DOI: 10.53469/jgebf.2025.07(10).11

Analysis of Rural Industrial Integration on Rural Revitalization: Impact Mechanism and Spatial Effect

Yaoyuan Zhang

Nanjing Audit University, Nanjing, Jiangsu, China

Abstract: ***Rural industrial integration is a key path to promote the rural revitalization strategy. Based on panel data from 29 provinces in China from 2010 to 2022, this study constructs a comprehensive evaluation index system for rural revitalization and industrial integration. The entropy method, AHP method and entropy weight TOPSIS method are used to measure the development level of the two. The influencing mechanism is explored through OLS regression, mechanism test, robustness, heterogeneity analysis and spatial model. The study found that: (1) The level of rural revitalization and industrial integration is on an upward trend overall, but there are significant regional differences, showing a "high in the east and low in the west" pattern. The eastern region takes the lead with its policy first-mover advantage and industrial cluster effect, while the central and western regions are lagging behind due to factors such as weak infrastructure and a single industrial chain. (2) Industrial integration has a significant positive role in promoting rural revitalization by increasing farmers' income and promoting industrial structure upgrading, and there is a spatial spillover effect, indicating that industrial integration in a province can drive the development of neighboring provinces through economic linkage. (3) Regional heterogeneity analysis shows that the marginal benefits of industrial integration in the eastern region are higher, while the benefits of integration in the central and western regions have not yet been fully released due to poor factor flow and insufficient policy adaptability. The study further indicates that digital technology empowerment, industrial chain extension, and ecological and economic synergy are the core pathways for industrial integration to drive rural revitalization. By constructing a multidimensional indicator system and analyzing spatial effects, this paper demonstrates that the degree of industrial integration positively impacts rural revitalization, providing theoretical and empirical support for optimizing regional policies and addressing development imbalances.***

Keywords: Rural Revitalization, Industrial Integration, Spatial Spillover Effect, Analytic Hierarchy Process.

1. Introduction

The 2025 Government Work Report proposes focusing on the "three rural issues" and deepening the comprehensive revitalization of rural areas. The implementation of the rural revitalization strategy is a decision made by the Party Central Committee based on the overall considerations of the Party and the country, and is a core task of the "three rural issues" work in the new era. The Third Plenary Session of the 20th CPC Central Committee pointed out that integrated urban and rural development is an inevitable requirement for China's modernization. It is necessary to coordinate new industrialization, new urbanization, and comprehensive rural revitalization, comprehensively improve the integration of urban and rural planning, construction, and governance, promote the equal exchange and two-way flow of urban and rural factors, narrow the urban-rural gap, and promote the common prosperity and development of urban and rural areas. The "Rural Comprehensive Revitalization Plan (2024-2027)" proposes that by 2027, substantial progress will be made in the comprehensive revitalization of rural areas, and agricultural and rural modernization will reach a new level. Therefore, studying the impact of industrial integration on rural revitalization can further promote the realization of comprehensive rural revitalization.

The Third Plenary Session of the 20th Central Committee of the Communist Party of China emphasized the need to improve long-term mechanisms for promoting comprehensive rural revitalization and better realize rural revitalization. The in-depth implementation of the rural revitalization strategy has opened up broad space for industrial integration. As a systematic project, industrial integration optimizes resource allocation at the industrial level to achieve optimal resource regeneration and, in turn, promote industrial upgrading. In this process, knowledge industries play a dominant role, agriculture provides fundamental support, industry plays an intermediary role, the service industry is at the core, and the information industry serves as a supporting link. By 2023, the central government's subsidy funds for promoting rural revitalization will be allocated 60% to industrial development. With the establishment of 100 agricultural modernization demonstration zones, industrial integration is steadily progressing. The emergence of industrial integration has brought about changes in production methods and the extension of industrial chains, diversifying farmers' income sources. Many places have increased the added value of agriculture and promoted the diversified development of the rural economy by integrating agriculture with services, industry, and other sectors. Furthermore, the rural e-commerce industry has flourished, with rural online retail sales reaching 2.49 trillion yuan throughout the year, injecting new vitality into rural industrial development. Industrial integration in rural revitalization is a key path to achieving agricultural modernization and improving the rural economic level, but in the actual process of promotion, it still faces many problems and challenges.

2. Literature Analysis

2.1 Rural Revitalization

In the process of urbanization and modernization, hollowing out is an inevitable problem in rural areas (Zhang Haipeng et al., 2018). As General Secretary Xi Jinping pointed out in his report to the 20th National Congress of the Communist Party of China, “The most difficult and arduous tasks in building a modern socialist country in an all-round way remain in the countryside.” Therefore, the Central Document No. 1, released in 2025, explicitly calls for deepening rural reform and steadily advancing all aspects of rural revitalization. However, there is a lack of unified indicators for measuring comprehensive rural revitalization. Scholars have adopted different methods and indicators to measure rural revitalization, including the entropy value method (Lu Fengying et al., 2022), the entropy weight method and the TOPSIS method (Shi Pengfei et al., 2023), and a combination of the analytic hierarchy process and the entropy weight method (Zhang Ting et al., 2018). The interpretation of these indicators is diverse. Currently, the secondary indicators are interpreted from the perspective of “thriving industries, livable ecology, civilized rural customs, effective governance, and affluent lives” (Zhang Ting et al., 2018; Zhang Hongyan et al., 2025).

2.2 Industrial Integration

In the 1990s, Japanese scholar Naraomi Imamura (1996) proposed the concept of the “sixth industry.” Its basic meaning is to use agriculture as its foundation and support (Xiao Weidong and Du Zhixiong, 2019). Through industrial linkage (Lü Tao and Nie Rui, 2007; Tao Wuxian, 2004) and industrial agglomeration (Tao Wuxian, 2004), a market-based agricultural production and management system with regional layout, specialized production, integrated management, socialized services, and standardized management (Wang Xinkun, 2007) is formed. This organically integrates agricultural production, processing, and sales, as well as agricultural leisure and other service industries, to extend the agricultural industry chain, expand the scope and scale of the industry, and ultimately achieve the goal of increasing farmers’ income (Zhao Xia, 2017; Xiao Weidong and Du Zhixiong, 2019; Guo Yunyun et al., 2019).

Currently, academic research has provided various approaches to measuring the degree of rural industrial integration. The main measurement methods include: 1) Grey correlation analysis (Gambardella et al., 1998; Liang Shuguang et al., 2017; Zheng Yuanrong, 2020); 2) Herfindahl Index (HHI); 3) Coupling coordination model (Fal et al., 2001; Wan, 2011; Hou Bing and Zhou Xiaoqian, 2015); 4) Input-output method (Cao Yixia et al., 2018; Choi et al., 2018); 5) Analytic Hierarchy Process (AHP) (Wang Ling, 2017).

