

Article

The Coupling and Coordination of Light Industry's High-Quality Development and Rural Revitalization in China

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Abstract

To promote Chinese-style modernization, we must unrelentingly promote the all-round revitalization of the countryside. Industry and agriculture are inseparable. The light industry is a traditionally dominant industry in China and is closely linked to the revitalization of rural areas. The coordination and resonance between the high-quality development of the light industry and rural revitalization is a significant area of research. This study developed models for coupling coordination degree and fuzzy set qualitative comparative analysis. It utilized data from 2012 to 2022 to empirically analyze the relationship between the high-quality development of China's light industry and rural revitalization. Both of the systems had reached a condition of moderate coupling and showed dynamic interactive coupling. The degree of coupling coordination is affected by multiple variables, like economic development and scientific and technological innovation. There are two ways to promote the two to achieve a highly coupled and coordinated state. Therefore, this study opens up a novel methodological perspective and innovative path for research in related fields.

Keywords: high-quality development of the light industry; rural revitalization; coupling coordination; fuzzy set qualitative comparative analysis



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1. Introduction

In October 2017, a report from the 19th National Congress of the Communist Party of China introduced a rural revitalization strategy for the first time. Document No. 1 of the Central Committee of the Communist Party of China for the year 2024 further underscores the advancement of Chinese-style modernization. It is imperative that we steadfastly reinforce the foundational aspects of agriculture while endeavoring to attain comprehensive revitalization and development of rural areas. The connection between industry and agriculture is inherently interconnected, and the complementarity between workers and farmers is well established as advantageous. Industry is the “booster” of agricultural development, whereas agriculture is the “stabilizer” of industrial development, and both support and complement each other.

The light industry is a traditionally dominant industry in China, which mostly uses agricultural products as raw materials, especially as a rigid industry in food, clothing, housing, use, and transportation, covering many industries, including agricultural food, textiles, and furniture manufacturing. All aspects of life in the light industry are linked to the agricultural economy. The development of the light industry and rural rehabilitation is

closely related, and both are vital for the sustained growth of the national economy. China's light industry contributes significantly to the steady expansion of the industrial sector, with its added value representing 16.2% of all industries in 2022. Several national policy papers, such as the work program for the steady growth of the light industry (2023–2024) and guidelines on promoting high-quality development within the sector, emphasize the need to advance light industry development in order to achieve notable improvements in quality and sustainable growth in quantity. This paper argues that the core connotation of the high-quality development of the light industry is reflected in the organic unity of the improvement of the stability of the economic cycle, the enhancement of the drive of scientific and technological innovation, and green and sustainable development.

The development of the light industry is a modern necessity, and the regeneration of rural areas is a prevalent trend. The main aim of this paper is to explore the coupling and coordination mechanism and enhancement path between the high-quality development of China's light industry and the revitalization of the countryside, and the purpose of our research is to achieve coordination and resonance between the high-quality development of the light industry and the revitalization of the countryside.

2. Journals Reviewed

2.1. Research on Rural Revitalization

In the domain of rural revitalization research, the overarching requirements of “prosperous industries, ecological livability, cultural ethos, effective governance, and affluent life” have become foundational guidelines. The majority of quantitative studies derive from the 20-character policy framework outlined in the 19th CPC National Congress report, with scholarly investigations spanning evaluation system construction [1], implementation pathways [2], typological characteristics [3], and policy impacts [4]. Researchers universally acknowledge the rural revitalization strategy as a cornerstone for advancing high-quality development, underscoring its critical significance in achieving moderate prosperity and accelerating socialist modernization.

The existing research focuses on the policy path, regional model, and technical empowerment of rural revitalization. On the policy analysis level, Guo and Li (2024) [5], based on the mixed research method of policy texts from 2018 to 2024, revealed the transformation trend of policy tools from exogenous drive to endogenous development, but their text analysis failed to effectively link policy implementation and implementation effects. At the micro level, although Zhou et al. (2025) [6] broke through the traditional paradigm, the case representation was insufficient. The research on technology empowerment shows obvious instrumental rationality. For example, Zhu's [7] digital inclusive finance research confirms the potential of technology monitoring, but underestimates the risk of digital exclusion; Peng et al. (2024) [8] neglected the heterogeneity of subjects in the analysis of the RIR effect. In terms of the evaluation system, the six-dimensional model developed by Lv and Zhang (2025) [9] expands the evaluation dimension, but its static analysis struggles to capture the dynamic complexity of rural revitalization. Although the four-dimensional framework of Li et al. (2019) [10] is systematic, it fails to address the dynamic response mechanism to spatial heterogeneity. At the same time, some scholars have also studied digital finance as a catalyst for rural revitalization [11], the challenges and promotion paths of rural industrial revitalization in counties [12], and the interactive relationship between new urbanization and rural revitalization [13]. Generally speaking, the existing research still has obvious limitations in terms of its theoretical construction, method application, and empirical testing, and it is urgent to establish a more dynamic and adaptive analytical framework.

2.2. Research on High-Quality Industrial Development

Existing studies on high-quality industrial development primarily focus on four key dimensions: performance measurement [13], enhancement pathways [14], innovation strategies [15], and influencing factors [16]. While these studies have established multi-dimensional analytical frameworks, there remains significant room for methodological innovation and theoretical deepening. Cui Li et al. (2024) [17] used the system dynamics model to prove the driving effect of the synergy of innovation factors on the upgrading of the manufacturing industry, but its R&D measurement index failed to reflect the innovation and ecological change caused by digital technology. Liu J et al. (2023) [18] constructed a five-dimensional evaluation system to evaluate the quality of tourism development. Although the endogenous problems were solved by the time-varying DID method, the definitions of “shared development” and regional heterogeneity were not considered sufficient. In research on the light industry, the empirical analysis of the Shaanxi light industry’s transformation by Guoying W et al. (2024) [19] fails to explore the micro-enterprise behavior mechanism; Fei Wang et al. (2020) [20] broke through the traditional cost theory framework, but failed to effectively control the interference of policy variables. Chenchen W et al. (2023) [21] revealed the carbon transfer effect in international trade based on the MRIO model, but the data lag affected the timeliness of the conclusion; Roleders et al. (2023) [22] neglected the environmental responsibility of consumers. Generally speaking, the existing research still has obvious limitations in terms of index construction, model applicability, and micro-mechanism.

Meanwhile, in 2022, the Guidelines for Promoting the High-Quality Development of Light Industry, jointly issued by five departments, including China’s Ministry of Industry and Information Technology, specified the development goals of the light industry in the next four years, aiming to significantly enhance the comprehensive strength of the light industry and strengthen its ability to promote high-quality economic and social development. Therefore, further in-depth study of the development situation of the light industry is needed in order to promote the high-quality development of the light industry.

