2020, the index of Beijing's high-quality economic development increased from 0.1677 to 0.1808, and the indexes of all dimensions except sustainability increased. The possible reason for the decline in the sustainability index is the lack of attention to ecological resource protection. At last, this paper concludes with policy recommendations,that is the government should: stabilize economic fundamentals and optimize the industrial structure; promote regional synergistic development by taking advantage of resource concentration; introduce new policies to expand the degree of openness; steadily promote the decentralization of non-capital functions and focus on sustainable development.*

Keywords: *High-quality economic development; Entropy method; CRITIC Weighting method; Sustainability*

1. Introduction

In October 2017, the concept of "high-quality development" was formally introduced for the first time at the 19th National Congress of the CPC, indicating that the purpose of China's economic development began to shift from "quantity first" to "quality first". The meeting pointed out that, as the main contradiction in China's society has changed, the focus of economic work has shifted to high-quality development, which is the urgent thing to do now. At the two sessions in 2021, president Xi Jinping repeatedly emphasized "high-quality development", pointing out that it is necessary to adhere to the priority of ecology and the well-being of people's livelihood. At the current stage, high-quality development has become an inevitable requirement for building China into a modern socialist country, and the new era is bound to be an era of high-quality development.

2. Literature review

As for the interpretation of the connotation of high-quality development, He (2018) believes that to promote high-quality development, an innovation-led, coordinated developing, unified and open, resource-saving and environment-friendly market economic system should be established [1]. Liu (2018) believes that in order to achieve high-quality development, the study should focus on the innovation, efficiency, sharing, and environmental protection [2]. In addition, Zhang (2018) argues that high-quality development requires completing the transformation from high-rate growth to high-quality development as soon as possible [3]. In short, the majority of scholars believe that high-quality development should fully reflect and expand the five concepts of development of "innovation, coordination, green, openness and sharing". By contrast, some scholars interpret the connotation from different perspectives.

As for indicators, existing studies mainly focus on the five concepts of development to build an evaluation system, such as Liu and Gong (2021) [4]. In addition, Li et al. (2019) constructed the evaluation system from five dimensions: economic vitality, green development, innovation and efficiency, social harmony, and living standards [5]. Shi and Han (2020) measure high-quality development of the real economy based on the fundamentals of development and socio-ecological outcomes [6]. In short, the current researches either completely copies the five concepts of

development with little innovation, or completely finds another way to examine. However, the epidemic since 2020 have huge impacts on Beijing's economy, such as a significant slowdown in GDP growth and a significant increase in government healthcare spending. If comparisons are to be made across time in the same region, we need to exclude these indicators to measure the status-quo more precisely.

Thus, this paper conducts a practical examination of Beijing based on the connotation of high-quality economic development, effectively screens appropriate indicators in the current era, and integrates the entropy method and CRITIC weighting method together to determine the weights. Based on the above weights, we calculate the score of Beijing's high-quality economic development from 2016 to 2020, and try to analyze the reasons for the change of the score and give policy suggestions.

The possible innovations of this paper are as follows: first, this paper makes its own interpretation of the connotation of high-quality development based on the previous studies. High-quality development is a new development concept that includes five dimensions of the city's, overall economic profile, innovation capability, openness, urban construction and sustainability. Secondly, based on the background of the times and Beijing's economic development plan, this paper properly selects indicators to construct the evaluation system, calculates the index of high-quality development of Beijing's economy from 2016 to 2020 with each dimension index and makes a vertical comparison. Thirdly, this paper makes an innovation in the method of determining the weights, and integrates the entropy method and CRITIC weight method to determine the weights of each index, so that the weights are more scientific.

3. Model construction and empirical analysis

3.1 Data selection

Table 1: Evaluation System of high-quality economic development in Beijing and the weight of indicators