2.3 The Impact of Industrial Integration on Rural Revitalization

Industrial integration is a key path to achieving agricultural modernization and improving the rural economy. Rural industrial integration can boost local economic development and farmers’ incomes (Liu Shuoming et al., 2024), increase the incomes of low-income groups, narrow the income gap within rural areas (Bai Enlai et al., 2023), and better achieve common prosperity for farmers (Liu Fei et al., 2024). Chen Yuying (2024) argues that rural industrial integration is an inevitable requirement for the transformation and development of the rural economy and provides a new path for achieving sustained increases in farmers’ incomes. In particular, industrial chain extension and technology-based integration, as important means for new agricultural operators to improve their performance and promote rural industrial revitalization, have significant practical benefits (Zhao Xue et al., 2023).

Research also shows that industrial integration can have a positive impact on the ecological environment. Cheng Li et al. (2024) found that rural industrial integration in the Yangtze River Basin has a significant positive impact on the rural ecological environment, and that rural economic growth plays an important mediating role between rural industrial integration and the rural ecological environment. Tian Caihong et al. (2024) concluded that the integration of the primary, secondary, and tertiary industries in rural counties within the Yangtze River Economic Belt can significantly promote green agricultural development. This conclusion holds true even after accounting for endogeneity and robustness.

Rural tourism, a typical example of industrial integration, has played a significant role in promoting rural revitalization. Xiang Yanping (2021) noted that my country’s rural tourism has developed rapidly and has become a key channel and important force in promoting rural revitalization. Qu Xueshu and Jiao Lihui (2020) believe that by extending, deepening, broadening, and strengthening the rural tourism industry chain, it can become an effective way to transfer surplus labor and increase farmers’ income, thereby providing a stronger and more diverse new impetus for rural revitalization. However, Long Jingran et al. (2021) found that the orderly promotion of cultural and tourism integration can provide strong support for the comprehensive revitalization of rural areas and promote the coordinated development of various undertakings. However, the realization of this positive role requires a good cultural heritage and tourism development conditions in the village. Not all villages have the conditions for cultural and tourism integration.

2.4 Literature Review

In summary, the academic community has studied the measurement of rural revitalization and industrial integration from many perspectives, and rural revitalization is also a hot topic of current research. Industrial integration plays an important role in the realization of rural revitalization through agricultural modernization, ecological environment or rural tourism, but there is little research on the impact of industrial integration on rural revitalization. Based on this, the marginal contribution of this paper is: first, for the measurement of rural revitalization and industrial integration indicators, for the existing indicator measurement, different indicator measurement methods are used to reflect the current development level of rural revitalization and industrial integration; second, for the analysis of the current status of rural revitalization and industrial integration development from 2010 to 2022, the current rural revitalization and industrial integration are analyzed from a statistical perspective. The role of industrial integration in promoting rural revitalization is analyzed, and its spillover effects are analyzed from a spatial perspective, and the current development of rural revitalization and industrial integration is comprehensively discussed.

The overall structure of this article is as follows: the first and second parts are introduction and literature review, respectively, summarizing the current background and research; the third part is indicator analysis, which constructs rural revitalization and industrial integration indicators in detail; the fourth part is statistical analysis, which conducts data analysis on the obtained comprehensive index to understand the current development situation; the fifth part is empirical analysis, which uses OLS benchmark regression, followed by robustness and heterogeneity analysis, and uses spatial models to analyze the spatial effects; finally, it provides research conclusions and policy implications.

3. Indicator Analysis

3.1 Construction of Rural Revitalization Indicators

3.1.1 Principles for constructing a rural revitalization indicator system

The report of the 20th National Congress of the Communist Party of China emphasized the need to comprehensively promote rural revitalization, signaling a new phase in the implementation of the rural revitalization strategy. To better adapt to the requirements of this new phase, the traditional rural revitalization indicator system needs to be adjusted and improved. This will not only help more accurately assess the effectiveness of rural revitalization efforts across regions, but also provide a more scientific and rational basis for policymaking. The “Law of the People’s Republic of China on Promoting Rural Revitalization” clearly states that promoting rural revitalization should adhere to the fundamental requirements of thriving industries, livable ecology, civilized rural customs, effective governance, and affluent lives, comprehensively and comprehensively promoting rural economic, political, cultural, social, and ecological civilization development, as well as Party building. The law emphasizes the unique role of rural areas in ensuring agricultural product supply, food security, protecting the ecological environment, and inheriting and promoting the fine traditional culture of the Chinese nation.

3.1.2 Selection of various dimensions of the rural revitalization indicator system

The rural revitalization indicators are measured based on the overall requirements of rural revitalization, selecting thriving industries, livable ecology, civilized rural customs, effective governance, and affluent lives as secondary indicators. Twelve tertiary indicators are selected, covering agricultural production capacity, industrial structure and diversification, green agricultural development, rural human settlement environment governance, rural ecological protection, farmers’ education level, traditional cultural dissemination, rural public cultural development, governance capacity, governance measures, farmers’ living standards, and basic public services. These indicators are explained using 29 specific indicators.

Table 1: Construction of rural revitalization indicators

First-level indicators	Secondary indicators	Level 3 indicators	Indicator Explanation
Rural revitalization	prosperous industry	Agricultural production capacity base	Total power of agricultural machinery per capita (kW)
			Comprehensive grain production capacity (10,000 tons/square meter)
			Agricultural labor productivity (yuan/person)
		Industrial structure and diversification	Main business income of agricultural product processing enterprises above designated size (100 million yuan)
			E-commerce sales (100 million yuan)
			Number of Taobao Villages
			Number of self-employed people in rural areas (10,000 people)
	Ecological and livable	Green development of agriculture	Amount of pesticides and fertilizers used (10,000 tons)
		Rural living environment governance	Proportion of administrative villages that treat domestic sewage (%)
			The proportion of administrative villages that handle domestic waste (%)
			Sanitary toilet penetration rate (%)
		Rural ecological protection	The proportion of nature reserves in the area under jurisdiction (%)
			Average years of education for rural residents (years)
		Traditional cultural dissemination	Cable TV coverage rate (%)
			Proportion of administrative villages with Internet broadband services (%)
			Proportion of rural cultural, educational and entertainment expenditure (%)
		Rural public cultural construction	Number of rural cultural centers
	Effective governance	Governance Capacity	The proportion of village directors and secretaries who shoulder the same responsibility (%)
		Governance measures	Proportion of administrative villages that have formulated village plans (%)
			Frequency of government-related rural revitalization terms (times)
			Proportion of administrative villages that have carried out village renovation (%)
	Affluent life	Farmers’ living standards	Per capita disposable income of rural residents (yuan)
			Rural poverty incidence (%)
			Theil Index
			Engel coefficient of rural residents (%)
			Number of rural residents receiving minimum living security
		Basic public services	Safe drinking water penetration rate (%)
			Village road hardening rate (%)
			Number of health technicians per thousand people in rural areas

3.1.3 Indicator system construction method

Using objective and subjective analysis methods alone presents problems. Objective analysis relies heavily on the quality and quantity of data; if the data is incomplete, inaccurate, or biased, the accuracy of the analysis will be affected. The results of subjective analysis largely depend on the analyst's subjective judgment and preferences, and different people may reach different conclusions. Therefore, this paper uses the entropy method and the analytic hierarchy process to jointly construct the rural revitalization indicators.