2.3. Research on Industrial Convergence and Rural Revitalization

The cross study of industrial integration and rural revitalization has formed a multi-dimensional analysis framework, but the theoretical depth and method innovation still need to be improved. Shao et al. (2022) [23] studied the new energy finance technology used to empower rural revitalization, but ignored the influence of regional resource endowment differences on technology adaptability. Xiang and Junwen (2022) [24] discussed the high-quality development of grain industry, but did not include the synergistic effect analysis of food security and rural revitalization. LI et al. (2024) [25] constructed the evaluation system of the integration of three industries, but the static analysis struggles to reflect the dynamic evolution and focuses on economic indicators while ignoring the ecological and social benefits. Guan (2024) [26] used principal component analysis to identify the elements of agricultural and industrial economic management, but failed to explain the innovation mechanism under the digital economy. Wu and Fang (2025) [27] put forward four modes of industrial integration, but the classification criteria are vague and there is a lack of research on the mode transformation mechanism. Jia et al. (2025) [28] analyzed the Anhui tea industry from the perspective of new quality productivity, but did not establish a quantitative model of cultural capital transformation. Luo et al. (2025) [29] explored the path of integration of production and education, but the single case study limited the theoretical popularization, and the research on the matching mechanism between education supply and industrial demand was insufficient. The existing research still has obvious limitations in regional differences, dynamic evolution analysis, and multi-dimensional evaluation.

In terms of related integration research, the current results mainly focus on the overall relationship between industrial development and rural revitalization, or the impact of specific industries such as tourism and the food industry on rural revitalization. On the one hand, “industrial prosperity” is the core content of the rural revitalization strategy, and since the rural revitalization strategy was proposed in 2017, there have been significantly more development opportunities in agriculture and rural areas, especially the rapid development of a series of new industries and new business forms in rural areas. Comprehensively promoting the revitalization of the countryside will strongly promote the national economic cycle into a benign cycle of industrial upgrading driven by the optimal allocation of factors, and industrial development, which will in turn increase the income of residents. On the other hand, industrial revitalization is the key to comprehensively promoting rural revitalization, the economic foundation of rural revitalization, and an important goal in realizing the modernization of agriculture and rural areas.

In summary, the definitions of related concepts and measurement systems have established a robust research foundation that supports high-quality industrial development and the revitalization of rural areas. Nevertheless, there is a paucity of studies examining the interplay between the high-quality development of industry, particularly within the light industry sector, and rural revitalization. Existing research primarily remains at a qualitative risk assessment level. There exists a deficiency in comprehensive quantitative research regarding the interplay between the high-quality development of the light industry and the revitalization of rural areas. The internal relationship between the two systems has yet to be thoroughly examined, thereby failing to establish a theoretical basis for industrial, economic, and socially balanced development. This study systematically developed a theoretical framework to examine the coupling and coordination between the high-quality development of China’s light industry and rural revitalization. It enhances the theoretical understanding of the internal relationships and interaction mechanisms between these two domains, thereby establishing a foundational theoretical basis for follow-up research. This has helped promote the progress of academic research in related fields. After measuring the coupling coordination degree of the two systems, this study used the fuzzy set qualitative comparative analysis (fsQCA) method to investigate the key factors and pathways that influence the development of the coupling coordination degree of the two systems. This approach has introduced a novel methodological perspective and an innovative pathway for research in related fields, thereby contributing to the alignment and synergy between the high-quality development of the light industry and the revitalization of rural areas.

3. Research and Design

3.1. Analysis of the Current Situation

3.1.1. Status of High-Quality Development of the Light Industry

According to the statistical bulletin on the development of the light industry, in 2013, all industrial enterprises in the light industry realized a cumulative total of CNY 24.7 trillion in main business income. In 2013, all industrial enterprises in the light industry realized a total of CNY 24.7 trillion in main business income, of which CNY 20.3 trillion was realized by industrial enterprises above the designated size, an increase of 13.66% over the previous year. In 2013, all industrial enterprises in the light industry realized a total of CNY 1.7 trillion in profit. Among them, the industrial enterprises above the designated size accumulated profit of CNY 1.3 trillion, an increase of 14.61% over the previous year.

In 2017, the industrial enterprises above scale in the light industry realized a cumulative main business income of CNY 24.2 trillion, up 8.34% year-on-year, and the industrial enterprises above scale in the light industry realized a cumulative profit of CNY 1.6 trillion, up 8.96% year-on-year. The profit rate of main business income of industrial enterprises

above scale in light industry was 6.56% in 2017. Among the 92 kinds of light industrial products counted by the National Bureau of Statistics, 73 kinds of product output realized positive growth, accounting for 79.35% of all light industrial products.

In 2023, all industrial enterprises in the light industry realized a cumulative business income of CNY 26 trillion, of which, enterprises above designated size realized a cumulative business income of CNY 22.2 trillion, an increase of 1.6% year-on-year.

3.1.2. Current Status of Rural Revitalization Development

The 2022 China Rural Revitalization Development Report points out that five years since the implementation of the rural revitalization strategy, especially in 2022, the agricultural economy has continued to grow steadily, the supply of major agricultural products has been abundant, the construction of agricultural infrastructure has been outstandingly successful, the appearance of the countryside and the human habitat has been significantly improved, rural governance and the standard of living of farmers has been markedly improved, and rural revitalization has made significant achievements and provided solid support for economic development and social stability.

The data in the report show that in 2021, the total output value of the national agriculture, forestry, animal husbandry and fishery industry reached CNY 14,701.3 billion, up 38.1% from 2016, whereas agricultural labor productivity reached CNY 48,000 per person, up 54.8% from 2016. The agricultural product processing industry is accelerating, with the national agricultural product processing and the conversion rate reaching 70% in 2021, and the ratio of the output value of the agricultural product processing industry to the total agricultural output value reaching 2.5:1, an increase of 12.61% from 2016. The report summarizes the remarkable results achieved in the country's rural ecology, rural civilization, rural governance, and the improvement of farmers' lives. It is worth mentioning that in 2021, the per capita disposable income of rural residents reached CNY 18,931, an increase of about 53.1% over 2016. Over the past five years, the per capita disposable income of rural residents has grown significantly faster than the per capita disposable income of urban residents, and the income ratio between urban and rural residents has narrowed from 2.72 in 2016 to 2.5 in 2021.

Data from the Report on the Implementation of the Strategic Plan for Rural Revitalization (2020) show that grain output has been "seventeen consecutive years of abundance", stabilizing at more than JIN 1.3 trillion for six consecutive years, and that pig production capacity has basically recovered to the perennial level, thus playing the role of a ballast stone in maintaining stable economic and social development; the rural poor have all been lifted out of poverty under the current standards, and 832 poor counties have all been lifted out of poverty. All 832 less affluent counties have been accounted for, and all 128,000 less affluent villages have been listed, so that the problem of absolute poverty in rural areas has been solved in a historic way. The level of agricultural modernization has reached a new level, with the contribution rate of scientific and technological progress in agriculture exceeding 60%, and the comprehensive mechanization rate of plowing, planting, and harvesting reaching 71%; the national operating income from the processing of agricultural products has reached CNY 23.2 trillion, and the retail sales volume of the rural network has reached CNY 179 million; there are more than 10 million returnees to the countryside who will engage in entrepreneurial and innovative activities, and new industries and new forms of business are booming in the countryside. Rural living conditions have improved markedly, with villages and towns being connected to electricity, hardened roads, and 4G networks. The three-year campaign to improve the rural human settlements environment has been completed in a better way; the per capita disposable income of rural residents has

reached CNY 17,131, more than double that of 2010; and the level of basic public services has been further raised.

