

Spatial-Temporal Characteristics and Configuration Pathways of Coupled and Coordinated Development of New Agricultural Productivity and Rural Revitalization in Jiangxi Province

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Abstract:

This study constructs an evaluation system for agricultural new-quality productivity and rural revitalization using a county-level sample from Jiangxi Province. By comprehensively applying the horizontal and vertical tiering method, the coupling coordination model, and fuzzy set qualitative comparative analysis (fsQCA), it systematically explores the spatiotemporal evolution patterns and configuration-driven pathways of their coupled and coordinated development. Empirical findings reveal that the coupling coordination degree between new-quality agricultural productivity and rural revitalization in Jiangxi's counties exhibits a fluctuating upward trend, yet remains at a barely coordinated stage overall. Spatial distribution shows pronounced non-equilibrium characteristics, with higher levels in central areas and lower levels in eastern and western regions. Configuration analysis identifies three high-coordination pathways: finance-dominated, industry-digital synergy, and comprehensive infrastructure enhancement. Research recommendations include: strengthening digital infrastructure investment, deepening targeted inclusive financial support for distinctive industries, and establishing a “technology-organization-environment” coordination mechanism tailored to regional endowments. Priority should be given to enhancing financial penetration and industrial diversification in underdeveloped areas.

Keywords:

New Quality Productivity, Rural Revitalization, Coupling Coordination Model, QCA

1. Introduction

In recent years, the global economic landscape has fluctuated with gradually slowing growth. Compounded by “black swan events” such as Sino-US trade friction and the COVID-19 pandemic, the world economy is undergoing a transformative phase of structural adjustment and reshaping. As an agricultural powerhouse, China

has consistently prioritized addressing issues concerning agriculture, rural areas, and farmers as its foremost task, mobilizing the entire nation and society to advance rural revitalization. Chinese government has placed high importance on digital rural development. On one hand, this initiative extends beyond merely digitizing agricultural industries; it represents a strategic layout encompassing agriculture, rural areas, and farmers, integrating digital technologies with the “three rural issues.” On the other hand, its scope transcends industrial digitalization like e-commerce or smart agriculture, encompassing systemic measures in agricultural production, rural living, governance, services, and ecology. However, China’s agricultural development still faces constraints such as resource and environmental limitations, insufficient technological support, and a shortage of highly skilled labor [1]. Achieving high-quality agricultural development urgently requires the creation of new engines.

In 2023, China introduced the concept of “new productive forces,” emphasizing innovation and advanced technology-driven productivity characterized by high technology, high efficiency, and high quality. This concept moves beyond traditional economic growth models and development paths, aligning with principles of innovation and sustainable development. Sustainable development and modernization in agriculture must rely on technological progress and enhanced productivity to achieve high-quality development goals. Consequently, advancing new productive forces has become an intrinsic requirement and key focus of rural revitalization, while rural revitalization itself serves as an inherent driving force for these forces. On one hand, technological innovations propelled by the digital economy extend into rural industrial systems; green development driven by shifts in production and lifestyles impacts rural ecosystems; and optimized allocation of production factors achieved through improved distribution mechanisms influences rural distribution systems. On the other hand, enhancements in rural infrastructure, public services, and governance systems create favorable conditions for developing new productive forces. Emerging demands and opportunities further provide new impetus and direction for the evolution of these forces.

Therefore, accelerating the layout of new rural industries, stimulating the transformation of new rural models and spaces, and promoting the coordinated development of new agricultural productive forces with rural revitalization have become crucial pathways for building an agricultural powerhouse. However, what measures are effective in advancing rural revitalization? Can exogenous policies like digital village pilot programs drive their coordinated development? In the actual process of advancing rural digital infrastructure, ensuring orderly development while fully tapping into and leveraging the unique resources and competitive advantages of each region remains a pressing issue requiring in-depth exploration and practical implementation.

2. Theoretical Foundation and Analytical Framework

2.1. New Quality Productivity in Agriculture

As a vital component of new-quality productive forces, it represents the innovation and future direction of agricultural productivity. Agricultural new-quality productive forces embody the modernization of agricultural productivity and have become a new driver, support, and engine for high-quality agricultural development. Academic discourse has extensively explored the conceptual logic, fundamental connotations, and implementation pathways of agricultural new-quality productive forces

[2][3][4][5]. However, academic research on agricultural new-quality productive forces has primarily focused on theoretical analysis, with limited quantitative studies concentrated on the level and spatio-temporal evolution of agricultural new-quality productive forces [6][7], digital inclusive finance [8][9], and agricultural industrial chain development [10][11]. Furthermore, scholars have proposed the fundamental logic of agricultural new-quality productivity in achieving rural revitalization and outlined specific pathways for accelerating its development [12].

2.2. Rural Revitalization

Since the 20th National Congress of the Communist Party of China first proposed the rural revitalization strategy, under government leadership and through in-depth scholarly exploration in recent years, the institutional framework and policy system for rural revitalization have taken initial shape [13]. Current academic research on rural revitalization focuses on three aspects. a. Research on the connotation of the rural revitalization strategy. Accurately grasping the essence of the strategy serves as the logical starting point for its study. Li Changxue [14], Jiang Yongmu [15], and Ma Yihua and Zeng Hongping [16] analyzed it from temporal, spatial, and ideological dimensions, arguing that rural revitalization represents an upgrade across seven fundamental aspects of socialist new rural construction. b. Research on practical obstacles to rural revitalization. Mu Liangze and Zhao Yong [17] summarize China's current impediments to rural revitalization into two points: internal imbalances within villages and urban-rural development disparities. Concurrently, rural hollowing-out, agricultural marginalization, and farmer aging also significantly impact rural revitalization [18]. c. Pathways for the Rural Revitalization Strategy. Yang Ren et al. [19], Zhang Yingnan et al. [20], and Li Yurui et al. [21] found that traditional linear rural development models slow progress, emphasizing the need for integrated approaches. Li Jintao et al. [22], Li Yurui et al. [23], and Sun Jiuxia and Wang Shujia [24] explored rural revitalization pathways for five distinct village types from perspectives including talent, governance, and industry. They identified four development models: Chinese rural transformation, modern agricultural scaling, enterprise scaling, and satellite towns, and categorized four pathways: land consolidation and aggregation, specialty industry development, industrial platform clustering, and social function intensification.

