Study on the Coupling and Coordinating Relationship between New Urbanization and Industrialization in Henan Province

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Abstract

New urbanization and new industrialization complement each other and are closely related. They promote and support each other. As a traditional agricultural province, Henan Province has a relatively weak foundation for urbanization and industrialization. It is of great significance to vigorously promote the development of the two and improve the degree of coupling and coordination to better improve the people's quality of life and high-quality economic development. By selecting 17 secondary indicators from the three aspects of economy, society and environment of Henan Province, and calculating the combined weight of each indicator by using entropy weight method and analytic hierarchy process, it is concluded that the coupling and coordination relationship between new urbanization and industrialization in Henan Province from serious imbalance to barely coordination from 2016 to 2020, and presents a sustainable and good development trend, which provides a useful reference for Henan Province to formulate new urbanization and industrialization development policies.

Keywords

Henan Province; New Urbanization; New Industrialization; Coupling and Coordination.

1. Introduction

New urbanization and new industrialization are the only way for China to realize socialist modernization. Compared with urbanization in the traditional sense, "new" focuses on the core position of "people", emphasizing economic intensification, industrial efficiency, integration of urban and rural areas and ecological friendliness [1]. The "new" concept of new industrialization emphasizes the implementation of the five development concepts of innovation, coordination, green, openness and sharing. New urbanization and new industrialization complement each other and are closely related. They promote and support each other.

Since the 18th National Congress of the Communist Party of China, China has started the process of new urbanization and new industrialization. The level and quality of urbanization in China have been significantly improved, the integration of urban and rural areas has been continuously promoted, and the industrial economic structure has been continuously adjusted, transformed and upgraded, which has become an important driving force to promote China's modernization. As a major agricultural province, Henan Province adheres to the new urbanization leading industrialization, coordinates the relationship between agriculture and industry, and between cities and rural areas, and takes a scientific, coordinated and sustainable development path. The research on the coupling and coordination relationship between new urbanization and industrialization in Henan Province and province can have a deeper understanding of the coordination of the development of new urbanization and industrialization in Henan Province, provide useful guidance for the coordinated development

of new urbanization and industrialization in Henan Province, and better promote our province to advance towards the goal of socialist modernization.

2. Research Status

New urbanization and industrialization play a vital role in regional economic and social development. New urbanization can accelerate the development of new industrialization, and new industrialization can facilitate the construction of new urbanization. The coordinated development of the two has important significance for promoting social modernization. Zhang Xiao (2018) took Xuzhou as an example, and found that the new type of urbanization and industrialization coupling co scheduling showed a steady upward trend, but the two played a significant role in promoting in the short term, while the positive role of the two gradually weakened in the long term [2]. Zhang Huihui et al. (2021) believe that the positive interaction between urbanization and industrialization in China is increasing [3]. Li Su and Dong Guoling (2021) believe that there is a positive promotion effect between new urbanization and industrialization, which is mainly manifested in the strong promotion effect of new urbanization on new industrialization, and the contribution of new industrialization to new urbanization is relatively low [4]. Liu Fangyuan et al. (2019), Zuo Pengfei et al. (2020), Ding Cuicui et al. (2020) and Lai Yongjian et al. (2022) respectively studied the development relationship and coupling co scheduling between new urbanization and industrialization and informatization green agricultural modernization, Internet development, Rural Revitalization level and industrial environmental efficiency [5-8].

On the road of exploring the coordinated promotion of new urbanization and new industrialization, Henan province insists on proceeding from the actual situation of the province, exploring the new urbanization to lead the new industrialization and agricultural modernization, and realizing the coordinated development of new urbanization, industrialization and agricultural modernization. Li Songhua and Gao Ke (2019), Xu Weihua (2019) and Wang Qiaoling (2020) conducted research based on the data of Henan Province from 1998 to 2015, 2013-2017 and 2008-2017 respectively. They all believed that the coordinated development level of new urbanization and industrialization in Henan Province was constantly improved and optimized. In addition, the research of Li Songhua and Gao Ke believed that although the interaction between the two was improved from the serious disharmony in 1998 to the high-quality coordination in 2015, However, this coordination relationship is unstable. Xu Weihua's research believes that the development of new industrialization lags behind the development of new urbanization [9-11]. From the research results of the above scholars, it can be found that the coordinated development level of new urbanization and new industrialization in Henan Province is constantly improving, but there are still problems such as insufficient industrial development, massive labor spillover, lack of urbanization development power, and unstable coordinated development level. Based on the original research, this paper optimizes the evaluation index system of coupled and coordinated development, and analyzes the level of coordinated development of "Two modernizations" in Henan Province in 2021, and puts forward relevant development paths, in order to provide useful reference for the coordinated development of "two modernizations" in Henan Province.