3.2. Coupling Relationship Analysis

3.2.1. Driving Effect of High-Quality Development of the Light Industry on Rural Revitalization

The cornerstone of rural revitalization lies in industrial revitalization, which is decisive in promoting all-round revitalization. The robust and healthy development of the industry may serve as a sustained and enduring force for the comprehensive revitalization of rural areas, thereby facilitating the overall rejuvenation of the countryside. The light industry, a traditionally advantageous industry that contributes significantly to China's national economy, has multiple responsibilities, including promoting market prosperity, increasing employment opportunities, and serving agriculture and rural farmers. The subject plays a crucial role in the process of rural revitalization, as detailed in the following discussion.

First, it promotes industrial linkages and enhances the vitality of rural economies. The production of the light industry involves the development of the industrial chain of raw materials, processing, manufacturing, sales, and many other links. This chain establishes an effective interconnection with the agricultural economy. The advancement of the light industry in rural areas can facilitate the integration of modern industrial production concepts and a people-oriented service industry. This development can foster innovation in production technologies and organizational models, extend the agricultural and industrial chains vertically, diversify the rural industrial landscape horizontally, and establish a comprehensive rural modern industrial production and management system. The light industry, through the utilization of advanced technology, has the potential to facilitate the development of the agricultural product processing sector. By leveraging intelligent logistics, it can optimize the productive service industry associated with agricultural products, ensuring a seamless connection from the field to the consumer's table. This approach not only extends the agricultural industrial chain but also enhances the added value of agricultural products. Consequently, it contributes to an increase in farmers' income, fosters the transformation of rural industries towards scalability and modernization, and further advances the establishment of a modern rural industrial system [30]. Additionally, it has the potential to expedite the process of agricultural modernization and infuse new vitality into the rural economy.

Second, the initiative not only improves the quality of life of farmers but also fosters the integrated development of both urban and rural areas. The advancement of high-quality development within the light industry, which serves as the primary source of consumer goods for both urban and rural populations, is intrinsically connected to the improvement of the material and spiritual living standards of residents, especially in rural regions. Developing the light industry may effectively promote the improvement of farmers' material and spiritual lives and their quality of life. The light industry mostly depends on agricultural products as raw materials that are closely connected to people's daily lives. With the rise of rural industries, the light industry has become an important basis for "organic coordination and balanced communication" between urban and rural economies [31]. This increases the production rate of the rural industry, promotes the separation of industrial labor from agricultural labor, accelerates the transition of urban–rural relations from a state of separation and opposition to one of integration, and contributes to addressing the problem of imbalance and inadequacy in the development of urban and rural areas in China.

Third, the initiative focuses on the excavation of local characteristic industries while promoting sustainable development in agriculture and rural areas. Define the strategic direction of rural industries based on the principles of "small but beautiful, small but excellent, small but many" [32]. The high-quality advancement of the light industry in rural

regions, characterized by high-quality development, has the potential to integrate local traditional culture with distinctive industries, thereby fostering both cultural inheritance and innovation. The simultaneous development of green industries in agricultural and rural areas represents a viable solution to the challenges faced by agriculture, rural communities, and farmers, while also facilitating the revitalization of these regions. The advancement of the light industry towards high-quality development is fundamentally based on the principles of green development and sustainable development. We should reduce or even eliminate pesticide residues and industrial waste gas emissions, enhance the availability of environmentally sustainable and high-quality agricultural products, and promote the transformation of rural industries to green industries, such as circular agriculture, ecological agriculture, and organic agriculture. Gradually building a green industrial structure system that can effectively increase farmers' income improves environmental benefits and achieves sustainable development [33], possibly reducing the consumption and waste of resources and creating a green product brand that is rich in local flavor.

3.2.2. Feedback Effect of Rural Revitalization on the High-Quality Development of the Light Industry

To comprehensively advance rural revitalization, China should achieve the goals of urban–rural integration and sustainable development in many areas, including industrial development, the living environment, rural civilization, living standards, and community governance. Within this framework, the enforcement of the rural revitalization strategy has engendered unprecedented prospects for the advancement of the light industry, concurrently setting higher benchmarks. The feedback effect of the high-quality development of the light industry on the revitalization of townships and villages is primarily evident based on the following key aspects.

First, it releases consumption potential and expands the market demand for the light industry. The implementation of the rural revitalization strategy has substantially improved agricultural prosperity and development. This has resulted in an increase in farmers' income, an expansion of the rural market scale, and the unlocking of potential for rural consumption [34]. This may also more effectively stimulate the growth of China's domestic demand and improve the quantity and quality of consumption, economic development's endogenous driving force, and internal circulation quality. Upgrading consumption may inevitably increase market demand and development opportunities for light industrial enterprises, strengthen the production scale effect and sustainable production capacity of excellent light industrial enterprises, and provide more extensive market and business opportunities for the light industry. It enhances the production and innovation power of the light industry.

Second, we should promote industrial complementarity and optimize the structure of the light industry. Promoting rural revitalization must be accompanied by integrating and developing cities and townships and coordinating new industrialization, urbanization, and all-around revitalization of rural areas. With deepening industrial integration, the number of industrial projects in cities and towns in rural areas continues to increase. The industrial framework in rural regions can be modified, enhanced, and advanced by leveraging the synergistic conditions present in both urban and rural industries. The refinement and enhancement of rural industrial structures have facilitated the dissemination of advanced agricultural processing technologies and the emergence of a novel rural economic paradigm. This, in turn, fosters agricultural and rural industrialization, reinforces the synergies and complementarity between rural and urban industries, cultivates industrial chains and clusters, elevates production efficiency and quality standards, and ultimately optimizes the structural configuration of the light industry.

Third, it relies on technological innovation to push the light industry towards a phase of high-quality development. Guided by the rural revitalization strategy, the industries in townships and villages are undergoing rapid development, trending towards diversification and modernization. The consumer market within the light industry is continuously expanding, accompanied by ongoing optimization of the industrial structure, which collectively contributes to the increasing overall strength of the light industry. Light industry enterprises possess greater capital resources to invest in scientific and technological advancements. They consistently innovate their products, facilitate the processes of transformation and upgrading, and advance the light industry towards a high-quality stage characterized by innovation, coordination, sustainability, openness, and inclusiveness. Based on this, the theoretical framework of coupled coordination of high-quality development of China's light industry and rural revitalization is obtained (Figure 1).

