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Research on the Evaluation and Obstacle Factors of Rural Industrial Revitalization Level from the Perspective of Rural Revitalization

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Abstract

Evaluating the level of rural industrial revitalization and analyzing its obstacles in various regions is beneficial for promoting high-quality development of rural industries in China according to local conditions. This article constructs an evaluation system for rural industrial revitalization, uses the entropy weight Topsis method to comprehensively evaluate the development level of rural industrial revitalization in 30 provinces and cities in China from 2010 to 2020, and uses an obstacle degree model to diagnose and analyze the obstacles to rural industrial revitalization. Research has found that the overall level of rural industrial revitalization in China is constantly improving, and the agricultural support industry system is developing rapidly; There are significant differences in the development index of rural industries among different regions, with the rural industry development index in the eastern region being significantly higher than the other three regions; The different levels of support and development policies for rural industries in different provinces result in different rankings of rural industry development indices; Industrial development and rural service industry development are obstacles to the development of rural industries in most provinces. Based on the above results, each region should adjust the development direction of rural industries according to the actual situation, optimize the development path of rural industries, fill the gaps, and ensure the realization of rural revitalization.

Keywords

Revitalization of rural industries; Entropy weight Topsis; Obstacle factors.

1. Introduction

In October 2017, the 19th National Congress of the Communist Party of China decided to implement the rural revitalization strategy. Among them, industrial revitalization is the foundation and key to rural revitalization. As the core of rural revitalization, industrial revitalization has played a crucial role in poverty alleviation. In order to implement the rural revitalization strategy, the Party Central Committee began implementing the rural industrial revitalization plan in 2019. In 2021, the Central Committee of the Communist Party of China and the State Council jointly issued the "Opinions on Comprehensively Promoting Rural Revitalization and Accelerating Agricultural and Rural Modernization", further promoting the revitalization of rural industries and gradually achieving rural revitalization. In this context, the government mainly adopts measures such as supporting the development of a new type of economy in rural areas, building a quality and safety supervision system for agricultural products, promoting land poverty alleviation, and building smart rural areas to accelerate the revitalization of rural industries. In recent years, with the support of national policies, China's rural industries have flourished and the industrial forms have been continuously enriched. However, at the same time, they are also facing problems such as imbalanced industrial

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structure development and insufficient investment in science and technology. At present, in order to further promote rural economic development and narrow the urban-rural income gap, it is necessary to consolidate and develop rural industries. Therefore, in recent years, the number of academic research on the development of rural industries has been continuously increasing, the research content has been constantly enriched, the research methods have been constantly updated, and significant research results have been achieved. In terms of research content, the main focus is on the relationship between rural industrial development and common prosperity, rural revitalization, and so on. The revitalization of rural industries can promote the development of village level collective economic organizations, establish a mechanism for linking the interests of village level collective economic organizations and farmers, and promote the realization of common prosperity for farmers; Industrial prosperity is the core driving force for rural revitalization. In addition, the development of the digital economy, the popularization of digital inclusive finance in rural areas, and talent cultivation have provided support for the development of rural industries. Digital inclusive finance can significantly improve the high-quality development level of rural industries, provide financial support for the development of rural industries [5]. The integration and development of digital economy and rural industries can achieve higher quality output through the synergistic effect of technological innovation, and promote the transformation of old and new driving forces, achieving sustainable development of industries [6]. By cultivating new types of professional farmers, cultivating grassroots party building talents in terms of ideology, and strengthening talent revitalization, we can achieve comprehensive revitalization of rural industries and assist in the implementation of the rural revitalization strategy. At the research methodology level, most scholars have used the entropy method to measure rural revitalization, while conducting regression analysis on the relationship between rural industries and other factors. Scholars Tianye et al. (2022) [8] introduced a mediation effect model for urban-rural integration development to analyze the impact of digital economy on rural industrial revitalization; Scholar Chen Yiming et al. (2023) [6] empirically tested the positive promoting effect of digital inclusive finance on the development of rural industries through a spatial econometric model; Scholar Yang Shuigen et al. (2023) [9] found through empirical testing that digitalization of circulation can significantly promote the level of rural industrial revitalization; Scholar Zhong Xiaohua (2023) [10] used a coupling coordination model to detect an upward trend in the coupling coordination level between high-quality development of rural industries and common prosperity.