3. Construction of the Indicator System for the Coupling Coordination Level if New Urbanization and Industrialization in Henan Province

3.1. Index Selection

Based on the current situation of economic development and the development of new urbanization and industrialization in Henan Province, the evaluation indicators of new

urbanization and industrialization are selected from the three aspects of economy, society and environment, as shown in Figure 1.

Table 1. Evaluation indicators of new urbanization and industrialization

Target layer	Functional layer	Indicator layer	Entropy weight	AHP weight	Combination weight
Urbanization	Economics	Proportion of secondary and tertiary industries	0.0540	0.2928	0.0789
		Per capita disposable income	0.0532	0.2577	0.0735
		Total fiscal revenue	0.0527	0.1744	0.0602
		Growth rate of fixed assets investment	0.0531	0.0600	0.0354
		Water penetration rate	0.0513	0.1076	0.0466
		Gas penetration rate	0.0509	0.1076	0.0464
	Society	Population density	0.0594	0.0442	0.0322
		Library collection	0.0566	0.2187	0.0698
		Urban and rural Engel coefficient	0.0744	0.1362	0.0632
		Per capita Road	0.0523	0.0916	0.0434
		Per capita Park green area	0.0523	0.1425	0.0542
		Urbanization rate	0.0538	0.2434	0.0718
		Number of doctors	0.0554	0.0617	0.0367
		Number of beds	0.0538	0.0618	0.0362
	Environment	Sewage treatment rate	0.0531	0.1833	0.0619
		Green coverage	0.0618	0.5000	0.1103
		Domestic waste treatment rate	0.0505	0.3167	0.0794
Industrialization	Economics	Proportion of export volume	0.0614	0.1697	0.0592
		Per capita GDP	0.0584	0.0964	0.0435
		Internal expenditure of R & D funds	0.0577	0.1928	0.0611
		Sales revenue of new products	0.0600	0.0887	0.0423
		Comprehensive energy consumption of industries above designated scale	0.0640	0.2428	0.0723
		Industrial water consumption above designated scale	0.0671	0.2095	0.0687
	Society	Unemployment registration rate	0.0617	0.4566	0.0973

Target layer	Functional layer	Indicator layer	Entropy weight	AHP weight	Combination weight
		Number of colleges and Universities	0.0600	0.2020	0.0638
		Number of authorized patents	0.0616	0.1202	0.0499
		Industrial valid invention patent	0.0608	0.2212	0.0672
	Environment	Comprehensive energy consumption per 10000-yuan output value	0.0579	0.2616	0.0713
		Wastewater discharge	0.0671	0.1701	0.0619
		Chemical oxygen demand	0.0683	0.0872	0.0447
		Ammonia nitrogen emission	0.0628	0.2082	0.0663
		Sulfur dioxide emissions	0.0693	0.1449	0.0581
		NOx emissions	0.0647	0.0528	0.0339
		Particulate emissions	0.0585	0.0751	0.0384

3.2. Data Source

The data are extracted from the statistical yearbook of Henan Province from 2016 to 2021 and the statistical bulletin of national economic and social development from 2015 to 2020.

3.3. Research Methods

3.3.1. AHP-entropy Weight Method

Through the establishment of evaluation index system for the relevant data of the coupling and coordination relationship between new urbanization and industrialization in Henan Province, we strive to seek more scientific evaluation results from a more objective perspective. Subjective weighting method (AHP) has more advantages than objective weighting method (entropy weighting method) in determining weights according to the intention of decision makers, but its objectivity is relatively poor and its subjectivity is relatively strong; The objective weighting method has objective advantages, but it cannot reflect the importance of different indicators by the decision-makers, and it will have certain weight and the degree opposite to the actual indicators.