3.1.3.1 Use the analytic hierarchy process to calculate the weight

The Analytic Hierarchy Process (AHP) is a multi-criteria decision analysis method commonly used to address complex decision-making problems. This method allows for scoring and ranking of evaluation indicators based on their relative importance. The core of the AHP is to construct a hierarchical model, calculate weights by comparing judgment matrices, and ultimately evaluate each option. Unlike objective analysis methods, the AHP is a subjective analysis method, and the scoring of each indicator is subjective. A 1-9 scale is typically used to compare the importance of indicators:

1: Both indicators are equally important.
3: One indicator is slightly more important than the other.
5: One indicator is clearly more important than the other.
7: One indicator is very important.
9: One indicator is extremely important.
2, 4, 6, 8: Indicates different levels of importance between these values.

Based on the subjective scoring above, the judgment matrix is generated. The next step is to calculate the weight of each indicator. The eigenvector method is commonly used. Furthermore, the consistency of the matrix must be assessed to ensure that the decision maker's judgments are consistent. A commonly used consistency metric is the consistency ratio (CR). If the CR value is greater than 0.1, the judgment matrix may be inconsistent and requires revision. As shown in Table 2, the CR value is less than 0.1, so the calculated weights are consistent after passing the consistency test.

Table 2: Consistency test results of rural revitalization indicator weights

Consistency test results summary				
Maximum characteristic root	CI value	RI value	CR value	Consistency test results
29.435	0.016	1.669	0.009	pass

3.1.3.2 Use entropy method to calculate weights

Calculating indicator weights using the entropy method requires standardizing or normalizing the data. This involves using forward and reverse normalization to bring the data for each indicator to the same dimension. The information entropy of each indicator is then calculated based on the standardized data to measure its information variability. Finally, the weights of each indicator are calculated based on the information entropy. Indicators with lower entropy values have higher weights, while indicators with higher entropy values have lower weights

3.1.3.3 Comprehensive weight

This paper uses an equal-weighted weighted average method, combining subjective and objective weights to calculate a comprehensive weight. Specifically, the average weight obtained by the analytic hierarchy process and entropy method is used as the comprehensive weight. Weighting is then applied to each level of indicators, resulting in the comprehensive weight results shown in Table 3.

Table 3: Comprehensive weights of rural revitalization indicators

First-level indicators	Secondary indicators	Level 3 indicators	Indicator Explanation	Entropy method weight	AHP weights	Comprehensive weight
Rural revitalization	prosperous industry	Agricultural production capacity base	Total power of agricultural machinery per capita (kW)	3.47612%	2.893%	3.185%
			Comprehensive grain production capacity (10,000 tons/square meter)	3.46633%	7.730%	5.598%
			Agricultural labor productivity (yuan/person)	3.47309%	4.880%	4.177%
		Industrial structure and diversification	Main business income of agricultural product processing enterprises above designated size (100 million yuan)	3.46696%	1.744%	2.605%
			E-commerce sales (100 million yuan)	3.27966%	4.880%	4.080%
			Number of Taobao Villages	2.86950%	2.893%	2.881%
			Number of self-employed people in rural areas (10,000 people)	3.36999%	1.744%	2.557%
	Ecological and livable	Green development of agriculture	Amount of pesticides and fertilizers used (10,000 tons)	3.52627%	0.812%	2.169%
		Rural living environment governance	Proportion of administrative villages that treat domestic sewage (%)	3.47311%	2.893%	3.183%
			The proportion of administrative villages that handle domestic waste (%)	3.47311%	2.893%	3.183%
			Sanitary toilet penetration rate (%)	3.47424%	4.880%	4.177%
		Rural ecological protection	The proportion of nature reserves in the area under jurisdiction (%)	3.47568%	1.138%	2.307%
		Traditional cultural dissemination	Average years of education for rural residents (years)	3.47474%	7.730%	5.602%
			Cable TV coverage rate (%)	3.47273%	0.812%	2.142%
			Proportion of administrative villages with Internet broadband services (%)	3.47646%	4.880%	4.178%
			Proportion of rural cultural, educational and entertainment expenditure (%)	3.47282%	1.138%	2.305%
		Rural public cultural construction	Number of rural cultural centers	3.46636%	1.138%	2.302%
	Effective governance	Governance Capacity	The proportion of village directors and secretaries who shoulder the same responsibility (%)	3.47459%	1.744%	2.609%
		Governance measures	Proportion of administrative villages that have formulated village plans (%)	3.47349%	2.893%	3.183%
			Government rural revitalization word frequency (times)	3.49645%	1.744%	2.620%
			Proportion of administrative villages that have carried out village renovation (%)	3.47270%	2.893%	3.183%
	Affluent life	Farmers' living standards	Per capita disposable income of rural residents (yuan)	3.47386%	7.730%	5.602%
			Rural poverty incidence (%)	3.47417%	7.730%	5.602%
			Theil Index	3.52203%	1.744%	2.633%
			Engel coefficient of rural residents (%)	3.47390%	2.893%	3.183%
		Basic public services	Number of rural residents receiving minimum living security	3.52677%	4.880%	4.203%
			Safe drinking water penetration rate (%)	3.47578%	4.880%	4.178%
			Village road hardening rate (%)	3.47542%	2.893%	3.184%
			Number of health technicians per thousand people in rural areas	3.47364%	2.893%	3.183%

Table 4: Industrial integration indicator system

Target layer	Baseline layer	Feature layer	Metrics	Indicator properties
Evaluation of the degree of industrial integration	Extension of the agricultural industry chain	Proportion of output value of agricultural product processing industry	Main business income of agricultural and sideline food processing industry/total output value of agriculture, forestry, animal husbandry and fishery	Forward
		Number of professional farmers’ cooperatives per 10,000 people in rural areas	Number of professional farmers’ cooperatives in rural areas/rural population	Forward
		The ratio of primary industry value added to GDP	Value added of primary industry/GDP	Negative
	Expanding agricultural multifunctionality	Main income from leisure agriculture	Annual operating income of leisure agriculture/total agricultural output value	Forward
		Level of facility agriculture	Facility agriculture area/crop planting area	Forward
		Fertilizer application intensity	Amount of agricultural fertilizer/total sown area of crops	Negative
	Development of new agricultural formats	Proportion of rural service industry output value	Output value of agriculture, forestry, animal husbandry and fishery and auxiliary activities/total output value of agriculture, forestry, animal husbandry and fishery	Forward
		Number of households with Internet access in rural areas	Number of households with Internet access in rural areas	Forward
Industrial integration benefit evaluation	Economic benefits	Engel coefficient of rural households	Total food expenditure in rural household expenditure/total household expenditure	Negative
	Social benefits	Ratio of disposable income of rural residents to urban residents	Per capita disposable income of rural residents/per capita disposable income of urban residents	Forward
		Ratio of per capita consumption expenditure of rural residents to urban residents	Per capita consumption expenditure of rural residents/per capita consumption expenditure of urban residents	Forward

3.2 Construction of Industrial Integration Indicators

3.2.1 Selection of various dimensions of the industrial integration indicator system

According to the guidance of the Central Document No. 1 of 2024, combined with the characteristics of the integration of the three industries in rural areas, a series of quantifiable indicators are selected based on systematicity, comparability and operability to construct an evaluation system for the rural industrial integration index, including 5 first-level indicators and 12 second-level indicators. The specific measurement standards are shown in Table 4.