Dimensions	Indicators	Notes	c_j
Overall economic profile 17.94%	GDP per capita (yuan)	Positive	0.0238
	CPI (%)	Negative	0.0050
	Engel coefficient (%)	Negative	0.0242
	Social labor productivity(yuan/person)	Positive	0.0225
	Marketization Index	Positive	0.0192
	Value added of secondary industry as a percentage of GDP (%)	Positive	0.0222
	Value added of tertiary industry as a percentage of GDP (%)	Positive	0.0050
	Value added of real estate industry as a percentage of GDP (%)	Negative	0.0335
Innovation capability 17.57%	The proportion of R&D expenditure to GDP (%)	Positive	0.0251
	Local fiscal government expenditure on science and technology (100 million yuan)	Positive	0.0263
	Number of patents and patents for invention granted (piece)	Positive	0.0388
	Total value of technical contract (100 million yuan)	Positive	0.0320
	Revenue of enterprises in Zhongguancun National Innovation Demonstration Zone (100 million yuan)	Positive	0.0300
Openness 24.42%	Total value of import and export (100 million yuan)	Positive	0.0317
	Total value of import and export trade of goods (10K USD)	Positive	0.0339
	The amount of actual utilization of FDI (100 million USD)	Positive	0.0724
	Total profit of national-level development zones (100 million yuan)	Positive	0.0440
	Registered capital of foreign-invested enterprises (million USD)	Positive	0.0295
Urban construction 9.40%	Length of rail transit operating lines (km)	Positive	0.0233
	Urban greening coverage rate (%)	Positive	0.0075
	Number of hospital beds per 1,000 residents (pcs/thousand people)	Positive	0.0132
	Length of roads per 10,000 residents (pcs/100 thousand people)	Positive	0.0100
	Number of museums per 100,000 residents (pcs/100 thousand people)	Positive	0.0274
Sustainability 30.67%	Annual average concentration of PM2.5(μg/m3)	Negative	0.0518
	NOx emissions (10 thousand ton)	Negative	0.0464
	Energy consumption reduction rate of 10,000 yuan regional GDP (%)	Negative	0.0447
	Water resources per capita (cubic meter)	Positive	0.0497
	Harmless disposal rate of domestic waste (%)	Positive	0
	Natural growth rate of resident population (%)	Negative	0.0561
	Motor vehicle ownership (10 thousand unit)	Negative	0.0170

All the data were obtained from the Beijing Statistical Yearbook and China Statistical Yearbook from 2017 to 2021, which contain statistics from 2016 to 2020.

Referring to Tu et al. (2021) [7], Fang et al. (2022) [8], Wang and Yao (2021)[9] and Li et al. (2019)[5], this paper constructs a system of indicators from five major aspects: overall economic profile, innovation capability, openness, urban construction and sustainability, which includes 30 secondary indicators. Details of the indicators are shown in Table 1. It is worth noting that, considering the basic policy of "Houses are for living in and not for speculative investment", value added of real estate industry as a percentage of GDP is taken as a negative indicator in this paper. Considering the high development level of Beijing's economy, the natural growth rate of resident population and motor vehicle ownership are considered as negative indicators in this paper.

3.2 Weight determining

After selecting the indicators and finding the relevant data, the next step is to determine the weights of each indicator. In this paper, the entropy method and CRITIC weighting method are used to determine the weights together, and the calculation steps of the two methods are as follows.

3.2.1 Entropy method

The entropy method is the most commonly used objective weighting method, and the specific steps are to first standardize the data, then calculate the proportion and information entropy of each indicator based on the standardized data, and then calculate the coefficient of each variation and their weights $a_j (j = 1, 2, ... n)$. All the above steps were be done with SPSS.

3.2.2 CRITIC weighting method

CRITIC weighting method is also an objective weighting method, which is based on data volatility and the conflict between indicators in calculating process. The specific operation procedure of this method is as follows.

Normalization Processing

Denote the original data as $x_{ij} (i = 1, 2, ... m, j = 1, 2, ... n)$,

For positive indicators,

$$y_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})}$$

(1)

For negative indicators,

$$y_{ij} = \frac{\max(x_{ij}) - x_{ij}}{\max(x_{ij}) - \min(x_{ij})}$$

(1)

(a) Calculating the amount of information

The amount of information contained in the j th indicator is

$$C_j = \delta_j \sum_{i=1}^{n} (1 - r_{ij})$$

(2)

Where r_{ij} is the correlation coefficient between the indicators i and j, δ_j is the standard deviation of the j th indicator.

(b) Calculating the weights

Based on the information content of the j th indicator, its weight equals to

(3)

$$b_j = \frac{C_j}{\sum_{j=1}^{n} C_j}$$

After using entropy method to calculate the weights $a_j(j=1,2,...30)$ and CRITIC weighting method to obtain the weights $b_j(j=1,2,...30)$, we take the geometric mean of the indicator weights calculated by the two methods and retain 4 decimals. That is, the weight of each indicator equals to $c_j = \sqrt{a_j b_j}(j=1,2,...30)$, which is shown below.