2.3. Coupling and Coordination of New-Quality Agricultural Productivity with Rural Revitalization

From the perspective of the constituent elements of new-quality productive forces, these forces can effectively advance rural revitalization. First, highly skilled laborers promote rural revitalization. As the core agents driving rural revitalization, highly skilled laborers with specialized expertise not only propel agriculture toward intelligent and specialized development while facilitating the adoption and dissemination of new technologies, but also foster the integrated development of primary, secondary, and tertiary industries in rural areas, thereby enhancing the value-added potential of agricultural industrial chains. Second, intelligent means of production advance rural revitalization. As the key carrier of new production activities, next-generation information infrastructure can, on one hand, meet farmers' needs for digital production, advance smart agriculture, enhance agricultural efficiency, and fulfill farmers' aspirations for a prosperous life. On the other hand, it can satisfy rural residents' growing demand for a better life and further strengthen the development of rural civility. Third, innovative labor objects advance rural revitalization. New

mechanisms, systems, and business models in the rural economy, as objects of innovation, can open new pathways for improving total factor productivity. By driving deep industrial transformation and upgrading, they stimulate new models and developments in rural revitalization, effectively bridging the urban-rural “digital divide” and meeting people’s aspirations for affluent living and ecologically pleasant environments.

As the foundation for developing new-quality productive forces, rural revitalization ensures their rapid advancement. First, the rural revitalization strategy provides highly skilled laborers for new-quality productive forces. These skilled workers not only adapt to modern agricultural technology applications but also foster the emergence and growth of new industries, business models, and patterns in rural areas, thereby injecting fresh vitality into the rural economy. The strategy creates vast market opportunities for industrial upgrading and economic development in rural regions, further promoting integrated urban-rural development. Second, the rural revitalization strategy provides essential production resources for new-quality productive forces. Improved rural infrastructure lays a solid foundation for the development of new-quality productive forces in agriculture. Simultaneously, the expansion of digital infrastructure like broadband networks enhances the well-being of rural residents. As rural revitalization deepens, the role of new-quality productive forces in rural socioeconomic development becomes increasingly prominent.

The development of new-quality productive forces in agriculture is both an intrinsic requirement and a key focus of rural revitalization, while rural revitalization itself serves as an endogenous driver for new-quality productive forces. Within the coordinated coupling process between new-quality productive forces and rural revitalization, various materials circulate between them, diverse information flows between them, and value ultimately moves between them, achieving a mutually reinforcing and stimulating effect.

2.4. Configuration Analysis Framework Based on the TOE Framework

The TOE model (Technology-Organization-Environment model) is a comprehensive analytical framework based on technology application scenarios.

Technology: The technological core of new-quality productive forces in agriculture manifests as the deep integration of digitalization and intelligentization, primarily reflected in core elements such as digital infrastructure and industrial structure foundations. Technology adoption theory indicates that digital infrastructure can optimize the allocation of production factors, break through the “scale-efficiency” threshold of traditional agriculture, and provide foundational technological support for rural revitalization. Simultaneously, the optimization and upgrading of industrial structures create favorable external conditions for the development of new productive forces, which in turn drive the green and low-carbon transformation of the logistics industry, forming a virtuous cycle.

Organization: Under the central-local collaborative governance framework, fiscal resource endowment and peer competition capacity become the core organizational drivers in the coupling and coordination process. On one hand, during the initial stages of coupling coordination, activities such as digital infrastructure development and inclusive finance promotion require government fiscal investment. Higher fiscal resource endowment drives the efficient transformation of means and objects of labor. On the other hand, the central government establishes top-down guidance through

strategic goal-setting and institutional provisioning, while local governments develop differentiated implementation strategies under the pressure of “competition effects” and “proximity effects,” ultimately achieving dynamic alignment between new-quality productive forces and rural revitalization.

Environment: As the external support system for the synergistic evolution of rural revitalization and new-quality productive forces, the financial ecosystem reshapes the development landscape through a composite mechanism involving coverage breadth, usage depth, and effectiveness. Coverage breadth expands the geographic accessibility of financial services, activating the flow of production factors and enhancing technological diffusion efficiency, thereby breaking the spatial constraints of traditional agricultural development. Usage depth reflects the integration of financial services with agricultural scenarios, driving technological penetration into high-value-added sectors through credit product innovation and optimized capital allocation; Effectiveness enhancement relies on risk control and inclusive mechanisms to reduce trial-and-error costs in technology adoption and establish sustainable value cycles. The interplay of these three dimensions forms a virtuous cycle of “expanding coverage → enhancing depth → increasing effectiveness.”

3. Materials and Methods

3.1. Variable Selection

3.1.1. Constructing an Indicator System for New Quality Productivity in Agriculture

As an emerging concept, new-quality productivity fundamentally involves qualitative transformations in new laborers, means of labor, objects of labor, and their optimized combinations, with total factor productivity growth as its core indicator. According to the theories of substantive and pervasive factors, the formation of new-quality agricultural productivity is rooted in new-quality productivity itself. It represents the concrete outcome of a new round of technological revolution exerting profound influence on substantive factors after impacting laborers, means of labor, and objects of labor. Dong Qingqian (2024) and Wang Ke (2024) [25] established an evaluation system for agricultural new-quality productive forces from three dimensions: new-type laborers, new-type labor objects, and new-type means of labor, as illustrated in and Table 1.

Table 1. Agricultural New Quality Productivity Indicator System.

Dimension	Primary Indicators	Second-Level Indicators	Indicator Explanation
Workers	Labor Value	Rural Per Capita Output Value	Regional GDP / Number of Rural Registered Residents
		Rural per capita disposable income	Direct Acquisition
	Human Capital	Average Years of Education per Rural Resident	[Number of Rural Population Not in School × 0 + Number of Primary School Students × 6 + Number of Junior High School Students × 9 + Number of Senior High School Students × 12 + (Number of College Students + Undergraduate Students + Graduate Students) × 16] / Registered Population
	Worker	Employment	Tertiary Industry Employment / Total

	Awareness	Philosophy	Employment Ratio
Labor Object	Output Efficiency	Land Productivity	Grain production/crop area sown
	Industrial Structure	Industrial Structure	Value Added of Tertiary Industry / Value Added of Primary Industry
	Green Development	Green Development	GDP/Agricultural Production Carbon Dioxide Emissions
Means of Production	Tangible resources	Rural Digitalization Bases	Number of Taobao Villages
		Traditional Infrastructure	Public Water Supply Coverage Rate
		Digital Infrastructure	Area of Facility Agriculture Land
	Intangible Data	Rural Network Investment Volume and Scale	Digital Inclusive Finance County-Level Investment Level
		Rural Online Payment Volume and Scale	Level of Mobile Payments in Counties with Digital Inclusive Finance

3.1.2. Establishing an Indicator System for Rural Revitalization

Chinese leaders have repeatedly made significant policy deployments regarding agriculture, rural areas, and farmers. However, due to differences in research subjects and timeframes, some indicators—such as clean water sources and safe drinking water coverage—show no variation, resulting in discrepancies across rural revitalization metrics. Drawing on Jiangxi Province’s actual development conditions and referencing studies by Zhang Wang and Bai Yongxiu [26] and Liao Wenmei et al. [27], we have decomposed the framework into 10 secondary indicators, as shown in Table2 .