3.2.2 Method of constructing the indicator system

For industrial integration indicators, the entropy weight TOPSIS method is used to calculate the weights.

3.2.2.1 Build the original decision matrix

Construct an industrial integration evaluation index system, with 29 provinces, 5 first-level indicators, and 12 second-level indicators, and establish the original decision matrix X.

$$\begin{bmatrix} X_{11} & X_{12} & X_{13} & \dots & X_{1n} \\ X_{21} & X_{22} & X_{23} & \dots & X_{2n} \\ X_{31} & X_{32} & X_{33} & \dots & X_{3n} \\ \dots & \dots & \dots & \dots & \dots \\ X_{m1} & X_{m2} & X_{m3} & \dots & X_{mn} \end{bmatrix} \tag{1}$$

3.2.2.2 Dimensionless processing

In order to eliminate the influence of dimension, the original decision matrix X_{ij} is dimensionless and the indicator types are divided into positive indicators and negative indicators. The calculation formula is as follows:

$$Y_{ij} = \frac{\max(X_{ij}) - X_{ij}}{\max(X_{ij}) - \min(X_{ij})}, \text{ positive index} \tag{2}$$

$$Y_{ij} = \frac{X_{ij} - \min(X_{ij})}{\max(X_{ij}) - \min(X_{ij})}, \text{ inverse index} \tag{3}$$

3.2.2.3 Determine the entropy weight of the evaluation index

Calculate the proportion of the j-th sample value under the j-th indicator:

$$p_{ij} = \frac{y'_{ij}}{\sum_{i=1}^{n} y'_{ij}} \tag{4}$$

Calculate the information entropy of each indicator:

$$e_j = -\frac{1}{\ln n} * \left[\sum_{i=1}^{n} p_{ij} * \ln(p_{ij})\right] \tag{5}$$

Determine the evaluation index weight w:

$$w_j = \frac{1 - e_j}{\sum_{i=1}^{m}(1 - e_j)} \tag{6}$$

3.2.2.4 Determine the weighting matrix

Construct a weighted matrix by multiplying the entropy weight of each evaluation indicator by w_{ij} the observation value of all objects under each evaluation indicator X_{ij}. The weighted matrix is obtained:

$$X'_{ij} = w_{ij} * X_{ij} \tag{7}$$

3.2.2.5 Determine positive and negative ideal solutions and calculate Euclidean distance

Based on the weighted normalization matrix, the positive and negative ideal solution sets are determined. The sets include two types of indicators. For positive indicators, the maximum value among the observed values is selected; for negative indicators, the minimum value among the observed values is selected. The determination of the negative ideal solution set is the opposite. It is shown in the following formula:

$$\begin{cases} p^{+} = (x_1'^{+}, x_2'^{+}, x_3'^{+}, \dots\dots x_m'^{+}) \\ p^{-} = (x_1'^{-}, x_2'^{-}, x_3'^{-}, \dots\dots x_m'^{-}) \end{cases} \tag{8}$$

On the basis of determining the positive and negative ideal sets, calculate the Euclidean distance of n evaluation objects:

$$\begin{cases} v_j^{+} = \sqrt{\sum_{i=1}^{m}(x'_{ij} - x_1'^{+})^2} \\ v_j^{-} = \sqrt{\sum_{i=1}^{m}(x'_{ij} - x_1'^{-})^2} \end{cases} \tag{9}$$

3.2.2.6 Calculate relative closeness and sort

Calculate the relative closeness and sort the n evaluation objects to measure the level of risk. That is, if the relative closeness calculation result is larger, the safety is higher and the risk is lower; otherwise, the risk is higher.

$$D_j = \frac{v_j^-}{v_j^- + v_j^+} \quad (10)$$

4. Statistical Analysis

4.1 Rural Revitalization

4.1.1 Statistical results of Rural Revitalization

This article selects 29 provinces in China from 2010 to 2022 as the research objects for the measurement of rural revitalization. It explains five secondary indicators and 29 specific indicators, and determines the indicator weights through a combination of subjective and objective analysis methods to determine the rural revitalization index of each province.

4.1.2 Analysis of statistical results of rural revitalization

As can be seen from the analysis in the table above, the overall trend of change in the Rural Revitalization Index across provinces continues to grow, with most provinces showing a steady upward trend. Economically developed regions such as Beijing, Guangdong, and Zhejiang provinces have seen annual increases, reflecting their significant investments in rural revitalization and their more pronounced results. Meanwhile, provinces in western and remote areas, such as Qinghai and Yunnan, have seen slight increases and overall weaker performance, reflecting slower progress in rural revitalization in these regions, potentially facing unique challenges due to geographical, economic, and demographic factors.

In terms of periodic fluctuations, the Rural Revitalization Index exhibited periodic fluctuations from 2010 to 2022, profoundly reflecting the dynamic relationship between policy drivers and regional responses. Specifically, from 2015 to 2018, the country vigorously promoted the “targeted poverty alleviation” policy, which drove rapid growth in rural revitalization in the central and western regions. For example, Guizhou Province, through the national targeted poverty alleviation policy and its own mountain tourism model, achieved an average annual growth rate of 5.2% in rural revitalization. During this period, the eastern region focused on exploring digital upgrades to lay the foundation for subsequent rapid growth. From 2020 to 2022, due to the impact of the COVID-19 pandemic, the national policy focus shifted to high-quality development and risk resilience building. During this period, the eastern region accelerated its digital transformation, while the central and western regions bucked the trend through the “ecological + industry” dual-drive approach. Rural revitalization levels in all regions have significantly improved.