3.3 Analysis of Beijing's high-quality economic development index
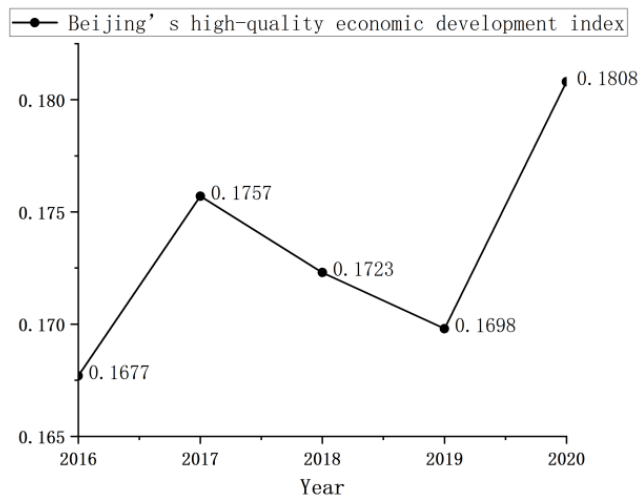

Figure 1: Beijing Economic Quality Development Index 2016-2020

$$U_j = \sum_{j=1}^{n} y_{ij} a_j$$

Based on the weight of each indicator, we use the formula to calculate the index of high-quality economic development in Beijing.

Viewing from Figure 1, we can see that Beijing's High-Quality Economic Development Index spiraled upward with an average annual growth rate of 1.548% from 2016 to 2020. From 2019 to 2020, the index improves by 6.48%, far exceeding the average annual growth rate, which shows that the level of Beijing's high-quality economic development has improved to a greater extent in the past two years. Then this paper will analyze the changes of each dimensional index of Beijing's high quality economic development.

As can be seen in Figure 2, the overall economic profile index improved from 0.0304 to 0.0316 from 2016 to 2020, with an average annual growth rate of 0.788%. Maintaining a stable overall economic profile is a necessary condition for high-quality economic development, as making people live and work in peace and contentment is the ultimate goal of high-quality economic development. Several of these indicators measure the quality of people's life.

The Innovation Capability Index improved from 0.0246 to 0.0365, with an average annual growth rate of 9.70%. In recent years, the government has continued to increase R&D investment and the expenditure on science and technology, introduce high-quality talents, and reduce taxes for innovative operations of SMEs. In order to further improve the quantity and quality of innovation results, it is not advisable to rush to success, but should dedicate to increase innovation investment and encouraging small and micro enterprises to come up with innovative business ideas.
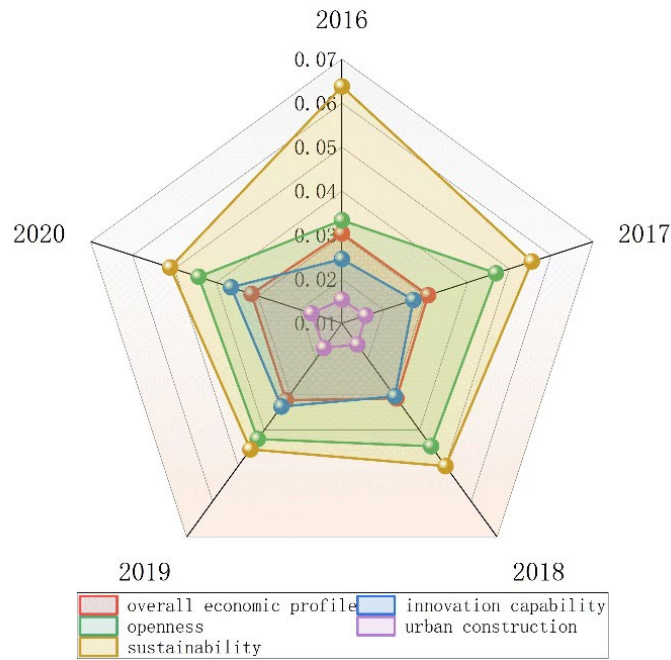
Figure 2: Radar chart for each dimensional index, 2016-2020

The openness index improved from 0.0334 to 0.0442 with an average annual growth rate of 6.46%, however, in 2017-2019, the openness index decreased by 9.16%. The possible reason is the government do not introduce important policies to attract investment; a group of second-tier and third-tier cities with strong policy support are more likely to gain the favor of foreign companies. In order to further improve the openness of Beijing, the government has been pushing forward the construction of "Two Zones" with high standards.