In view of this, based on previous research, this article constructs an evaluation index system for the revitalization of rural industries in provinces from three dimensions: agricultural product system, multi-functional agricultural industry system, and agricultural support industry system. Based on the entropy weight Topsis method, the evaluation and analysis of the level of rural industry revitalization in 30 provinces, cities, and autonomous regions in China from 2010 to 2020 are carried out, and the obstacle degree model is used to diagnose and analyze the obstacles to the revitalization of rural industries in each province, To accurately grasp the current situation and shortcomings of rural industrial revitalization development, propose optimization suggestions, and provide reference basis for steadily promoting rural revitalization strategies according to local conditions in various regions.

2. Research methods and data sources

2.1. Construction of evaluation index system

Following the principles of rationality and accessibility of data, this article selects 17 specific indicators from three dimensions: agricultural industry system, agricultural multifunctional

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industry system, and agricultural support industry system, and constructs a relatively reasonable evaluation index system for the level of rural industrial revitalization.

Table 1. Evaluation Index System for Rural Industrial Revitalization Level

Primary indicators	Secondary indicators	Third level indicators	Indicator Description	unit	direction
Agricultural industry system	Agricultural production capacity	Agricultural productivity a1	Total agricultural output value/rural population	100 million yuan/10000 people	+
		Facility agriculture level a2	Total area of facility agriculture/cultivated land area	%	+
		Natural disaster situation a3	Affected area of crops/cultivated land area	%	–
		Effective irrigation capacity a4	Effective irrigation area/cultivated land area	%	+
		Agricultural mechanization capacity a5	Total power of agricultural machinery per mu	10000 kilowatts/1000 hectares	+
	Agricultural industry structure	The proportion of planting and breeding industry a6	Output value of planting and breeding industry/total agricultural output value	%	+
		The proportion of leisure agriculture a7	Annual operating income of leisure agriculture/total output value of the primary industry	%	+
		Processing degree of agricultural products a8	Operating income of agricultural product processing owners/total agricultural output value	%	+
		The proportion of agriculture, forestry, animal husbandry and fishery service industry a9	Agricultural, forestry, animal husbandry and fishery service industry output value/total rural output value	%	+
Multi functional system of agricultural industry	Economic functions	Rural non-agricultural income proportion b1	Wage income/net income of rural residents	%	+
	social function	Non farm employment ratio b2	(Rural employment - primary industry employment)/total employment	%	+
	Ecological functions	Chemical input ratio b3	(Standardized application of agricultural fertilizers+standardized pesticide use)/cultivated land area	10000 tons/1000 hectares	–
		Village greening degree b4	Green coverage rate	%	+
	Cultural functions	Coverage rate of rural cultural stations b5	Number of comprehensive cultural stations in townships/number of townships	%	+
Agricultural support industry	Agricultural information service	Broadband access rate c1	Broadband access households/total number of rural residents	%	+

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system	system				
	Agricultural management system	Scale of farmer professional cooperatives c2	Number of farmer professional cooperatives per 10000 people in rural areas	Number/10000 people	+
	Agricultural financial investment system	The proportion of agricultural fiscal investment c3	Agricultural financial investment/total financial investment	%	+

2.2. Research methods

2.2.1. Entropy weight Topsis method

The entropy weight Topsis method is a multivariate decision-making method commonly used to evaluate and rank the advantages and disadvantages of several decision options. Compared with traditional Topsis, it introduces the concepts of entropy and weight to better handle uncertainty and subjectivity in decision-making problems. The advantage of this method is that it takes into account the weights and correlations of different indicators, as well as their uncertainty, which can comprehensively evaluate the advantages and disadvantages of decision-making options.

Firstly, standardize the data by distinguishing between positive and negative indicators.

Secondly, determine the weight of evaluation indicators W_j for rural industrial revitalization.

Thirdly, construct a weighted matrix V for the standardization of rural industrial revitalization.

Fourthly, determine the positive and negative ideal solutions of the evaluation index for rural industrial revitalization, calculate the Euclidean distance D^+ and D^-, and ultimately calculate the degree of closeness $C_j = \frac{D^-}{D^+ + D^-}$.