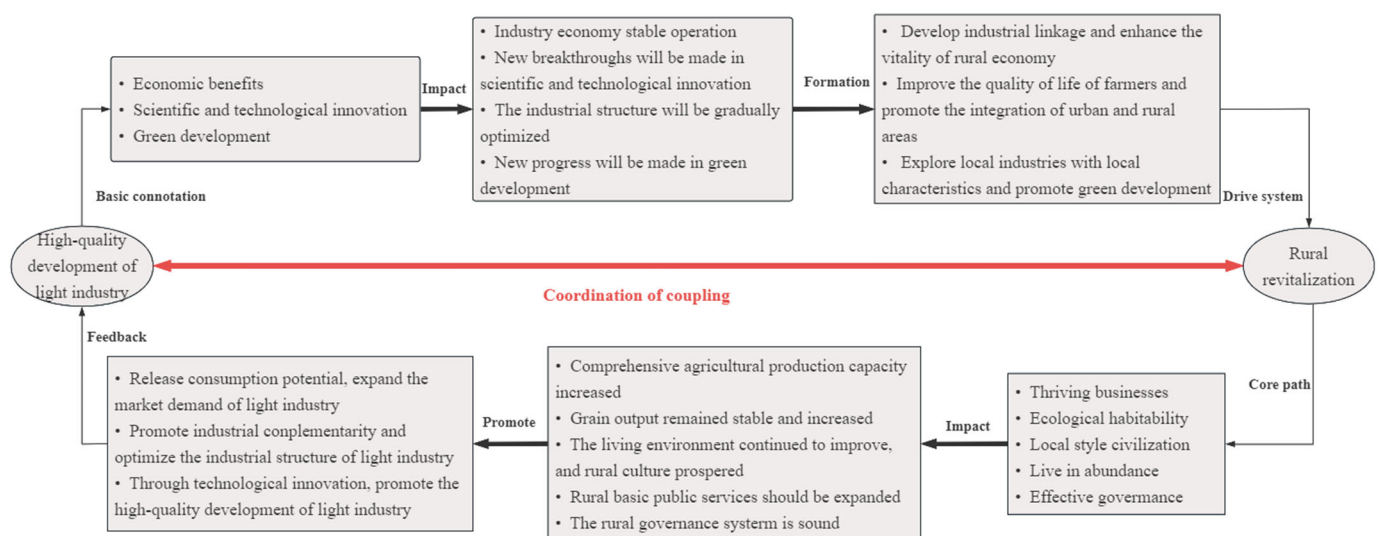


Figure 1. Theoretical framework for coupled coordination of high quality. Development of the light industry and rural revitalization (image from the author).

3.3. Data Sources

To comprehensively and accurately evaluate the policy-driven impact of the rural revitalization strategy, which was formally proposed at the 19th National Congress of the Communist Party of China in 2017, this study utilized data spanning five years prior to and following the policy's implementation. The objective was to undertake a comparative analysis aimed at elucidating the variations in the level of integration and synchronization between the high-quality advancement of the light industry and rural revitalization, prior to and subsequent to the initiation of the rural revitalization strategy. The sample for this study encompassed the high-quality development metrics of 16 sub-industries within the light industry sector in China, as well as the rural revitalization index data from 30 provinces, municipalities, and districts in China (excluding Hong Kong, Macao, Taiwan, and Tibet) for the period spanning from 2012 to 2022. Linear interpolation was used to fill the missing values.

3.4. Research Methods

3.4.1. Coupling Coordination Model

The degree of coupling coordination represents a crucial indicator for evaluating the intensity of interaction and the extent of influence among two or more systems. It provides a comprehensive evaluation of the developmental and coordinated state between these systems, encompassing two dimensions: the degrees of coupling and coordination.

The level of coupling reflects the magnitude of interconnectedness between the systems. A higher degree of coupling signifies a closer relationship among the systems, whereas coordination reflects the extent of mutual enhancement between subsystems; thus, a higher degree of coordination suggests a more pronounced positive promotional effect between the systems [34]. As a result, this research employed the coupling coordination model to evaluate the interplay and synchronization between the high-quality progression of China's light industry and the revitalization of rural areas.

3.4.2. fsQCA

The fsQCA method is a case study-oriented, Boolean algebra, and fuzzy-set-based research method proposed by Ragin in 1987. It is devoted to exploring and mining causal complexity and has qualitative and quantitative attributes [35]. The fsQCA has a small sample size, making it more suitable for small-sample research. From the perspective of configuration thinking, it examines the relationship between multiple factors, which is more in line with reality. This research utilized the fsQCA approach to explore the determinants shaping the integration and synchronization between the high-quality advancement of the light industry and the revitalization of rural areas in China. The aim is to enhance the coupling coordination between these two domains.

3.5. Definition and Selection of Indicators

The light industry, recognized as a traditional strength and a vital sector within China's economic system, significantly contributes to the national economy and is an integral component of the economic cycle. Tian S et al. [36] believes that the essence of high-quality development lies in the enhancement of economic vitality, driving force, innovation potential, and market competitive advantage. He particularly emphasizes the importance of improving input–output efficiency and overall economic efficiency. This research proposes that the high-quality development of the light industry encompasses three facets: ensuring the stable performance of the light industry economy, fostering advancements in scientific and technological innovation, and advancing green and sustainable development. This study examines the index measurement of high-quality development within the light industry, drawing insights from the evaluation index systems constructed by Wu Z et al. [37], Zhou Z et al. [38], and Qu L et al. [39]. This research developed a comprehensive assessment framework for evaluating the high-quality progression of the light industry, emphasizing three key aspects: economic performance, technological advancements, and environmental sustainability. The entropy weight approach was utilized to determine the significance of each index, thereby augmenting the precision and rigor of the evaluation outcomes. Entropy serves as an indicator of the level of disorder present within a system. A higher degree of discretization of the index correlates with a lower entropy value, indicating that the index conveys a greater amount of information; conversely, a lower degree of discretization results in higher entropy and less informative weight. The specific formula for calculation is derived from the research conducted by Hua M et al. [40], with the findings detailed in Table 1.

In the report of the 19th National Congress of the Communist Party of China, the 20-character guideline of the Rural Revitalization Strategy was established as the overarching objective and core requirement for rural revitalization. This guideline comprehensively addresses multiple dimensions of rural development, including economy, ecology, culture, society, and governance, thereby delineating the ideal vision pursued by rural revitalization initiatives. This paper posits that rural revitalization constitutes an integrated and interconnected whole encompassing five interrelated dimensions: industrial prosperity, human capital development, cultural advancement, ecological conservation, and organiza-

tional revitalization. Each of these dimensions embodies a rich connotation, collectively contributing to the holistic advancement of rural areas.

Table 1. Evaluation index system and weights for high-quality development of the light industry. (image from the author).