The urban construction index improved from 0.0154 to 0.0173, with an average annual growth rate of 2.46%. Currently, the government is accelerating the construction of various infrastructures in order to improve the city's appearance and benefit people. For example, the Jingli Expressway and Jingzhang High-speed Railway are promoting the development of cultural and tourism industries in the areas along the route contributing to 2022 Winter Olympics.

In particular, from 2016 to 2020, the sustainability index decreases from 0.0638 to 0.0510, with an average annual decrease of 4%. In terms of specific indicators, water resources per capital decreased steadily, which shows that Beijing is currently paying little attention to ecological resource consumption. In the next stage, the government should dedicate to curb the waste of ecological resources, insisting on "taking the carrying capacity of resources and environment as a hard constraint, determining the upper limit of total population, and stipulating the ecological red line and urban exploiting boundary [10]".

4. Conclusion and Suggestions

This paper constructs an evaluation system of Beijing's high-quality economic development from five dimensions: overall economic profile, innovation capability, openness, urban construction and sustainability, comprehensively applies the entropy method and CRITIC weighting method to determine the weights of each index, then calculates the index from 2016 to 2020 and conducts inter-dimensional comparisons. Over the past five years, the index has spiraled upward, rising from 0.1677 to 0.1808, and the index of sustainability has decreased by 20%. Except for sustainability, all the indexes enhanced. Based on the above findings, this paper makes the following suggestions.

4.1 Stabilize economic fundamentals and optimize industrial structure

Against the background of the normalization of the epidemic, safeguarding people's livelihood should be considered as the primary goal of the government, despite the great pressure on local finances. The government should overcome difficulties to stabilize economic fundamentals, make every effort to stabilize prices and preserve employment, and improve people's sense of well-being and

access. The government should also pay close attention to the changes in industrial structure, focus on improving the construction of service projects, and accelerate the development of emerging industries and talents training. Finally, strictly implement the policy of restricting housing purchases and loans should be continued, such as controlling the house price in hotspot areas.

4.2 Promote regional synergistic development by utilizing resource concentration

To further enhance the quality of economic development, promoting region-wide development is urgently required. As an international innovation center of science and technology, Beijing should proactively take advantage of the concentration of innovative resources to promote the construction of a sophisticated industrial system represented by high-end manufacturing, cutting-edged information technology etc.. After the advancement, Beijing ought to radiate the outcome to neighboring cities, helping to achieve the synergistic development of Beijing, Tianjin and Hebei as soon as possible.

4.3 Introduce new policies to expand the degree of openness

To mitigate the impact of the epidemic on openness, the government can target the introduction of industries with strong demand, such as medicine and vaccines, which will also help to supplement the materials needed during the epidemic. In addition, the government should further strengthen the construction of the main platform of "three cities and one district" and reduce taxes to attract investments and thus expand the degree of openness. Improving infrastructure and residential facilities to create a balanced and well-structured industrial park is also helpful, which can reduce commuting costs for workers and increase the attractiveness of the park to employees, thus urging companies to expand their operation scales.

4.4 Steadily promote the decentralization of non-capital functions and focus on sustainable development

Beijing should insist on a combination of strictly controlling the increment and decongesting the stock while deconstructing non-capital functions, controlling the population and motor vehicle ownership in the core area, while relocating industries that do not conform to the capital's role timely. At the same time, we should actively respond to various climate challenges and strive to take the lead in achieving the goal of "emission peak and carbon neutrality". The government should also consciously build a clear and effective property rights system for ecological resources.

It is believed that with the implementation of the above policies, even if the epidemic cannot be ended in the near future, the settlement of pharmaceutical companies will certainly enhance the level of openness and attract talents to settle in the city, thus limiting the adverse effects of the epidemic on high-quality development of Beijing's economy. In addition, sustainability of Beijing will be enhanced with the increased protection of ecological resources and the further control of pollutants.

In summary, the policy recommendations are beneficial to each dimension of high-quality economic development, especially for openness and sustainability, and alleviate the current "big city disease" in Beijing. After Beijing's high quality economic development has achieved certain results, the level of the North China Plain will be promoted in a concerted manner with the deepening of the Beijing-Tianjin-Hebei integrated development strategy, and the common prosperity will be truly achieved.

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