The value of C_j ranges from 0 to 1, and the closer it is to 1, the higher the level of development of rural industries. This article uses this method to calculate the development level of rural industries in 30 provinces.

2.2.2. Obstacle model

To gradually identify the shortcomings in the development of rural industries in each province, an obstacle degree model is used to diagnose the obstacles to the development of rural industries in each province. The obstacle model is a statistical model that quantitatively measures the factors that hinder the development of things. The specific calculation steps are as follows:

Firstly, calculate the contribution W_j and deviation M_{ij} of each indicator factor.

$$M_{ij} = 1 - L_{ij} \tag{1}$$

Furthermore, calculate the obstacle level q_{ij} of individual indicators to the development of rural industries.

$$q_{ij} = \frac{w_j M_{ij}}{\sum_j^n W_j M_{ij}} \times 100\% \tag{2}$$

Where, q_{ij} is the obstacle level of the j-th indicator in the i-th region.

2.3. Data source

In order to ensure the availability and continuity of the overall data, this study takes the rural development data of 30 provinces in China except Xizang, Hong Kong, Macao and Taiwan from 2010 to 2020 as the main research object. The data mainly comes from the China Rural Statistical Yearbook, the National Bureau of Statistics, and the official website of the Ministry of Agriculture and Rural Affairs of China. In data collection and statistics, linear interpolation is used to supplement missing indicators for certain years in certain regions.

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3. Evaluation and Analysis of the Revitalization Level of Rural Industries in China's Provinces

3.1. The level of revitalization of rural industries in China

The development level of rural industries in our country is constantly improving, and the growth rate of different evaluation dimensions varies greatly. From 2010 to 2020, the development level index of rural industries in China increased from 1.172 to 0.296, indicating that different dimensions of evaluating the development level of rural industries have varying degrees of impact on the growth of development level. Overall, the dimension of agricultural support industry system scored the highest, followed by agricultural industry system, while the dimension of agricultural multifunctional industry system scored the lowest. This indicates that in recent years, the digitalization and level of rural industry development in China have been continuously improving, and technology has been more widely applied to the field of agricultural development. The functions of rural industries in driving rural economic development, promoting rural employment, improving rural environment, and enriching rural people's lives need to be further developed and improved.

Table 2. Comprehensive Index of Rural Industry Revitalization and Results of Various Dimensions Index from 2010 to 2020

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Composite Index	0.172	0.182	0.195	0.209	0.223	0.236	0.245	0.254	0.263	0.278	0.296
Agricultural industrial system	0.149	0.163	0.179	0.195	0.213	0.226	0.234	0.244	0.252	0.268	0.281
Agricultural multi-functional industrial system	0.216	0.215	0.216	0.216	0.215	0.221	0.220	0.224	0.232	0.239	0.260
Agriculture supports the industrial system	0.168	0.195	0.220	0.240	0.272	0.301	0.339	0.362	0.369	0.387	0.427

3.2. The level of regional rural industrial revitalization

There are significant differences in the development level and growth rate of rural industries in different regions of the country. In terms of development level, the eastern region has a higher level of rural industrial development, while the western region has the lowest level of development. In 2010, the development level of rural industries ranked from high to low in the eastern region, central region, northeast region, and western region. By 2020, the development speed of rural industries in the northeast region was relatively fast, surpassing that of the central region. In terms of development speed, the development of rural industries in the eastern region<central region<western region<northeast region is closely related to resource endowment, policy support, industrial structure, and economic development status. In recent years, with the implementation of the Western Development Strategy, the western region has made great progress, while the Northeast region, as an old industrial base with good conditions for agricultural development, has gradually developed in recent years. This also indirectly reflects the continuous improvement of China's economic development level, and the development of rural industries has strong regional characteristics.