In view of the advantages and disadvantages of the subjective and objective weighting methods, this paper tries to control the subjective randomness within a certain range and realize the scientific index weighting fairness in the subjective and objective weighting, that is, the combined weighting method combining the subjective weighting method (AHP) and the objective weighting method (entropy weighting method) is adopted to make up for the shortcomings brought by the single weighting, achieve the internal unity of the subjective and objective, and the evaluation results are true, scientific and credible.

Comprehensive weight Wj of indicators in combination weighting method:

$$W_j = \frac{\sqrt{\alpha_j * \beta_j}}{\sum_{j=1}^{n} \sqrt{\alpha_j * \beta_j}}$$

α_j -- weight calculated by analytic hierarchy process;

β_j -- weight calculated by entropy method.

3.3.2. Coordinated Development Model

The coordinated development model consists of two parts: CO scheduling and coordinated development index.

(1) Coordination degree C is:

$$C=[\frac{X*Y}{(\frac{X+Y}{2})^2}]^k$$

X -- Score of coupling and coordinated development level of new urbanization;

Y -- Score of new industrialization coupling coordinated development level;

K=2

Wherein, the X and Y values are the product of the normalized index data and the combination weight.

(2) Coordinated development index T is:

$$T=\sqrt{\alpha X + \beta Y}$$

α=β= 0.5; X and Y are described above.

(3) Coordinated development model

$$D=C*T$$

As shown in Table 1, the coordination degree is divided from low to high into seven grades for evaluation: severe disorder, severe disorder, disorder, barely coordinated, moderate coordinated, good coordinated and high-quality coordinated.

Table 2. Coupling coordination level

Coordination level	Severe disorder	Severe disorder	Imbalance	Reluctantly coordinate	Moderate coordination	Good coordination	High quality coordination
Evaluation value	0-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7	0.7-0.8	>0.8

4. Results and Analysis

The coordinated development of new urbanization and industrialization is an important sign of the improvement of people's living quality, the acceleration of industrial development, and the continuous improvement of the environment. The coordinated development of the two plays an important role in promoting the high-quality development of China's economy. In the study on the coupling and coordination relationship between new urbanization and industrialization in Henan Province, 17 secondary indicators are selected from the three aspects of economy, society and environment. The entropy weight method and analytic hierarchy process are used to calculate the combined weight of each indicator (see Table 1), and then the relevant data of the coordinated development model are obtained (see Table 3).

It can be seen from table 3 that the score of the coupling and coordinated development level of new urbanization in Henan Province has continued to increase from 2016 to 2020, which also shows that the construction of new urbanization in Henan Province has made remarkable achievements and steadily improved; The score of Henan Province's new industrialization coupling and coordinated development level shows an overall growth trend, but it shows a downward trend in 2019 and rapidly rises again in 2020. From the score results of the coordinated development model, the development of new industrialization and new urbanization in Henan Province presents a long-term uncoordinated phenomenon, reaching a barely coordinated level in 2020, which is inconsistent with Wang Qiaoling's view that the coordination of new urbanization and new industrialization in Henan has reached high-quality

coordination in 2017 [11] and the good coordination obtained by Xu Weihua's research [10]. However, it can be found that the development of new industrialization and new urbanization in Henan province continues to improve, and the degree of coupling and coordination continues to improve.

Table 3. Development of new industrialization and new urbanization in Henan Province from 2016 to 2020

	X	Y	C	T	D	grade
2016	0.0700	0.1061	0.9175	0.2968	0.2723	Severe disorder
2017	0.1616	0.1674	0.9994	0.4056	0.4053	Imbalance
2018	0.2010	0.1968	0.9998	0.4460	0.4459	Imbalance
2019	0.2548	0.1719	0.9259	0.4619	0.4277	Imbalance
2020	0.3128	0.3577	0.9911	0.5790	0.5738	Reluctantly coordinate

As a traditional agricultural province, Henan Province has a relatively weak foundation for urbanization and industrialization, scattered industrial development and lack of core competitiveness. Therefore, on the one hand, we should deepen the reform, coordinate and coordinate the relations between all parties, do a good job in planning and guidance, and promote the coupled and coordinated development of new urbanization and industrialization through continuous promotion of systematic supporting reforms; On the other hand, we should adhere to the concentrated development, promote the development of industrial clusters and characteristic industrial parks, promote industrial structure adjustment and high-tech research and development, and improve industrial agglomeration and competitiveness.

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