In terms of the dynamic evolution of the temporal distribution characteristics, in 2010, the top five provinces in terms of rural revitalization were dominated by eastern and northeastern provinces: Beijing (0.393), Guangdong (0.397), Heilongjiang (0.369), Liaoning (0.356), and Zhejiang (0.354). By 2022, the top five had evolved into Beijing (0.589), Shandong (0.545), Hebei (0.538), Jiangsu (0.537), and Guangdong (0.601), with eastern provinces now fully dominant. This may be due to the fact that northeastern provinces (Heilongjiang and Liaoning) dropped out of the top five due to the entrenchment of their traditional growth model, reflecting the limitations of their resource-dependent growth path. Eastern provinces such as Jiangsu and Shandong, on the other hand, have reshaped their competitiveness through a dual-engine “technology + capital” approach, highlighting the combined effects of policy dividends and industrial clusters.

Regarding the five provinces at the bottom of the rankings, in 2010, Inner Mongolia (0.093), Ningxia (0.089), Xinjiang (0.104), Yunnan (0.069), and Qinghai (0.09) were mired in the bottom tier. By 2022, the bottom five were still concentrated in western China (Inner Mongolia 0.164, Yunnan 0.151, Qinghai 0.148, Ningxia 0.174, and Xinjiang 0.171). This is primarily due to the continued sluggish growth in western China, constrained by a single industrial structure and insufficient internal driving force. This pattern suggests that lagging regions need to overcome structural bottlenecks through “innovation in distinctive industries combined with cross-regional collaboration.” Single-policy support alone cannot fundamentally overcome the rigid constraints of resource endowments.

4.2 Industrial Integration

4.2.1 Statistical results of industrial integration

Based on the availability and validity of data, this paper calculates the rural industrial integration index of 29 provinces in China (excluding Tibet) from 2010 to 2022 by using the entropy weight TOPSIS method, which is divided into five primary indicators and twelve secondary indicators from the two aspects of industrial integration degree evaluation and industrial integration benefit evaluation.

4.2.2 Analysis of statistical results of industrial integration

Overall, the national rural industrial integration index showed a significant upward trend between 2010 and 2022, with distinct growth patterns across different regions. Eastern provinces, exemplified by Beijing and Jiangsu, saw their growth primarily driven by technological innovation and the efficient integration of policy resources. For example, Beijing’s index climbed steadily from 0.35 in 2010 to 0.55 in 2022, representing an average annual increase of approximately 1.7%. This rapid growth was closely linked to the development of science and technology parks and the advancement of digital agriculture pilot projects within the capital’s economic circle. In contrast, central and western provinces, despite starting from a lower base, have experienced impressive growth over time. For example, Sichuan Province’s average annual growth rate exceeded 3% since 2018, reaching an index of 0.43 in 2022. This growth was primarily due to the coordinated development policies of the Chengdu-Chongqing Twin Cities Economic Circle. This policy dividend has significantly enhanced the level of industrial integration in the province.

Regarding periodic fluctuations, the Rural Revitalization Index exhibited periodic fluctuations from 2010 to 2022, reflecting the complex challenges of economic transformation in some regions. For example, in Tianjin, the index peaked at 0.52 in 2016 before declining slightly to 0.46 in 2022, likely due to the growing pains of industrial restructuring. Tianjin has a disproportionate share of traditional heavy industry, and tightening environmental protection policies have led to the exit of some highly polluting industries. However, the integration of emerging service industries with agriculture is still in its exploratory stages and will be difficult to fill in the short term, leading to fluctuations in the level of industrial integration. Furthermore, Zhejiang Province experienced a brief decline around 2016 (0.42 → 0.36), which was related to tightening regulations on agricultural product e-commerce platforms at the time. However, the index subsequently recovered rapidly (reaching 0.47 in 2022) through supply chain optimization.

In terms of the dynamic evolution of temporal distribution characteristics, in 2010, the top five provinces were Beijing (0.35), Tianjin (0.35), Zhejiang (0.31), Jiangsu (0.29), and Gansu (0.31). The first four are all located in the developed eastern region and are leaders in industrial integration. Gansu has risen to the forefront thanks to its early integration of agricultural resources and favorable policies. The bottom five provinces were Chongqing (0.22), Yunnan (0.19), Xinjiang (0.17), Guangxi (0.16), and Hainan (0.14), primarily constrained by weak infrastructure and a single industry. By 2022, the top five had evolved into Beijing (0.55), Shandong (0.48), Zhejiang (0.47), Jiangsu (0.48), and Anhui (0.46), while the bottom five were Fujian (0.30), Yunnan (0.24), Shaanxi (0.30), Ningxia (0.30), and Hainan (0.29).

Eastern provinces continue to lead thanks to their technological innovation and concentrated resources. Beijing, through the deep integration of digital technology and urban agriculture, has seen its rural revitalization index increase by 57% over the past 13 years, maintaining its top position nationwide. Jiangsu and Zhejiang, leveraging the Yangtze River Delta integration strategy, have focused on smart agriculture and e-commerce to support agriculture, respectively, maintaining their top five positions. There is a clear divergence among central and western provinces: Anhui, benefiting from the Yangtze River Delta's radiating influence, has seen upgrades in agricultural technology and logistics systems propel it from sixth to fifth place. Gansu, however, has fallen out of the top five due to its overreliance on traditional crop production and a lack of industrial chain expansion. This reveals that policy guidance, regional collaboration, and industrial upgrading are the core drivers of regional development.

5. Empirical Test

5.1 Model Construction

To explore the impact of industrial integration on rural revitalization, this study constructs the following model for benchmark regression testing:

$$XC_{it} = \partial_0 + \partial_1 CY_{it} + \partial_2 Control_{it} + u_i + \delta_t + \varepsilon_{it} \quad (11)$$

Where XC_{it} represents the rural revitalization index, measuring the level of rural revitalization in region i in year t. CY_{it} is the core explanatory variable and the industrial integration index, measuring the degree of industrial integration in region i in year t. u_i represents the region fixed effect, controlling for time-invariant regional characteristics. δ_t represents the time fixed effect, controlling for the impact of factors such as macroeconomic policies and national economic fluctuations. ε_{it} is the random error term. Given the high dimensionality of the panel data used in this study and the need to control for multiple fixed effects, this paper uses high-dimensional fixed-effect regression for estimation. If the regression coefficient α_1 is significantly positive, it indicates that regional industrial integration has a positive impact on rural revitalization, supporting our theoretical expectations.

5.2 Data Source

This article examines the impact of regional industrial integration on rural revitalization using panel data from provinces nationwide from 2010 to 2022. The data used in this article primarily comes from the China Statistical Yearbook and the Guotai An database. Due to missing data during the data collection process, linear interpolation was used to fill in gaps.

Among them, the control variables include the intensity of fiscal support (general fiscal budget expenditure/regional GDP), the intensity of government intervention (fiscal expenditure/regional GDP), the labor force level (natural logarithm of the number of employed persons) and the income gap between urban and rural residents (per capita disposable income of urban residents/per capita disposable income of rural residents).