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Table 3. Revitalization level and comparison of rural industries in four major regions from 2010 to 2020

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Eastern region	0.272	0.288	0.301	0.302	0.314	0.323	0.329	0.335	0.340	0.353	0.365
Central Region	0.146	0.154	0.170	0.178	0.193	0.210	0.214	0.226	0.238	0.240	0.255
Western region	0.110	0.116	0.125	0.139	0.158	0.170	0.187	0.201	0.214	0.238	0.254
Northeast	0.119	0.129	0.145	0.212	0.220	0.237	0.237	0.238	0.234	0.248	0.294

3.3. Provincial level of rural industrial revitalization

The entropy weight Topsis method was used to calculate the comprehensive development index of rural industries in 30 provinces of China in 2010, 2020, and the specific results are shown in Table 4. Overall, there are 6 provinces with a comprehensive index of rural industrial development greater than 0.3, namely Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, and Shandong. We can find that the economic development level of these provinces is relatively high, which indirectly reflects that the economic development level of each province affects the development level of its rural industries. From the changes in the comprehensive index rankings of various provinces in 2010 and 2020, there are significant differences in the rankings of different provinces. The rankings of some central and coastal eastern regions have shown a downward trend, while the rankings have mostly risen in the western and northeastern regions. This indicates that the development speed of rural industries in the western and northeastern regions is relatively fast, while the development speed of the central and eastern regions has slowed down. Although the comprehensive index rankings of the western and northeastern regions are currently not high, But the gap with the other two regions is gradually narrowing.

Table 4. Measurement and Ranking of Rural Industrial Revitalization Level in Provinces from 2010 to 2020

Region	Composite Index		2010		2020		Ranking changes
	Index score	National rankings	Index score	National rankings	Index score	National rankings	
Beijing	0.463	1	0.469	1	0.451	3	-2
Tianjin	0.431	2	0.341	3	0.501	1	2
Shanghai	0.379	3	0.416	2	0.348	7	-5
Jiangsu	0.375	4	0.226	6	0.494	2	4
Zhejiang	0.327	5	0.267	4	0.392	4	0
Shandong	0.300	6	0.248	5	0.355	6	-1
Liaoning	0.289	7	0.188	9	0.314	10	-1
Fujian	0.262	8	0.188	8	0.342	8	0
Hebei	0.246	9	0.207	7	0.273	17	-10
Anhui	0.225	10	0.139	17	0.277	16	1
Chongqing	0.223	11	0.099	24	0.328	9	15
Hainan	0.221	12	0.180	10	0.270	18	-8
Hunan	0.215	13	0.152	15	0.266	19	-4
Shanxi	0.212	14	0.141	16	0.296	12	4
Inner Mongolia	0.202	15	0.118	21	0.306	11	10
Sichuan	0.201	16	0.117	22	0.264	20	2

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Xinjiang	0.200	17	0.155	14	0.234	22	-8
Guangdong	0.196	18	0.173	11	0.223	26	-15
Henan	0.195	19	0.165	12	0.228	24	-12
Qinghai	0.189	20	0.109	23	0.389	5	18
Hubei	0.184	21	0.119	20	0.244	21	-1
Jiangxi	0.182	22	0.160	13	0.220	27	-14
Ningxia	0.180	23	0.129	18	0.227	25	-7
Shaanxi	0.175	24	0.121	19	0.230	23	-4
Jilin	0.173	25	0.085	30	0.283	15	15
Gansu	0.169	26	0.090	27	0.294	13	14
Heilongjiang	0.169	27	0.085	29	0.286	14	15
Guizhou	0.133	28	0.094	25	0.195	28	-3
Guangxi	0.127	29	0.092	26	0.174	29	-3
Yunnan	0.114	30	0.086	28	0.158	30	-2

4. Diagnostic Analysis of Obstacles to the Level of Rural Industrial Revitalization in China

We used an obstacle degree model to diagnose the obstacle factors affecting the development of rural industries in 30 regions. Based on the size of the obstacle degree of a single indicator, we selected the top 3 factors with obstacle degrees. The results are shown in Table 5.