Table 2. Indicator System for Rural Revitalization.

Primary Indicators	Secondary Indicators	Measurement Method	Attribute
Industrial Prosperity	Agricultural Industry Efficiency	Share of Primary Industry Value Added in Regional GDP	Positive
	Level of Agricultural Modernization	Total Agricultural Machinery Power	Positive
Ecological livability	Rural living standards	Public water supply coverage rate	Positive
	Rural Ecological Level	Sewage discharge volume	Negative
Rural Civilization	Level of Public Service Provision	Hospital Beds per 1,000 People	Positive
	Rural Civilization Development	Public Toilets per 1,000 People	Positive
Effective governance	Rural Living Environment	Sewage Treatment Rate	Positive
	Sanitation Management Level	Domestic Waste Disposal Rate	Positive
Prosperity	Urban-rural income gap	Ratio of Urban and Rural Residents' Disposable Income	Negative
	Rural prosperity level	Savings deposit balance	Positive

3.2. Research Methodology

3.2.1. Modified Coupling Coordination Degree Model

Based on the principles of the coupling coordination model, the coupling coordination degree between new-type productive forces and rural revitalization for each county is calculated using the following formula:

$$C = \sqrt{\left[1 - \sqrt{(U_2 - U_1)^2}\right] \times \frac{U_1}{U_2}} = \sqrt{\left[1 - (U_2 - U_1)\right] \times \frac{U_1}{U_2}} \quad (1)$$

$$T = \alpha U_1 + \beta U_2 \quad (2)$$

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

Where: C represents the coupling degree between new-type productive forces and rural revitalization, T denotes the comprehensive evaluation index, and α 、 β respectively indicate the contribution rates of new-type productive forces and rural revitalization to the coupling coordination degree. This study assumes equal importance for both factors, thus $\alpha = \beta = 0.5$.

Based on relevant research findings and the practical context of this study [28], the coupling coordination level is categorized into three grades, as detailed in Table 3.

Table 3. Grading of Coupling Degree and Coupling Coordination.

Coupling Coordination Level	[0,0.4]	[0.4,0.6]	[0.6,1]
Level	Dysfunctional Decline	Transitional Development	Harmonious Development

3.2.3. fs-QCA (Fuzzy Set Dynamic Qualitative Comparative Analysis) Method

Qualitative Comparative Analysis (QCA) is a comprehensive research methodology grounded in set theory and Boolean operations. Combining the strengths of both qualitative and quantitative analysis, it has been extensively applied in the social sciences. Based on variable types, it can be categorized into three variants: Clear Sets (csQCA), Multi-Valued Sets (mvQCA), and Fuzzy Sets (fsQCA). Among these, the Fuzzy Set Qualitative Comparative Analysis method more effectively handles continuous variables than the first two approaches. Therefore, this paper employs the fsQCA method for analysis.

3.3. Data Sources

The data primarily originate from the Statistical Yearbook of Chinese Counties, the Statistical Yearbook of Rural China, county-level statistical bulletins, and the Guotai An database. To ensure data reliability despite missing values at the county level, this study selected data from 80 counties in Jiangxi Province, which exhibit relatively complete sample sizes.

4. Results Analysis

4.1. Spatiotemporal Characteristics of New Quality Productivity and Rural Revitalization

4.1.1. Spatiotemporal Characteristics of New Quality Productivity Development Levels

Using the natural breakpoint method, this study categorizes the development level of new-type productive forces into five types: low, relatively low, medium, relatively

high, and high. Cross-sectional data from 2018, 2020, and 2022 were selected for visualization analysis (e.g., Figure 1).