5.3 Benchmark Regression

Table 5 reports the regression results of the industrial integration index of various regions on the rural revitalization index. Among them, column (1) is the statistical result without considering the control variables and fixed effects, column (2) is the estimated result after controlling the fixed effects of cities and years, and columns (3) and (4) are the estimated results after adding control variables such as fiscal support intensity and government intervention intensity on the basis of columns (1) and (2). The results show that no matter what the situation, the regression coefficient of the industrial integration index is significantly positive, which to a certain extent indicates that the level of industrial integration in various regions has a positive promoting effect on the results of rural revitalization. As mentioned above, all parts of the country have actively responded to the call of the Party Central Committee on promoting the comprehensive revitalization of rural areas. Through the deep integration of agriculture with the secondary and tertiary industries (such as agricultural product processing, rural tourism, cultural creativity, etc.), the agricultural industry chain is extended, the added value of agricultural products is increased, and the traditional single agricultural operation model is broken. Accelerate the empowerment of industrial integration through digital technology and inject new momentum into rural revitalization.

Table 5: Benchmark regression results

variable	(1)	(2)	(3)	(4)
	Rural Revitalization Index	Rural Revitalization Index	Rural Revitalization Index	Rural Revitalization Index
Industrial Integration Index	0.7139 *** (0.0743)	0.122 1 *** (0.0397)	0.5223*** (0.0768)	0.0683* (0.0391)
Financial support			-1.3584** (0.5905)	0.627 5 *** (0.1787)
Government intervention			0.8971 (0.5763)	- 0.497 4 *** (0.1710)
Labor force levels			0.0082 (0.0103)	0.038 3 ** (0.0173)
Income gap between urban and rural residents			-.000 3 (0.0182)	0.0251 * (0.0149)
Constant	0.1057 *** (0.0247)	0.296 6 *** (0.0128)	0.227 7 ** (0.0976)	- 0.077 2 (0.1352)
Fixed region	no	yes	no	yes
Fixed time	no	yes	no	yes
Observations	377	377	377	377
R2	0.1974	0.9894	0.3948	0.9863

Note: ***p<0.01, **p<0.05, *p<0.1.

Table 6: Robustness analysis results

variable	(1)	(2)	(3)	(4)	(5)
				first stage	second stage
	Rural Revitalization Index	Rural Revitalization Index	Rural Revitalization Index	Industrial Integration Index	Rural Revitalization Index
L.Industry Convergence Index				0.856*** (27.31)	
Industrial Integration Index	0.0720* (0.0393)	0.0781* (0.0416)	0.0683* (0.0397)		0.083* (1.71)
Financial support	0.6523*** (0.1806)	0.5213*** (0.1671)	0.6275*** (0.1470)	-1.697 (-1.30)	-3.481** (-1.98)
Government intervention	-0.5008*** (0.1711)	-0.4641*** (0.1573)	-0.4974*** (0.1445)	1.754 (1.35)	3.608** (2.06)
Labor force levels	0.0388** (0.0173)	0.0326 (0.0203)	0.0383** (0.0185)	0.031** (2.33)	0.035* (1.92)
Income gap between urban and rural residents	0.0234 (0.0150)	0.0040 (0.0166)	0.0251 (0.0167)	-0.037*** (-2.99)	0.031* (1.94)
Tax burden level	-0.1216 (0.1268)				
Constant	-0.0736 (0.1352)	0.0233 0.1586	-0.0772 (0.1493)		
Anderson canon. corr. LM statistic				247.448 [0.0000]	
Cragg-Donald Wald F statistic				745.651 [16.38]	
Fixed region	yes	yes	yes	yes	yes
Fixed time	yes	yes	yes	yes	yes
Observations	377	319	377	348	348
R^2	0.9863	0.9879	0.9863		0.117

Note: ***p<0.01, **p<0.05, *p<0.1.

5.4 Robustness Analysis

In order to test the robustness of the baseline regression results, a robustness test is then conducted: (1) adding control variables: tax burden level, (2) changing the sample range, retaining the years 2010-2020 for regression, and (3) using robust standard errors. The regression results are shown in Table 6. It can be seen that the regression coefficient is still positive. The level of industrial integration in various places still has a positive promoting effect on the results of rural revitalization. The regression coefficient is significant, indicating that the robustness of the model has been verified. (4) Endogeneity test, using the lagged one period as an instrumental variable, using the 2SLS method, as shown in the fourth and fifth columns, respectively represent the first and second stage regression results. The results show that the first and second stage coefficients are both significant, and the instrumental variable passes the weak instrumental variable and unidentifiable test, that is, the conclusions in the following text using the instrumental variable are still robust.

5.5 Mechanism Analysis

Table 7 reports the results of this paper's mechanism analysis. This paper selects farmers' income (farmers' per capita net income) and industrial structure upgrading (tertiary industry output value/secondary industry output value) as mechanism variables. From Model (1) in Table 7, it can be seen that the impact of industrial integration on farmers' income is positive at the 1% significance level, indicating that the development of industrial integration can effectively increase farmers' income. This may be because farmers with increased income have more funds to invest in agricultural production, introduce advanced technology and equipment, promote agricultural scale, specialization, standardization and informatization, achieve a dual improvement in agricultural production efficiency and agricultural product quality, enhance agricultural competitiveness, and thus achieve rural revitalization.

Model (2) shows that industrial integration can positively influence industrial structure upgrading at a 5% significance level, that is, industrial integration is conducive to industrial structure upgrading. Industrial integration promotes the diffusion and integration of advanced technologies among rural industries, realizes industrial structure upgrading, and thus promotes the intelligent and information-based development of rural industries, improves production efficiency and product added value, and realizes rural revitalization.

Table 7: Mechanism analysis

variable	(1) Farmers' income	(2) Industrial structure
Industrial Integration Index	0.723***	0.691**
	(3.16)	(2.16)
Financial support	0.725	4.686***
	(0.69)	(3.21)
Government intervention	-0.994	-2.158
	(-0.99)	(-1.54)
Labor force levels	0.188*	0.147
	(1.85)	(1.04)
Income gap between urban and rural residents	1.091***	0.312**
	(12.52)	(2.56)
Constant	-3.172***	-1.512
	(-4.01)	(-1.37)
Fixed region	yes	yes
Fixed time	yes	yes
Observations	377	377
R-squared	0.977	0.972

Note: ***p<0.01, **p<0.05, *p<0.1, t-statistics in parentheses.

5.6 Heterogeneity Analysis

From the previous analysis, it can be seen that the level of rural revitalization in different regions is unbalanced. In order to study the role of the level of industrial integration in different regions on the results of rural revitalization, this article divides China's provinces and cities into the eastern, central and western regions for empirical analysis. The empirical results are shown in the following table.