Table 5. Top Three Obstacle Factors

Region	Beijing	Tian jin	He bei	Shanxi	Inner Mongolia	Liao ning	Jilin	Hei Long jiang	Shang hai	Jiang su	Zhe jiang	An hui	Fu jian	Jiang xi	Shan dong
Factor1	a9	b2	a3	a3	a2	a7	a3	a7	a3	b2	a2	a3	b2	a3	a2
Factor2	b2	a9	a7	b2	a7	a3	b2	a9	a7	a7	b2	a9	a9	b2	b2
Factor3	a7	a3	b2	a9	a5	a9	a9	b2	a9	a9	c2	a7	a7	a9	c2
Region	Henan	Hu bei	Hu nan	Guang dong	Guang xi	Hai nan	Chong qing	Si chuan	Gui zhou	Yun nan	Shaanxi	Gan su	Qing hai	Ning xia	Xin jiang
Factor1	a3	a7	a9	b2	a9	a2	a3	a3	a3	a3	a9	a5	a5	a1	a2
Factor2	a9	a9	a3	a9	a7	b2	a9	a7	a8	a2	a7	a3	a7	a7	a4
Factor3	a7	a3	a7	a7	a3	a7	a7	b2	a4	a6	a5	a7	a3	a2	a7

Sorting and analyzing the top three obstacle factors, the first obstacle factor with the highest frequency of occurrence is a3 (facility agriculture level), followed by a2 (land productivity), b2 (rural industrial development space), a5 (effective irrigation capacity), a7 (proportion of leisure agriculture), and a9 (proportion of agriculture, forestry, animal husbandry, and fishery service industry). Through analysis, it is found that industrial development and rural service industry development are obstacles to the development of rural industries in most provinces, and the development planning of rural industries needs to be further improved.

5. Conclusion and Suggestions

5.1. Conclusion

Based on the entropy weight Topsis method and obstacle model, this study investigates the development level and obstacles of rural industries in China from 2010 to 2020. The conclusions drawn are as follows.

From 2010 to 2020, the overall development level of rural industries in China continued to rise, with different evaluation dimensions indicating different levels of development. There are significant differences in the development level of rural industries in different regions of the country. The eastern region has a higher level of rural industry development, while the western

region has the lowest level of development. At the provincial level, the development speed of rural industries in the western and northeastern provinces is relatively fast, while the development speed of provinces in the central and eastern regions is slowing down, and the gap between different regions is constantly narrowing.

Through sorting and analyzing the obstacles to the development of rural industries, it is found that industrial development and rural service industry development are obstacles to the development of rural industries in most provinces, and the development planning of rural industries needs to be further improved.

5.2. Suggestions

How to improve the quality and effectiveness of rural industrial development is a problem that we need to pay close attention to. Based on the above research results, this article proposes the following policy recommendations to promote further development of rural industries.

5.2.1. Plan local characteristic industries

Every village has its unique resources and cultural characteristics. Therefore, it is crucial to prioritize local characteristic industries in rural development. By conducting in-depth research on local resources and advantageous industries, the potential of rural industries can be discovered, and corresponding development strategies can be formulated. These strategies may include providing technical support, training human resources, promoting market promotion, and other measures to help local characteristic industries flourish.

5.2.2. Strengthen infrastructure construction

Infrastructure is the foundation of rural industrial development. Investing in the construction of infrastructure such as transportation, electricity, communication, and water conservancy can improve the productivity and competitiveness of rural areas. For example, improving transportation conditions can facilitate the transportation of agricultural products and increase the income of farmers. In addition, providing reliable electricity and communication networks can also help rural enterprises stay connected to the market and utilize new technological means to improve efficiency.

5.2.3. Promote agricultural modernization

Agriculture is the core of rural economy. By introducing modern agricultural technology and management models, the quality and yield of agricultural products can be improved, achieving sustainable development of agriculture. In addition, promoting ecological and organic agriculture can meet consumers' demand for green food and create higher added value. The government can provide funding, training, and technical support to help farmers transform and upgrade, and enjoy the opportunities brought by modern agriculture.

5.2.4. Promote the cultivation of rural talents

The key to promoting the revitalization of rural industries lies in talent. The government can increase investment in agricultural talent cultivation by establishing specialized agricultural colleges, training institutions, and research institutions to provide comprehensive training and education services. In addition, it can also guide universities and research institutions to cooperate with rural enterprises, promote the transformation of technology and talents, and enhance the technological content and innovation ability of rural industrial development. At the same time, it is necessary to strengthen vocational training for rural labor, improve the skills and professional qualities of farmers, and promote the transformation and upgrading of rural labor.

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