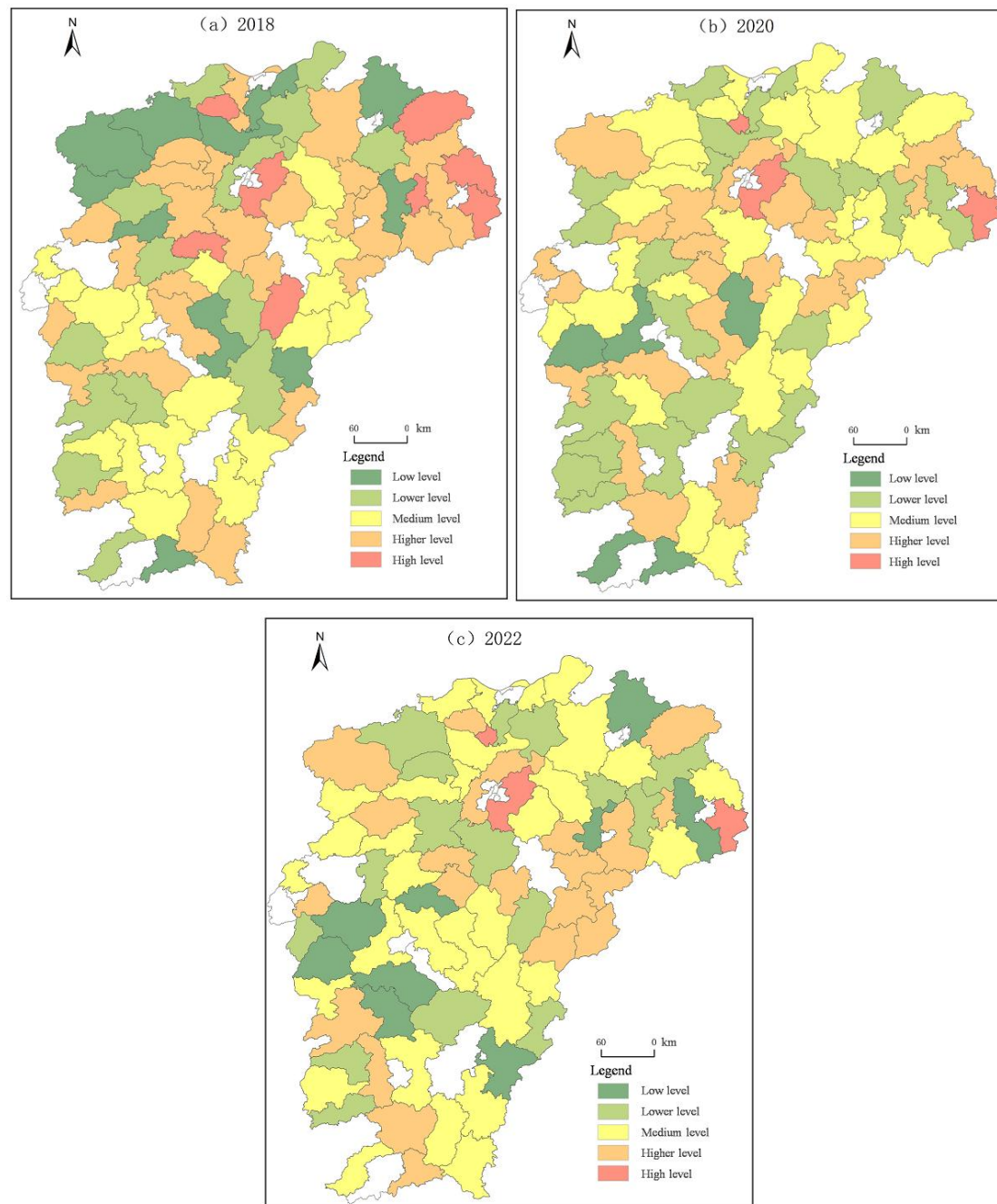


Figure 1. Spatiotemporal Evolution of New Quality Productivity Development Levels in Jiangxi Province, 2018–2022.

From 2017 to 2022, the development level of new-type productive forces in Jiangxi Province showed an overall fluctuating upward trend. However, significant disparities existed among counties, revealing a distribution pattern characterized by “higher levels in the central region and lower levels in the eastern and western regions.”

4.1.2. Spatiotemporal Characteristics of Rural Revitalization Levels

This study employs the natural breakpoint method to classify the rural revitalization development levels of 2018, 2020, and 2022 into five tiers, depicting their spatiotemporal evolution (Figure 2). Spatially, counties with higher rural revitalization

levels exhibit significant overlap with those possessing advanced new-type productive forces, both following a “higher in the center, lower in the east and west” distribution pattern.

From a temporal perspective, the average rural revitalization development levels in 2018, 2020, and 2022 were 2.237, 2.227, and 2.226 respectively, showing a fluctuating upward trend. Most counties saw improvements in their rural revitalization levels over the five-year period from 2017 to 2022, though the pace of growth varied. This reflects regional disparities in the pace of rural revitalization across Jiangxi Province, underscoring that it is a long-term, complex systemic endeavor requiring sustained effort and targeted policies.

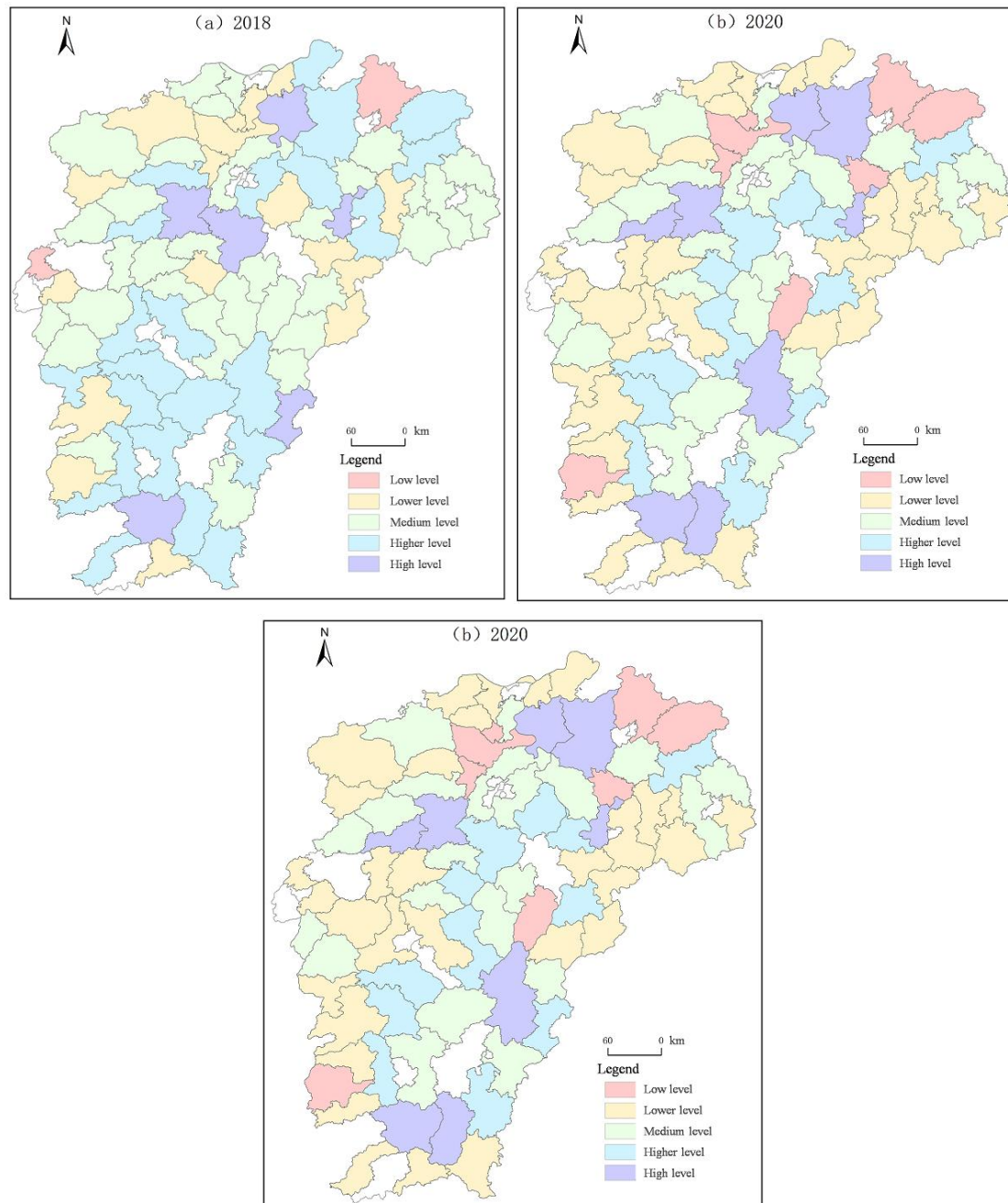


Figure 2. Spatiotemporal Evolution of Rural Revitalization Levels in Jiangxi Province, 2018–2022.