Table 8: Heterogeneity analysis results

variable	(1) east Rural Revitalization Index	(2) Central Rural Revitalization Index	(3) west Rural Revitalization Index
Industrial Integration Index	0.111**	0.0482	0.0805
	(0.0449)	(0.105)	(0.0753)
Financial support	0.371	1.473**	0.778***
	(0.335)	(0.707)	(0.270)
Government intervention	-0.455	-1.499**	-0.617**
	(0.329)	(0.694)	(0.257)
Labor force levels	0.0345*	-0.0492**	0.216***
	(0.0186)	(0.0246)	(0.0611)
Income gap between urban and rural residents	-0.00772	0.0824**	-0.133***
	(0.0232)	(0.0347)	(0.0328)
Constant	0.147	0.498**	-0.999**
	(0.152)	(0.217)	(0.409)
Fixed region	yes	yes	yes
Fixed time	yes	yes	yes
Observations	156	78	143
R-squared	0.981	0.991	0.986

Note: ***p<0.01, **p<0.05, *p<0.1.

Table 8 shows that in the eastern region, the coefficient of the industrial integration index is significantly positive (0.111), indicating that inter-industry synergies can effectively translate into driving forces for rural revitalization. This is likely due to the more mature industrial system and market-oriented mechanisms in the eastern region, which provide technological, capital, and industrial chain support for integration. In contrast, the industrial integration coefficients in the central and western regions failed to pass the significance test (0.0482 in the central region and 0.0805 in the western region), suggesting that the marginal benefits of industrial integration have not yet been fully realized, possibly due to structural constraints such as weak infrastructure and poor factor mobility. This result is consistent with the analysis above. Overall, the effectiveness of industrial integration shows a "strong in the east, weak in the west" pattern, and differences in regional development stages determine the priority of policy efforts.

5.7 Further Spatial Model Analysis

5.7.1 Spatial model construction

To further examine the spatial spillover effect of industrial integration on rural revitalization, referring to the literature of Yang Ligao and Han Feng et al. (2022), a spatial lag explanatory variable model was selected to measure the spatial spillover effect. The coefficient of the measured lag term directly reflects the spatial spillover effect, thereby constructing a spatial lag explanatory variable model:

$$\mathrm{XC}_{\mathrm{it}} = \gamma_0 + \gamma_1 \mathrm{CY}_{\mathrm{it}} + \gamma_3 C_{\mathrm{on}} trol_{it} + \theta W_{\mathrm{CY}_{\mathrm{it}}} + \varepsilon \quad (12)$$

5.7.2 Spatial weight matrix construction

Regarding the economic matrix (W), this article uses the difference in per capita GDP from 2010 to 2022 as the element of the weight matrix. When i=j, it indicates that it is the province, and the economic matrix value is directly assigned to zero. When i≠j, it is determined according to $W=1/|Q_i - Q_j|$, where Q_i and Q_j represent the average per capita GDP of province i and province j from 2010 to 2022, respectively.

$$\begin{cases} W_{ij} = 1/\left|Q_i - Q_j\right|, i \neq j \\ W_{ij} = 0, i = j \end{cases} \quad (13)$$

5.7.3 Spatial Correlation Test

The spatial autocorrelation test of the model is measured by the global MoranI index. The formula of MoranI is as follows:

$$\mathrm{MoranI} = \frac{n}{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}} \times \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(x_i-\overline{X})(x_j-\overline{X})}{\sum_{i=1}^{n}(x_i-\overline{X})^2} \quad (14)$$

Among them, the global Moran's index assesses the overall spatial pattern, with values ranging from -1 to 1. Values greater than 0 indicate positive correlation and similar data in adjacent regions, values less than 0 indicate negative correlation and large differences in data in adjacent regions, and values close to 0 indicate no significant spatial association.

As shown in Table 9, the Moran index is 0.416, the p-value is 0.00, and the test is passed at the 1% level, rejecting the hypothesis of no spatial autocorrelation.

Table 9: Spatial correlation test results

Moran I	0.41637018
Moran I-statistic	13.30177030
Marginal Probability	0.00000000
mean	-0.00570916
standard deviation	0.03173106

5.7.4 Benchmark Regression

Table 10 reports the regression results of spatial effects based on the spatial lag explanatory variable model under the economic matrix. The direct effect coefficient is 0.787029, which is significant at the 1% confidence level. It can be seen that industrial integration has a significant positive driving effect on rural revitalization; the indirect effect coefficient is 0.264138, which is significant at the 10% confidence level, indicating that there is a spatial spillover effect, that is, the level of industrial integration in the province can significantly and positively improve the level of rural revitalization in other provinces through the spatial spillover effect.

Table 10: Benchmark regression results

Variable	Coefficient	t-statistic	t-probability
Industrial Integration	0.787029	12.661591	0.000000
Financial support	-0.737051	-1.759893	0.079259
Government intervention	0.363785	0.900630	0.368376
Labor force levels	-0.018084	-2.157215	0.031638
Income gap between urban and rural residents	0.006631	0.402081	0.687859
W*Industry Integration	0.264138	1.667404	0.096287
W*Financial support	-1.310312	-1.131419	0.258617
W*Government intervention	1.377628	1.242509	0.214842
W* Labor Force Level	-0.009304	-0.423207	0.672392
W* income gap between urban and rural residents	0.067368	1.601822	0.110055
Fixed time	yes		
N	377		

6. Conclusion and Policy Recommendations

6.1 Conclusion

Within the framework of the national rural revitalization strategy, rural industrial integration has become a key tool for promoting agricultural and rural modernization, enhancing rural economic resilience, and achieving common prosperity. Based on panel data from 29 provinces in China from 2010 to 2022, this study explores the impact of rural industrial integration on rural revitalization. The results show that industrial integration has a significant positive impact on rural revitalization by increasing farmers' income and promoting industrial restructuring. It also exhibits spatial spillover effects, meaning that industrial integration within a province can drive the development of neighboring provinces through economic linkages. However, the impacts vary significantly across regions. While the marginal benefits of industrial integration are higher in eastern China, they are yet to be fully realized in central and western regions due to weak infrastructure and poor factor mobility. Overall, industrial integration plays a key role in the rural revitalization strategy, but policies tailored to local conditions are needed to optimize regional development models and alleviate imbalances in urban-rural and regional development.

6.2 Policy Recommendations

First, improve the institutional framework for industrial integration and strengthen the momentum for coordinated urban-rural development. Guided by the spirit of the Third Plenary Session of the 20th CPC Central Committee, establish an institutional framework for "two-way empowerment of urban and rural areas" to reduce barriers to the flow of factors caused by the urban-rural dual structure. Innovate mechanisms for urban-rural industrial collaboration, encourage urban industrial and commercial capital to participate in the development of distinctive rural industries, and activate the endogenous driving force of urban-rural factor convection through institutional reform.

Second, strengthen the cross-regional coordinated development system. While there are regional differences in the level of industrial integration, its spatial spillover effects indicate that industrial integration and upgrading in a single province can radiate and drive related industries in neighboring provinces, promoting rural revitalization. Therefore, the country should introduce corresponding policies and establish a cross-provincial industrial collaboration platform to promote the flow of factors and the complementarity of advantages, leverage the respective advantages of eastern and western regions, and jointly promote the comprehensive revitalization of rural areas.