First-Level Index	Secondary Index	Third-Level Indicators (Unit, Nature of Indicators)	Data Sources	Weight
Economic performance (0.524)	Business performance	Profit margin of industrial enterprises (% , +)	<i>China Statistical Yearbook</i>	0.321
	Competitive ability	The proportion of total assets of industrial enterprises to GDP (Gross Domestic Product) (% , +)	<i>China Statistical Yearbook</i>	0.095
		The proportion of total assets of industrial enterprises to GDP (% , +)	<i>China Statistical Yearbook</i>	0.108
Scientific and technological innovation (0.444)	Innovation investment	Number of enterprises with Rened activities (units , +)	<i>China Science and Technology Statistical Yearbook</i>	0.124
		Full-Time Equivalent of Research and Development Personnel (person year , +)	<i>China Science and Technology Statistical Yearbook</i>	0.130
	Innovation output	Number of new product development projects (items , +)	<i>China Science and Technology Statistical Yearbook</i>	0.190
Green development (0.032)	Green production	Sulfur dioxide emissions (tons , −)	<i>China Environmental Statistics Yearbook</i>	0.008
		Nitrogen oxide emissions (tons , −)	<i>China Environmental Statistics Yearbook</i>	0.008
		Electricity consumption (billion kilowatt-hours , −)	<i>China Energy Statistics Yearbook</i>	0.016

Note: In the nature of the indicator, + means that the indicator has a positive impact on the variable and − means that the indicator has a negative impact on the variable.

Regarding the measurement of rural revitalization indicators, this study constructs primary indicators for assessing rural revitalization based on the five dimensions outlined in the 20-character guideline of the Rural Revitalization Strategy, as detailed in Table 2. The framework integrates the “Key Indicators of the Rural Revitalization Strategic Plan” from the Rural Revitalization Strategic Plan (2018–2022) and draws upon methodologies from prior studies by Li et al. (2023) [41] and Zhang et al. (2018) [42]. Specifically, the indicator system aligns with the five core aspects of rural revitalization: prosperous industry, ecological livability, civilized countryside, effective governance, and affluent living, comprehensively evaluate progress toward the strategic objectives.

Table 2. Rural revitalization evaluation index system and weights. (image from the author).

First-Level Index	Secondary Index	Third-Level Indicators (Unit, Nature of Indicators)	Data Source	Weight
Industrial prosperity (0.193)	Industrial efficiency	The proportion of added value of primary industry to GDP (% , +)	<i>China Statistical Yearbook</i>	0.046
		Labor productivity (CNY/person, +)	<i>China Statistical Yearbook</i>	0.054
	Agricultural modernization	Total power of agricultural machinery (10,000 kilowatts, +)	<i>China Statistical Yearbook</i>	0.093
Ecologically livable (0.165)	Human settlement environment	Per capita residential floor space in townships (square meters, +)	<i>Statistical Yearbook of Urban and Rural Construction in China</i>	0.046
		Township green coverage (% , +)	<i>Statistical Yearbook of Urban and Rural Construction in China</i>	0.071
	Health care	Number of rural health technicians per 10,000 people (person, +)	<i>China Statistical Yearbook</i>	0.048
Civilization of rural style (0.187)	Cultural consumption	The proportion of rural residents' expenditure on education, culture, and entertainment (% , +)	<i>China Rural Statistical Yearbook</i>	0.020
	Construction of rural public culture	Per capita collection of public libraries (volumes, +)	<i>China Statistical Yearbook</i>	0.093
		Number of cultural stations in villages and towns (unit, +)	<i>China Statistical Yearbook</i>	0.074
Effective governance (0.384)	Grass-roots service	Number of units in community service centers (units, +)	<i>China Civil Affairs Statistical Yearbook</i>	0.097
	Governance measures	Number of villagers' committees (individual, +)	<i>China Civil Affairs Statistical Yearbook</i>	0.101
		Director of the Villagers' Committee and Party Branch Secretary Shouldering Dual Responsibilities (person, +)	<i>China Civil Affairs Statistical Yearbook</i>	0.186
Live a rich life (0.071)	Farmers' income level	Income comparison between urban and rural residents (CNY/person, −)	<i>China Rural Statistical Yearbook</i>	0.013
		Per capita disposable income of farmers (CNY, +)	<i>China Statistical Yearbook</i>	0.047
	Farmers' consumption structure	Engel coefficient of rural families (% , −)	<i>China Statistical Yearbook</i>	0.011

Note: In the nature of indicator, + means that the indicator has a positive impact on the variable and − means that the indicator has a negative impact on the variable.

4. Analysis of the Coupling Coordination Degree Between the High-Quality Development of China's Light Industry and Rural Revitalization

4.1. Analysis of Coupling Coordination Level

4.1.1. Coupling Coordination Degree Model

A coupling degree is a dynamic correlation degree that quantifies the level of interaction between two or more systems, facilitating their coordinated development. This reveals a close relationship between interdependence and restrictions between systems

(Zhao H, Meng Y, 2022) [43]. The degree of coupling serves as an indicator of the strength of coordination between the systems, as well as their capacity to adapt and adjust to each other. The coupling model that illustrates the relationship between the two systems is presented as follows:

$$C = \frac{\sqrt{U1 \times U2}}{U1 + U2} \quad (1)$$

$U1$ and $U2$ denote the levels of the high-quality development in the light industry and rural revitalization, respectively. C signifies the intensity of coupling between these two systems. A higher C value implies a stronger interdependence between the systems, whereas a lower C value indicates a weaker connection.

To avoid the issue of low-level yet high coupling and to ensure an accurate reflection of the coordinated development level between the two systems, this paper employs the coordination coupling degree model to thoroughly evaluate the intensity of interaction and the degree of coordination between them. The corresponding calculation formula is presented as follows:

$$T = \alpha U1 + \beta U2 \quad (2)$$

$$D = \sqrt{C \times T} \quad (3)$$

T signifies the aggregate comprehensive evaluation score of the two systems, whereas D represents the degree of coupling coordination between them. In this study, both systems are deemed to possess equal significance, hence the coefficients α and β , which are to be determined, are assigned a value of 0.5. According to the research conducted by Tian Wanhui et al. (2023) [44], the degree of coupling coordination is classified into ten distinct categories.

4.1.2. Result Analysis

The extent to which China's rural recovery and the superior growth of recently emerging businesses coincided between 2012 and 2022 is shown in Figure 2.