4.2. Spatiotemporal Characteristics of Coupled and Coordinated Development Between New Quality Productivity and Rural Revitalization

4.2.1. Temporal Variation Characteristics

This study employs a modified coupling coordination model to measure the coupling coordination degree between new-type productive forces and rural revitalization across 80 counties in Jiangxi Province from 2018 to 2022, analyzing its temporal changes and typological proportions (Figure 3). From 2018 to 2022, the coupling coordination degree between new-type productive forces and rural revitalization in Jiangxi Province showed an overall fluctuating upward trend, with an average value around 0.7. The overall performance was barely coordinated, still not entering the stage of high-quality coordinated development. From 2018 to 2020, the coupling coordination degree rose from 0.68 to 0.72, remaining in a state close to imbalance. From 2020 to 2022, the coupling coordination level ranged between 0.72 and 0.75, shifting to a state of barely coordinated development. The proportion of counties experiencing mild imbalance continued to decrease, while the shares of barely coordinated and primary coordinated counties increased.

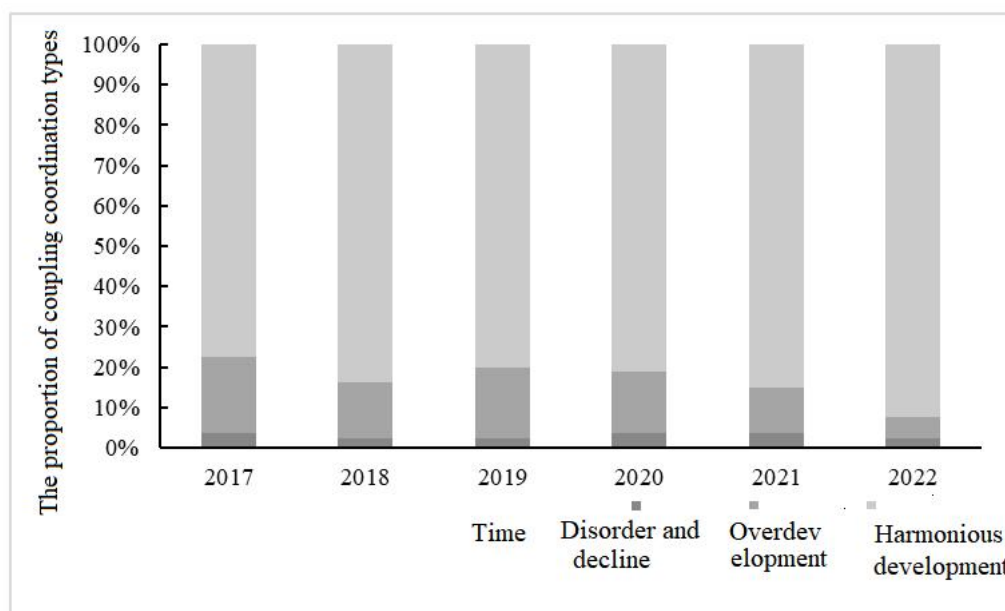


Figure 3. Grading of Coupling Coordination Between New Productive Forces and Rural Revitalization in Jiangxi Province.

4.2.2. Spatial Distribution Characteristics

Based on the classification criteria, the spatial distribution of each county's coupling coordination level between new quality productive forces and rural revitalization was determined for 2018, 2020, and 2022 (Figure 4). Counties with higher coupling coordination levels exhibit spatial clustering. Central regions demonstrate stronger coupling due to their robust economic foundations, technological innovation capabilities, and policy support. In contrast, eastern and western regions show relatively lower coupling coordination owing to less developed infrastructure and lower economic development levels. Remote mountainous areas or counties with relatively single-industry development patterns also exhibit lower coupling coordination levels.