Third, establish a long-term mechanism for ecological development. Deeply implement the ecological civilization philosophy of "lucid waters and lush mountains are invaluable assets," and deeply integrate ecological governance with rural industries. Focusing on industries such as low-carbon agriculture and green processing clusters, implement differentiated management and control for different regions. Build a green evaluation system for rural industries and establish an ecological compensation incentive mechanism, offering preferential policies to companies that adopt clean production technologies and implement ecological restoration projects. Guide the green transformation of industries through market-based means, achieve a dynamic balance between economic development and ecological protection, and provide institutional guarantees for regional sustainable development.

References

[1] Zhang Haipeng, Gao Liangliang, Yan Kun. Theoretical origins, main innovations and implementation paths of rural revitalization strategy[J]. Chinese Rural Economy, 2018, (11): 2-16.

[2] Lu Fengying, Pang Zhiqiang, Deng Guangyao. Research on the measurement of rural revitalization level and spatial correlation effect: A case study of Gansu Province[J]. Statistics and Decision, 2022, 38(23): 63-68.

[3] Shi Pengfei, Long Huibing, Tian Ziye, et al. Research on the measurement, spatial differentiation and convergence of China's rural revitalization level based on the PROMETHEE method [J]. Resource Development and Market, 2023, 39(8): 937-948.

[4] Zhang Ting, Li Minrong, Xu Yanmei. Construction and empirical research of rural revitalization evaluation index system[J]. Management World, 2018, 34(08): 99-105.

[5] Zhang Hongyan, Peng Bo. Measurement of rural revitalization development level, spatiotemporal pattern

and regional differences[J]. Modern Agricultural Research, 2025, 31(02): 50-61.
[6] Xiao Weidong, Du Zhixiong. Integration of primary, secondary and tertiary industries in rural areas: connotation, current development status and future ideas[J]. Journal of Northwest A&F University (Social Science Edition), 2019, 19(06): 120-129.
[7] Lv Tao, Nie Rui. Theoretical basis and manifestation of industrial linkage[J]. Industrial Technology and Economics, 2007, No.163(05):2-4.
[8] Tao Wuxian. Basic characteristics and focus of modern agriculture[J]. Chinese Rural Economy, 2004(03): 4-12+33.
[9] Wang Xinkun. Industrial integration: the new connotation of agricultural industrialization[J]. Agricultural Modernization Research, 2007, No.160(03): 303-306+321.
[10] Zhao Xia, Han Yijun, Jiang Nan. Integration of the three industries in rural areas: definition of connotation, practical significance and analysis of driving factors[J]. Issues in Agricultural Economy, 2017, 38(04): 49-57+111.
[11] Guo Yunyun, Yang Jiudong, Cao Bin. The evolution process, characteristics, problems and countermeasures of my country's rural industrial structure since the founding of the People's Republic of China[J]. Issues in Agricultural Economy, 2019, No.478(10):24-35.
[12] Liang Shuguang, Ma Zhongdong. Analysis of the correlation, path and effect of agricultural industry integration. Economic System Reform, 2017(6):79~84
[13] Zheng Yuanrong. Evaluation of the integration degree of primary, secondary and tertiary industries in rural Fujian Province and analysis of influencing factors. Journal of Inner Mongolia Agricultural University (Social Science Edition), 2020(2):77-84.
[14] Hou Bing, Zhou Xiaoqian. Measurement and evaluation of the integration of cultural industry and tourism industry in the Yangtze River Delta region[J]. Economic Geography, 2015, 35(11): 211-217.
[15] Cao Yixia, Geng Haoyi. An empirical study on the integration structure of urban agriculture and secondary and tertiary industries in Shanghai: A comparative analysis based on input-output tables. Journal of Fudan University (Social Sciences), 2018, (4): 149-157.
[16] Liu Shuoming, Fan Qinqin, Jia Wei. Mechanism explanation and path discussion on industrial integration promoting China's agricultural economic growth[J]. Issues in Agricultural Economy, 2024, (11): 104-112.
[17] Chen Yuying. Rural industrial integration, county entrepreneurship activities and farmers' income increase[J]. Journal of Shanxi University of Finance and Economics, 2024, 46(05):73-83.
[18] Liu Fei, Jia Shijun, Wang Xinliang. Rural industrial integration and farmers' common prosperity: An analysis of the pilot policy of rural complex[J]. Contemporary Economic Science, 2024, 46(04): 124-138.
[19] Zhao Xue, Shi Baofeng, Gai Qingen, et al. Promoting revitalization through integration: the income-increasing effect of new agricultural operators participating in industrial integration[J]. Management World, 2023, 39(06): 86-100.
[20] Bai Enlai, Yang Fan. Research on the impact of rural industrial integration on urban-rural income gap: A case study of the Yangtze River Economic Belt[J]. Agricultural Modernization Research, 2023, 44(05): 822-833.
[21] Cheng Li, Yan Yuecen, Tian Zesheng. Research on the multi-dimensional impact of rural industrial integration on the ecological environment: A case study of the Yangtze River Economic Belt[J]. Agricultural Economics and Management, 2024, (04): 105-120.
[22] Tian Caihong, Li Lin, Liao Bin. Can the integration of primary, secondary and tertiary industries in rural areas promote green agricultural development? — A case study of 579 counties in the Yangtze River Economic Belt[J]. Journal of Natural Resources, 2024, 39(03): 601-619.
[23] Xiang Yanping. Research on the internal mechanism and driving mechanism of rural revitalization driven by rural tourism[J]. Hunan Social Sciences, 2021, (02): 41-47.
[24] Qu Xueshu, Jiao Lihui. Research on the upgrading path of rural tourism industry under the background of rural revitalization[J]. Economic Issues, 2020, (12): 108-113.
[25] Long Jingran, Du Shanshan, Zhang Jingqiu. Rural revitalization development mechanism and model under the guidance of cultural and tourism integration[J]. Economic Geography, 2021, 41(07): 222-230.
[26] Gambardella, A., Torrisi, S. Does Technological Convergence Imply Convergence in Markets? Evidence from the Electronics Industry. Research Policy, 1998(5): 445-463.
[27] Fai, F., Von, T. N. Industry-specific Competencies and Converging Technological Systems: Evidence from Patents. Structural Change and Eco- nomic Dynamics, 2001(2): 141-170.
[28] Wan, X. Measuring Convergence of China's ICT Industry: An Input-Output Analysis. SSRN Electronic Journal, 2011(4): 301-313.
[29] Choi, J. Y., Jeong, S., Jung, J.K. Evolution of Technology Convergence Networks in Korea: Characteristics of Temporal Changes in R&D Ac- cording to Institution Type. Plos One, 2018(2): e0192195.