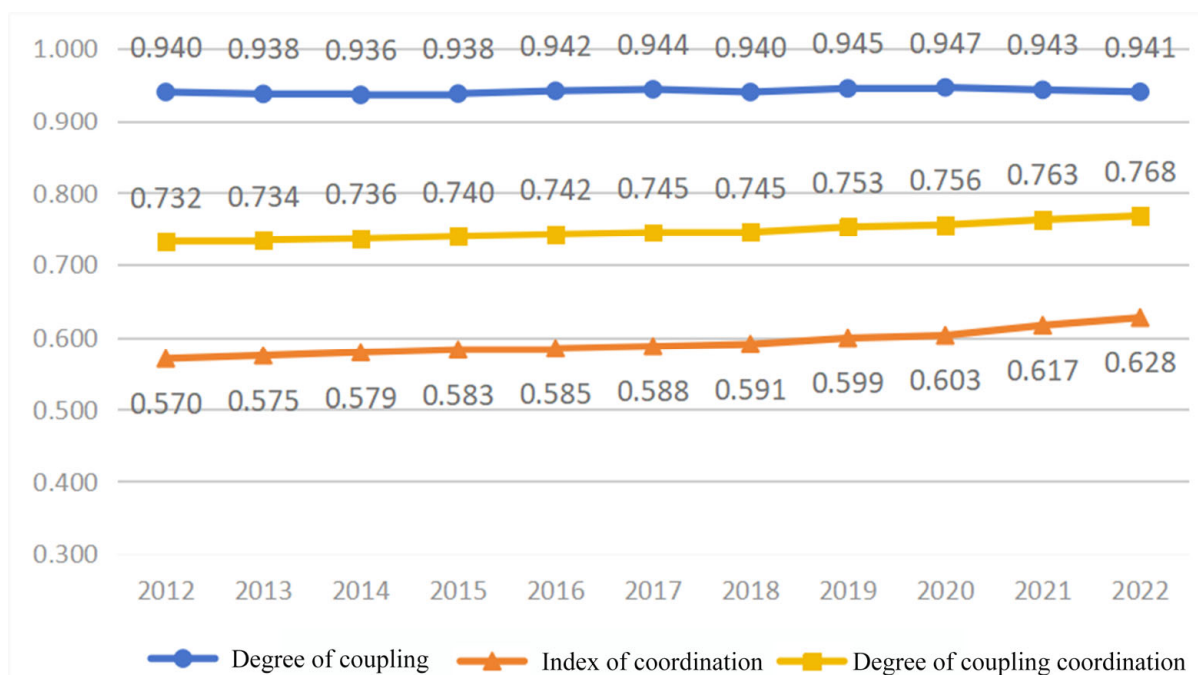


Figure 2. Level of coupling and coordination between high-quality development of China's light industry and rural revitalization from 2012 to 2022 (image from the author).

Figure 2 shows the degree of correlation between China's good growth in the light industry and rural rejuvenation from 2012 to 2022, which is >0.9 , suggesting a highly connected state. This implies that there is a clear reciprocal relationship between the growth of the light industry at a high level and rural rejuvenation. A clear relationship exists between mutual restrictions and mutual influence. Simultaneously, the coordination index for the quality development of the light industry and rural revitalization exhibited an increasing trend year-on-year, from 0.570 in 2012 to 0.628 in 2022, a relative increase of 10.18%. This suggests that light industry and rural revival are developing at a higher overall quality level. Finally, the degree of coordination between the high-quality development of the light industry and the revitalization of rural areas has increased from 0.732 in 2012 to 0.768 in 2022, a relative increase of 4.91%. In accordance with the grade classification of the degree of coupling coordination, the coupling coordination degree of the two systems remained within this range throughout the period of study. The coupling coordination level was classified as eight, indicating an intermediate coordination type, and demonstrated a positive development trend. Accompanied by the implementation of the rural revitalization strategy starting in 2017, as well as the corresponding introduction of a series of national policies to promote the high-quality development of the light industry, the development of China's light industry has also entered a new stage, and the trend of the coupling and coordination of the two has been accelerated.

4.2. Relative Development Analysis

4.2.1. Construction of Relative Development Model

The relative degree of development of high-quality development of the light industry and rural revitalization was calculated by establishing the relative development degree model to reveal the relative development between the two systems.

$$K = \frac{U1}{U2} \quad (4)$$

K represents the relative degree of development, $U1$ refers to the comprehensive index of high-quality development of the light industry, and $U2$ represents the comprehensive index of rural revitalization and development. According to the relevant research for reference, the relative development types are divided: if $0 < K \leq 0.9$, the high-quality development of the light industry lags behind in terms of rural revitalization, and this development type is known as type a; if $0.9 < K \leq 1.1$, there is synchronous high-quality development of the light industry and rural revitalization, which is known as development type b; if $K > 1.1$, the relative development type of rural revitalization lags behind the high-quality development of the light industry, making it type c.

4.2.2. Result Analysis

Based on the relative development model, this study calculated the relative development of high-quality industrial development and rural revitalization of emerging industries in China from 2012 to 2022 (Table 3).

According to the overall results, the relative development degree K value of China's light-industry high-quality development and rural revitalization was around 0.90 during the study period. At this relative development level, the high-quality development of the light industry lags behind that of rural revitalization. Since the implementation of the rural revitalization strategy in 2017, significant progress has been made, and the comprehensive agricultural production capacity has been strengthened and enhanced, leading to a stable supply of essential agricultural products, such as grain. The advancements in agricultural science and technology are clear. Green agricultural development has accelerated, and the

development of agriculture and rural areas has shifted to a new level. However, in terms of the high-quality development of the light industry, the industrial system of the light industry has not been effectively optimized and upgraded. According to a report on the economic operation of China's light industry in 2022, the operating costs of light industries in 2022 increased by 5.9% over the previous year. The operating costs of some industries have increased significantly, and the losses of the light industry enterprises are nearly 20%. The profits of some light industries have declined because it is difficult for consumers to absorb the rapid increase in costs. At the end of 2022, the inventory of finished goods of enterprises above the size of the light industry increased by 8.3% from the end of the previous year, and the number of receivable bills and accounts increased by 16.4%. At present, the number of finished goods, bills, and accounts receivable from light industrial enterprises is still high, and the backlog of inventory and increase in accounts receivable may occupy the cash flow of enterprises and restrict their strength of production repair of industrial enterprises. Therefore, it is crucial for China to promote the high-quality development of the light industry.

Table 3. Relative development degree and type of high-quality development and rural revitalization of China's light industry from 2012 to 2022 (image from the author).

Year	Relative Degree of Development
2012	0.827
2013	0.822
2014	0.785
2015	0.770
2016	0.800
2017	0.791
2018	0.735
2019	0.754
2020	0.802
2021	0.785
2022	0.752

5. Analysis of Coupling Coordination Horizontal Driving Path Based on fsQCA

The fsQCA is characterized by its low sample size requirements, which makes it more suitable for small-sample research [41], and is based on the group thinking perspective, which focuses on examining the interrelationships among multiple factors and is more in line with the real-world context. Therefore, in this section, we adopt the fsQCA method to further explore the path toward the improvement of the coupling coordination degree between the high-quality development of the light industry and rural revitalization.

5.1. Selection of Conditional Variables

The two systems have not yet reached a state of high-quality coordination by clarifying the coupling relationship between the high-quality development of the light industry and rural revitalization. Therefore, this study is based on the politics, economy, society, and technology analysis framework. It focuses on four core dimensions: government intervention, economic development, social security, and science and technology. In addition, the fsQCA method is used in this study, which takes several influence factors as antecedent variables to explore the causal relationship between the coupling and coordinated development of the high-quality development of the light industry and rural revitalization. In order to make the results more specific and practical, the variables were defined based on the research of relevant scholars.