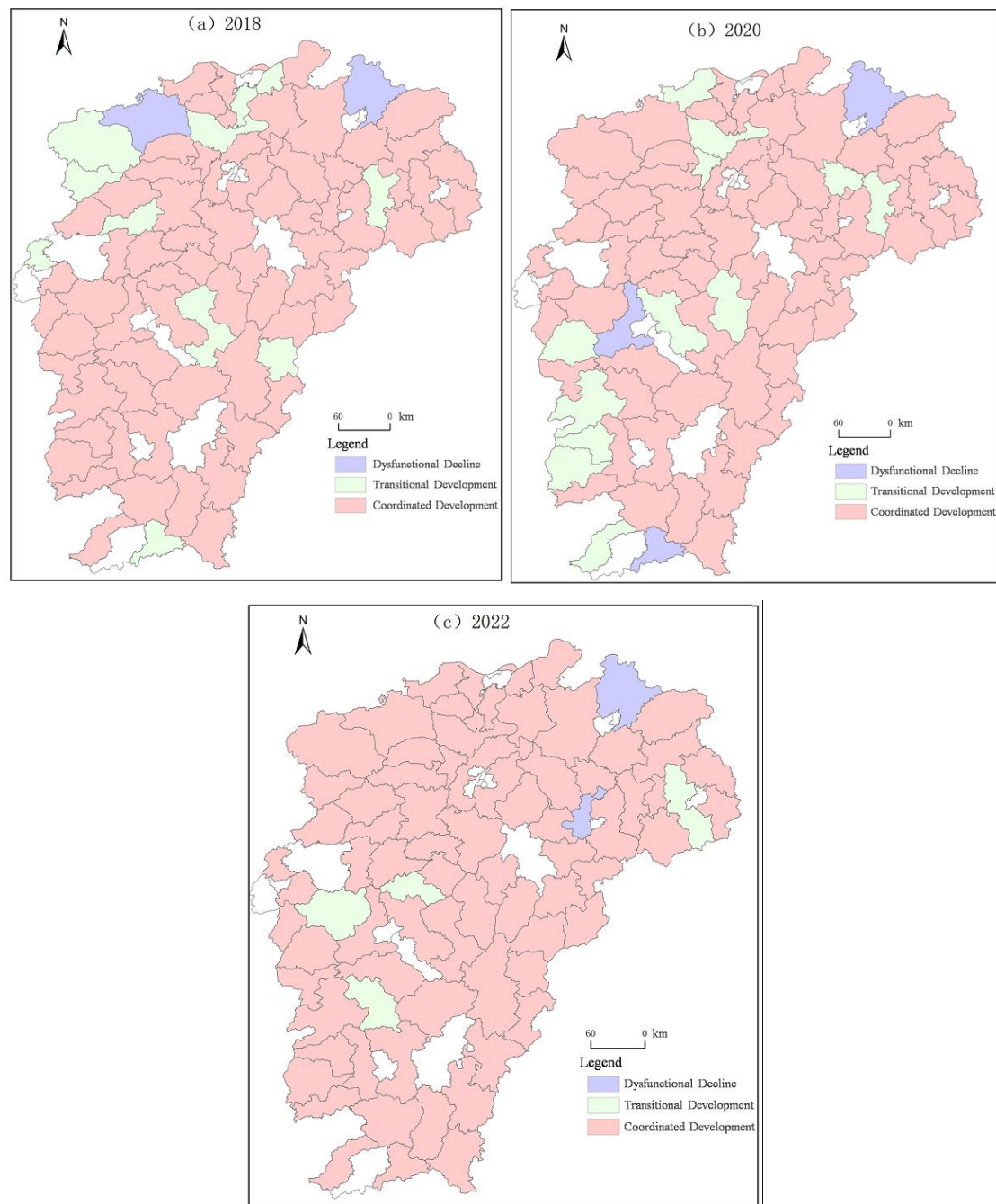


Figure 4. The spatiotemporal evolution of the coupling coordination degree between new quality productivity and rural revitalization in Jiangxi Province from 2018 to 2022.

4.3. Configuration Analysis of Coupling Coordination Between New Quality Productivity and Rural Revitalization

4.3.1. Variable Measurement and Calibration

This study employs the coupling coordination degree between new quality productivity and rural revitalization as the outcome variable, while utilizing the seven influencing factors analyzed under the TOE framework as condition variables. Referencing existing research, the direct calibration method is applied to the outcome and condition variables. The 25th, 50th, and 75th percentiles of the sample data are set as incomplete membership points, intersection points, and complete membership

points, respectively, for calibration. This transforms the original variable data into fuzzy membership numerical variables. The calibration process is illustrated in Table and 4.

Table 4. Variable Description and Calibration.

		Measurement Method	Variable Assignment		
			Full Membership	Intersection Point	Complete Non-Association
Result Variable	Coupling Coordination Degree	Modified Coupling Coordination Model	0.79	0.72	0.64
Condition Variable	Financial Coverage	Peking University Digital Inclusive Finance Index	94.95	91.47	88.83
	Financial Usage Depth	Peking University Digital Inclusive Finance Index	153.54	145.13	132.67
	Financial Utilization Validity	Year-end Financial Institution Loan Balance / Regional GDP	1.16	0.97	0.77
	Fiscal Resource Endowment	Government public budget expenditure as a percentage of GDP	0.31	0.25	0.20
	Industrial Structure Foundation	Secondary and tertiary industry value-added as a percentage of GDP	0.90	0.87	0.84
	Competitiveness	GDP exceeds the provincial average for that year, indicating strong competitiveness; record as 1, otherwise record as 0	-	-	-
	Digital Infrastructure	Mobile Telephone Switching Capacity	46,982	30,385	19,077

4.3.2. Prerequisite Analysis

To prevent the simplification of necessary conditions, this study employed fsQCA 3.0 software to conduct necessary condition analysis on both high-coupling coordination and non-high-coupling coordination cases across counties prior to truth table analysis. Results are presented in Table 5. Generally, when a condition's consistency level exceeds 0.9, it is deemed a necessary condition for the outcome variable.

Table 5. Necessity Test for Variable Conditions.

	High Coupling Coordination		Non-High Coupling Coordination	
	Consistency	Coverage	Consistency	Coverage
Financial Coverage Breadth	0.77	0.68	0.40	0.39
~Financial Coverage	0.30	0.31	0.67	0.76
Financial Usage Depth	0.83	0.73	0.35	0.35
~Financial Usage Depth	0.26	0.27	0.73	0.83
Financial Usage Validity	0.67	0.61	0.47	0.47

~Financial Usability Validity	0.41	0.41	0.60	0.67
Fiscal Resource Endowment	0.44	0.43	0.59	0.65
~Fiscal Resource Endowment	0.64	0.59	0.48	0.49
Industrial Structure Foundation	0.64	0.58	0.52	0.51
~Industrial Structure Foundation	0.46	0.46	0.58	0.64
Competitiveness Among Peers	0.44	0.72	0.15	0.28
~Competitiveness among colleagues	0.56	0.37	0.85	0.63
Digital Infrastructure	0.55	0.54	0.50	0.54
~Digital Infrastructure	0.53	0.49	0.57	0.58

4.3.3. Conditional Configuration Analysis

During the analysis of condition configuration adequacy, the intermediate solutions generated by fsQCA software are typically prioritized due to their moderate complexity and consideration of necessary conditions. Based on existing research, the original consistency threshold for configuration analysis is set to 0.8, and the frequency threshold is set to 1. To reduce the number of contradictory configurations, the PRI (Proportional Reduction in Inconsistency) threshold is set to 0.7. Specific results are shown in Table6 at REF _Ref189645441 \h * MERGEFORMAT.

Table 6. Configuration Paths for Coupling and Coordination Between New Quality Productivity and Rural Revitalization.