1. Degree of government intervention (X1). To assess performance, local governments may implement industrial policies to promote regional industrial transformation and upgrading. Therefore, this study uses the share of general government expenditure in regional GDP to measure the intensity of local government intervention [45].
2. Economic development level (X2). The economic level, as a prerequisite for development, affects the integrated development of the quality of the light industry and the revitalization of villages and townships. The most direct measure of economic development is GDP per capita. As a result, this study used per capita GDP to measure the level of economic development [46].
3. Social security level (X3). The provision of good social security can enhance labor stability and labor security, stimulate workers' enthusiasm for their work, improve the production efficiency and product quality of light industrial enterprises, and provide stable employment opportunities in rural areas. In this study, civil affairs expenditures were used to measure the level of social security [47].
4. The level of science and technology (X4). According to Marx, science and technology are important factors that influence the level of productive forces. Continuous changes in science and technology have promoted the increasingly high quality and sophistication of industrial forms, the increasingly high-end and refined industrial structure [48], and the progress of science and technology. It can speed up the coupling and coordination of high-quality light industry development and rural revitalization. This study used the proportion of science and technology expenditure in GDP to measure the level of science and technology [49]. This study considered the degree of coupling and coordination between the high-quality development of the light industry and rural revitalization as the outcome variables. The theoretical framework is illustrated in Figure 3.

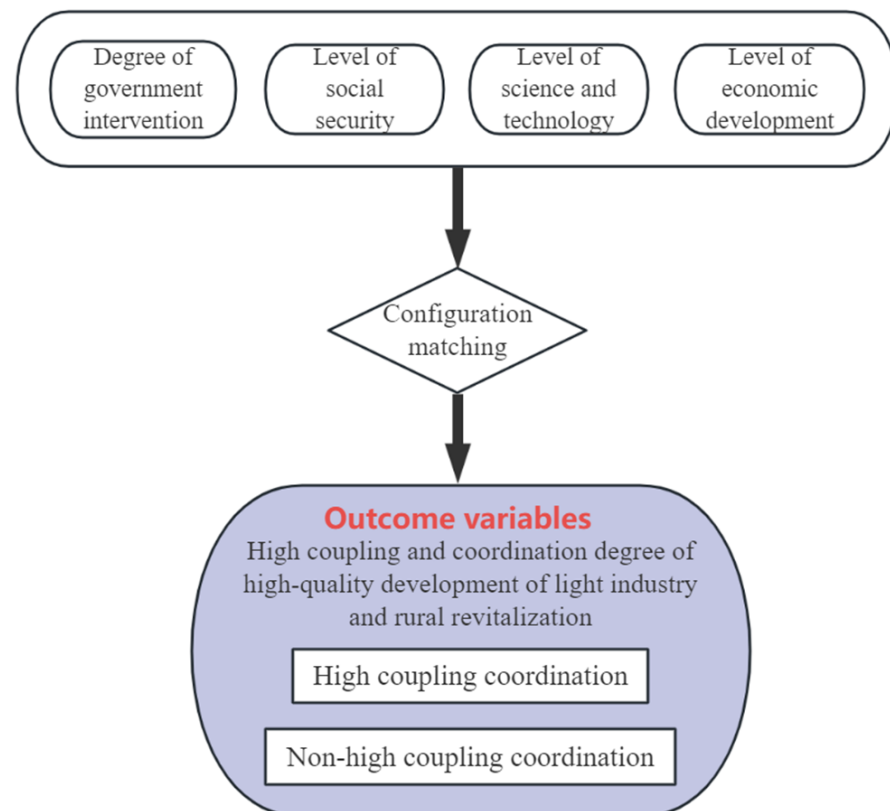


Figure 3. Framework diagram based on PEST theory. (image from the author).

5.2. Data Calibration

In this study, the corresponding data were as follows: “0.95 complete membership”, “0.5 intersections” and “0.05 complete non-membership”. These three data indicators were used as qualitative anchors and transformed into fuzzy set membership scores. The data were calibrated and transformed. The calibration anchor points for each variable are presented in Table 4.

Table 4. Calibration anchors for each variable (image from the author).

Variable	Variable Name	Completely Subordinate	Crossing Point	Completely Unaffiliated
X1	Degree of government intervention	25.34	24.03	21.45
X2	Economic development level	83,534.04	59,592	41634
X3	Social security level	5686.45	4549.8	3880.3
X4	Scientific and technological level	0.0093	0.0086	0.0083
Y	High coupling coordination degree	0.766	0.745	0.733

5.3. Necessity Analysis

In this study, the fsQCA software (version 4.0) was used to analyze the calibrated sample data and whether a single driving variable could contribute to the necessary conditions of “high coupling between high-quality development of the light industry and rural revitalization” and “non-high coupling between high-quality development of the light industry and rural revitalization”. The results are presented in Table 5. A condition is usually considered necessary for the outcome when the consistency result of the necessity analysis is ≥ 0.9 . Coverage reflects the explanatory power of the condition variable over the outcome variable, i.e., what proportion of the outcome cases is explained by the condition. The higher the coverage (closer to 1), the greater the explanatory power.

Table 5. Analysis of necessity (image from the author).

Conditional Variable	High Coupling Coordination Degree		Non-High Coupling Coordination Degree	
	Consistency	Coverage Rate	Consistency	Coverage Rate
Degree of government intervention	0.584	0.556	0.697	0.734
~Degree of government intervention	0.720	0.682	0.578	0.606
Economic development level	0.979	0.957	0.375	0.406
~Economic development level	0.392	0.362	0.960	0.981
Social security level	0.632	0.625	0.540	0.591
~Social security level	0.586	0.535	0.657	0.664
Scientific and technological level	0.651	0.679	0.531	0.612
~Scientific and technological level	0.628	0.548	0.722	0.696

Note: The symbol “~” represents the logical NOT operation, which is the negation of a certain condition variable.

The results of the analysis of the necessary conditions show that the level of economic development influences the consistency of a high degree of coupling coordination > 0.9 (Table 5), indicating that the level of development of the economy is a necessary condition for a high coupling coordination degree. In the analysis of the level of economic development as a conditional variable for the coupling and coordination of high-quality development of the light industry and rural revitalization, the coverage rate of the level of economic development is 0.957. Among them, 95.7% of the cases can prove that the level of

economic development is a necessary condition for realizing the coupling and coordination of high-quality development of the light industry and rural revitalization.

The coverage was 98.1%, which clearly indicates that 98.1% of the cases explain why the level of non-economic development is a necessary condition for non-high coupling coordination between the high-quality development of the light industry and the revitalization of rural areas. Consequently, these variables were therefore combined to further explore the configurations that produce high and non-high coupling coordination degrees.

5.4. Conditional Configuration Analysis

The resulting variables are the configuration results of the high coupling coordination degree and non-high coupling coordination degrees (Table 6).

Table 6. Analysis of conditional configuration (image from the author).

Conditional Variable	A Configuration with a High Coupling Coordination Degree		A Configuration That Produces a Non-High Coupling Coordination Degree	
	L1	L2	N1	N2
Degree of government intervention	●	⊗	⊗	●
Economic development level	●	●	⊗	⊗
Social security level		●	⊗	●
Scientific and technological level	●	⊗		
Original coverage	0.555726	0.383187	0.493250	0.531153
Unique coverage	0.371888	0.199349	0.269990	0.307892
Overall consistency	0.997470		0.987204	
Overall coverage	0.755075		0.801142	

According to the presentation form of scholars, the appearance of condition variables is represented by ● and ●, where ● displays the existence of the core condition, ● indicates the existence of the edge condition, ⊗ indicates the absence of the core condition, ⊗ indicates a lack of edge condition, and “blank” indicates that the condition may or may not exist.

L1 is the degree of government intervention, the level of economic development, and the level of science and technology. The key condition is that the level of economic development, the degree of government intervention, and the level of science and technology exist as marginal conditions, and the level of social security is not a significant element. This path proves that, regardless of the level of social security, it can achieve a high degree of coupling coordination with a high level of economic development, a strong degree of government intervention, and a higher level of science and technology. The level of economic development is the key condition that influences the results. This clearly demonstrates that a solid economic foundation is important for high coupling coordination. In L1, the level of social security is not significant and does not directly contribute to high coupling coordination.

L2 is ~ the level of government intervention * the level of economic development * the level of social security * ~ the level of science and technology. There is no doubt that economic development is the core condition. The level of social security is the condition of marginal existence, and the degree of government intervention and level of science and technology are the conditions of marginal lack. The path clearly states that if the levels of economic development and social security are high, then even if the degree of government intervention and the level of science and technology are low, it can also produce a high coupling coordination degree. As with L1, the level of economic development in L2 is of crucial importance. It is evident that a high level of economic development is a vital factor in promoting the coupling coordination degree. The difference is that the degree of

government intervention and the level of science and technology are marginal conditions. This implies that when social and economic foundations are solid and the social security system is relatively perfect, the system already has a strong capacity for self-regulation and optimization. Therefore, a higher state of coupling and coordination can be achieved even if the degree of government intervention and level of science and technology are low.

N1 is ~ the degree of government intervention * ~ level of economic development * ~ the level of social security. The level of economic development is the core condition; the degree of government intervention and the level of social security are marginal conditions, and the level of science and technology are non-significant factors. The path clearly shows that, regardless of the level of science and technology, if the level of economic development is low, the level of government intervention and social security is also low, this produces a high coupling coordination degree. The lack of economic development as the core condition in this path directly leads to difficulties in achieving high coupling coordination. It was established that the degree of government intervention and level of social security were regarded as marginal missing conditions. This makes it even more challenging to achieve high coupling coordination in the system. The level of science and technology is irrelevant in this path and has no bearing on the outcome.

N2 is the degree of government intervention * ~ the level of economic development * the level of social security. There is no doubt about it: economic development is the key missing ingredient here. The degree of government intervention and level of social security are marginal factors, and the level of science and technology is irrelevant. This path clearly shows that, regardless of the level of science and technology, if the level of economic development is low, even if the degree of government intervention is strong and the level of social security is high, it will produce a non-high coupling coordination degree. The difficulties in achieving a high degree of coupling coordination are directly related to the lack of economic development as a core condition in this path. Although the degree of government intervention and the level of social security are regarded as marginal conditions, their role has become relatively limited in the context of a low level of economic development. It is clear that the levels of science and technology are irrelevant to this path and do not play a significant role.

5.5. Robustness Analysis

The fsQCA is a set theory method. When the operation was modified slightly and the results remained unchanged, the findings were deemed robust [50]. To guarantee the reliability of the findings, the consistency threshold was increased from 0.75 to 0.85, and the configuration results were consistent with those before adjustment. This study is therefore robust in its analysis of the driving factors of the degree of coordination between the high-quality development of the light industry and rural revitalization.

6. Conclusions and Enlightenment

6.1. Research Conclusions

This study empirically examines the coupling coordination relationship between the high-quality development of China's light industry and rural revitalization from 2012 to 2022, along with its driving mechanisms. The findings reveal both consistencies and divergences with existing domestic and international research.

First of all, regarding the coupling relationship between the high-quality development of the light industry and rural revitalization, the two are in a moderate coupling state, indicating that policy coordination and economic interaction have formed a preliminary linkage mechanism, but they have not yet reached a high degree of coordination. This discovery echoes the collaborative model of regional industry and rural development in the

EU's "Smart Specialization Strategy" [51], but the pulling effect of China's light industry on rural revitalization is weaker than the deep integration of European manufacturing and agricultural value chain.

Secondly, it is found that the high-quality development of China's light industry lags behind the rural revitalization, which is in contrast with the "industry-first" path in the process of Indian rural industrialization [52], reflecting that China's light industry still needs to achieve a breakthrough in technology upgrading and demand adaptation.

Finally, in terms of driving mechanism, the analysis framework based on PEST theory expands the existing research and verifies the necessity of multi-factor collaboration under the framework of PEST theory through two highly coupled coordination paths identified by fsQCA. Among them, the path of "strong government intervention $\times$ economic foundation empowerment $\times$ technology drive" is consistent with the practical logic of South Korea's "government-led innovation system" [53], while the path of "market-led $\times$ social security compensation" echoes the adjustment of the welfare system to regional balance in Germany's "social market economy" model [54].

To sum up, the findings of this study on the measurement and driving mechanism of coupling and coordination not only echo the common law of global industrial–rural coordinated development, but also reveal the particularity of China as a transitional economy, which provides a new analytical dimension and policy enlightenment for subsequent research.

6.2. Deficiency and the Prospect of Research

By combining theoretical and empirical dimensions, this study discusses the coupling and coordination relationship between the high-quality development of China's light industry and rural revitalization and its promotion path, thus expanding the breadth and depth of existing research to a certain extent. This provides a new perspective for future research. However, it must be acknowledged that this study has several limitations. First, it is clear that the coupling and coordination of high-quality development of the light industry and rural revitalization is a dynamic evolution process, but the current static index system cannot fully capture the specific details of this dynamic change. Therefore, future research can integrate dynamic and static indicators to establish an index system to more accurately measure the comprehensive development level of high-quality development and rural revitalization of the light industry. Secondly, it is important to note that China is a vast territory, with significant regional differences in regional policies, economic development situations, and social and cultural backgrounds in different regions. There will be a gap in the effect of the high-quality development of the light industry and the revitalization of rural areas. In the future, we should also conduct a comparative analysis of the spatial pattern of the coupling and coordination between the high-quality development of the light industry and rural revitalization in different regions and its influencing factors. We must investigate the impact of policy, the economy, and other environmental factors in different regions on the coupling and coordination degree of the two systems. Thirdly, compared with international research, this study has expanded the existing knowledge in the following aspects: First, technology intervention needs to match the industrial base, and excessive dependence on technology output may lead to unbalanced regional development. This conclusion supplements the digital trap research of rural revitalization under the framework of "Society 5.0" in Japan (Bissadu K D et al., 2025) [55], and emphasizes the importance of technological adaptation. Secondly, China's mixed model of "strong intervention + market regulation" provides developing countries with a third path beyond "Washington Consensus" and "East Asia Model" (Rodrik, 2025) [56], but we need to be alert to the possible resource mismatch caused by excessive government intervention.

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