	High Coupling Coordination Degree				Low Coupling Coordination		
	P1a	P1b	P2	P3	P4	P5	P6
Financial Coverage Breadth			•	•	⊗		
Financial Usage Depth	•	•	•	•	⊗	⊗	⊗
Financial Usage Validity	•	⊗	•	•		⊗	
Fiscal Resource Endowment	⊗	⊗	⊗			⊗	⊗
Industrial Structure Foundation			•	•	⊗		⊗
Competitiveness Among Peers	•	•			⊗	⊗	⊗
Digital Infrastructure	⊗	•		•		⊗	⊗
Consistency	0.89	0.84	0.86	0.88	0.37	0.16	0.22
Original Coverage	0.08	0.14	0.25	0.20	0.91	0.85	0.93
Unique Coverage	0.01	0.04	0.06	0.04	0.03	0.03	0.01
Overall consistency	0.83				0.88		
Overall Coverage	0.52				0.61		

• indicates core condition present, • indicates peripheral condition present, ⊗ indicates core condition absent, ⊗ indicates peripheral condition absent, — indicates condition not present, same below

Configuration analysis of highly coupled and coordinated development between new-type productive forces and rural revitalization.

Four configurations yield pathways for high-coupling coordinated development. Among them, configurations P1a and P1b share identical core conditions, forming a second-order equivalent configuration P1. The overall solution consistency is 0.83, indicating high explanatory power for the four configurations. The overall coverage is 0.52, meaning these four configuration pathways explain 52% of the cases exhibiting high coupling coordination.

(1) Comprehensive Factor Integration Type

This model comprises two highly similar configurations: P1a and P1b. Through simplified Boolean logic operations, the expression for P1 is: Inclusive Finance Utilization Depth * Peer Competitiveness Capacity * ~ Fiscal Resource Endowment. Here, the depth of inclusive finance utilization and strong peer competitiveness capacity serve as core conditions, while fiscal resource endowment acts as a peripheral missing condition. Leveraging county-level economic competitiveness advantages, combined with inclusive finance penetration to compensate for fiscal resource endowment shortcomings, achieves multidimensional coordinated development. Hence, this model is named the Comprehensive Revitalization Balanced- .

P1a indicates that with deep utilization of inclusive finance and strong peer competitiveness as core conditions, coupled with high financial utilization efficiency as a marginal condition, even with weaker fiscal resource endowments and digital infrastructure, a county's coupling coordination level can still reach a high standard. P1b indicates that even with poor financial utilization efficiency and fiscal resource endowments, high coupling coordination can be achieved when counties possess deep utilization of inclusive finance and strong peer competitiveness, with robust digital infrastructure as a marginal condition.

(2) Digital Empowerment-Industry Driven Model

This configuration centers on deep and efficient inclusive financial utilization alongside a robust industrial structure foundation, with broad inclusive financial coverage as a peripheral condition. It demonstrates that even with relatively weak fiscal resource endowments, high-level coupled coordination between new productive forces and rural revitalization can be achieved. Its expression is: Inclusive Financial Coverage × Inclusive Financial Utilization × Financial Utilization Efficiency × ~ Fiscal Resource Endowment × Industrial Structure Foundation.

(3) Comprehensive Infrastructure Synergy Model

This configuration exhibits no missing condition dimensions. Deep and efficient inclusive financial usage, a sound industrial structure foundation, and digital infrastructure serve as core conditions, while broad inclusive financial coverage acts as a peripheral condition. It enables the construction of county-level areas featuring highly coupled and coordinated new productive forces and rural revitalization. Its fundamental expression is: Inclusive Financial Coverage × Inclusive Financial Usage × Financial Usage Effectiveness × Industrial Structure Foundation × Digital Infrastructure Development.

Comparing the prerequisites for induced outcomes reveals that “financial utilization depth” plays a central role in achieving high-coherence development, while “peer competitiveness,” “industrial structure foundation,” and “financial utilization effectiveness” also exert significant influence. Based on this, other conditions can achieve high-coherence development of new productive forces and rural revitalization

through divergent yet convergent pathways. Comparing P1a and P1b, as well as P2 and P3, reveals that digital infrastructure development exhibits a substitution relationship with financial utilization effectiveness and fiscal resource endowment. Specifically, when a region exhibits deep inclusive financial usage, strong peer competitiveness, and poor fiscal resource endowment, allocating limited funds to enhance financial utilization effectiveness and digital infrastructure development can improve the coupling and coordination between new-quality productive forces and rural revitalization. For regions with strong inclusive financial coverage, usage, effectiveness, and industrial foundations, strengthening digital infrastructure development can reduce reliance on fiscal resources.

(4) Configuration Analysis of Low-Coupling Coordination Between New Quality Productivity and Rural Revitalization.

Three configuration paths yield low coupling coordination, with overall solution consistency at 0.88 indicating strong explanatory power. The aggregate coverage rate of 0.61 shows these paths explain 61% of high-coupling coordination cases. Since inclusive financial utilization and peer competitiveness appear in every path, model induction prioritizes combinations of other conditions.

Multiple-Missing Pattern (P4): This configuration features core condition deficiencies in inclusive financial coverage, inclusive financial usage, and peer competitiveness, with industrial structure foundation as a marginal condition deficiency. Other conditions may be present or absent. Its configuration expression is: Inclusive Financial Coverage* ~ Inclusive Financial Usage* ~ Industrial Structure Foundation* ~ Peer Competitiveness.

Resource-Capability Dual Deficiency Type (P5): This configuration exhibits core deficiencies in inclusive financial usage, financial utilization effectiveness, fiscal resource endowment, peer competitiveness, and digital infrastructure. Its expression is: Inclusive Financial Usage × Financial Utilization Effectiveness × Fiscal Resource Endowment × Peer Competitiveness × Digital Infrastructure Development.

Infrastructure-Industry Lag Type (P6): This configuration exhibits core deficiencies in inclusive financial utilization, fiscal resource endowment, peer competitiveness, and digital infrastructure development, with industrial structure foundation as a peripheral deficiency. Other conditions may be present or absent. The configuration expression is: Inclusive Financial Utilization* ~ Fiscal Resource Endowment* ~ Industrial Structure Foundation* ~ Peer Competitiveness* ~ Digital Infrastructure Development.

When comparing the prerequisites for the derived results, the configuration paths of low-coupling coordinated development often exhibit deficiencies in “inclusive financial usage,” “peer competitiveness,” and “industrial structure foundation.” Conversely, these conditions are validated in the configuration paths of high-coupling coordinated development. This indicates that enhancing the coupling and coordination between regional new-quality productive forces and rural revitalization fundamentally relies on the foundational support of these three conditions.

4.3.4. Comparative Analysis by Time Period

To further analyze the evolution patterns of configuration conditions for the coupled and coordinated development of new-quality productive forces and rural revitalization, this study divides the period into two phases: 2017–2019 and 2020–

2022, using 2020 (the year national digital village pilot programs commenced) as the boundary. First, necessity analyses were conducted for single-condition variables across both periods. Results indicate that consistency levels for all antecedent conditions remained below 0.9. Configuration analysis employed aggregated fsQCA with consistent threshold and variable calibration methods as previously described. Configuration results are presented in Table 7.

Table 7. Comparison of Configuration Paths Across Time Periods.

	2017–2019			2020–2022		
	P7	P8	P9	P10	P11	P12
Financial Coverage Breadth	●	•	●	⊗	•	●
Financial Usage Depth		●	●	⊗	●	●
Financial Validity	●	●	●	●	●	●
Fiscal Resource Endowment			●	⊗		
Industrial Structure Foundation	⊗	●		●	●	
Competitiveness Among Peers	●		⊗	●		⊗
Digital Infrastructure	•	●	⊗	•	•	⊗
Consistency	0.08	0.90	0.83	0.96	0.91	0.84
Original Coverage	0.00	0.20	0.21	0.02	0.17	0.25
Unique Coverage	0.98	0.05	0.15	0.01	0.05	0.15
Overall consistency	0.86			0.87		
Overall Coverage	0.68			0.63		

From the perspective of configuration path changes, the three configuration paths from 2017 to 2019 can be categorized into three highly coupled and coordinated configuration models based on the composition of core conditions: Basic Financial Coverage Type (P7), Validity-Dominant-Competition-Driven Type (P8), and Fiscal Dependency-Competition-Weakness Type (P9). Similarly, 2020-2022 produced three highly coupled coordination paths: Digital Infrastructure Enhancement (P10), Dual Excellence in Industry and Validity (P11), and Competition-Technology Synergy (P12).

Comparing Table 6 and Table 7 reveals similarities between segmented and non-segmented configuration paths. “Financial utilization depth” and “financial utilization effectiveness” consistently serve as key conditions for the highly coupled, coordinated development of new productive forces and rural revitalization. Among the six high/low coupling paths in Table 6, all high-coupling paths (P1a-P3) incorporate both “financial utilization depth” and “financial utilization effectiveness”; Table 7 shows that among the six time-period paths, five high-coupling paths (P8-P12) besides P7 incorporate both factors. Overall, nine out of ten effective configuration paths include “financial usage depth” and “financial usage effectiveness,” validating their core role.

A longitudinal comparison of the configuration paths in Tables and 7 reveals a significant strengthening of the dominance of technological conditions, while the importance of industrial structure foundations gradually emerges. For instance, in the 2020-2022 configuration P11 (dual excellence in industry-validity), “industrial structure foundation” served as the core condition while digital infrastructure was only a peripheral condition. Conversely, in the 2017-2019 configuration P8 (validity-dominant, competition-driven), digital infrastructure remained the core condition. This shift indicates that as digital village pilot initiatives advance, the overall improvement in rural digital infrastructure has reduced its necessity, making industrial structure optimization a more critical driving factor.

Furthermore, comparing Path P9 (fiscal dependency-competitive disadvantage model) with Path P12 (competitive-technological synergy model) reveals that in regions with deeper adoption of inclusive finance (), fiscal resource endowment shifts from being a core deficiency condition in P9 (requiring fiscal support to address shortcomings) to a non-essential condition in P12 (®). This indicates that fiscal functions transition from “direct infusion” to “facilitating self-sustaining growth,” enhancing the system’s endogenous momentum through technological synergy and resource reallocation.

4.3.5. Robustness Tests

This study employs three robustness testing methods: (1) Raising the consistency threshold from 0.8 to 0.85 while maintaining case frequency and PRI consistency thresholds unchanged. (2) Increasing the PRI consistency threshold from 0.7 to 0.75 while preserving case frequency and consistency thresholds. (3) Setting the case frequency threshold to 2, retaining over 90% of cases. Findings indicate that increasing case frequency reduces the number of configurations, yet these configurations maintain a clear correlation with the original ones. Beyond this, all configuration results only exhibit changes under isolated marginal conditions, insufficient to produce entirely different outcomes. Thus, this study demonstrates strong robustness.

5. Conclusions and Recommendations

5.1. Findings

(1) The coupling coordination level between new productive forces and rural revitalization in Jiangxi’s counties exhibits a “higher in central regions, lower in eastern and western regions” distribution pattern. It fluctuates upward over time but remains at a barely coordinated stage, not yet entering high-quality coordinated development. Counties with higher coupling coordination levels show spatial clustering. The central region exhibits higher coupling coordination due to its economic foundation, technological innovation, and policy support advantages. In contrast, the eastern and western regions face lower coordination levels constrained by weak infrastructure and monolithic industrial structures. Digital village pilot policies have significantly enhanced coupling coordination in some pilot counties (e.g., Nanchang County, Fengcheng City) through technological empowerment and resource integration, yet regional development disparities persist.

(2) Four configuration pathways exist for achieving high-level coupled coordination between new-quality productive forces and rural revitalization. Based on core conditions, three configuration models emerge: comprehensive factor integration, digital empowerment-industry-driven, and integrated infrastructure coordination. Each model requires multiple factors to interact synergistically. When a region exhibits deep usage of inclusive finance, strong peer competitiveness, and poor fiscal resource endowment, digital infrastructure construction substitutes for financial utilization efficiency and fiscal resource endowment, respectively. A period-by-period comparison reveals three configuration pathways between 2017-2019 and 2020-2022. Over time, the dominance of inclusive finance significantly strengthened, while the importance of industrial structure foundations gradually became more prominent.

5.2. Recommendations

(1) Accelerate the development of new-quality productive forces and promote their higher-level integration with rural revitalization. While most regions in Jiangxi Province are in a coordinated development phase, regional disparities necessitate prioritizing remote mountainous areas in eastern and western regions, as well as counties with single-industry development, to accelerate the convergence of new-quality productive forces with rural revitalization. First, governments should increase investment in rural digital infrastructure to expand coverage of next-generation information infrastructure such as broadband networks and the Internet of Things (IoT). This will meet farmers' needs for digital production and living, drive the intelligent and specialized development of agriculture through digital technology applications, enhance agricultural productivity, and promote the integrated development of primary, secondary, and tertiary industries in rural areas. Simultaneously, policy guidance should be strengthened to encourage enterprises and social capital to participate in digital rural development. This will foster a collaborative framework involving government, market, and social entities, pooling resources to drive high-quality progress in digital rural initiatives.

(2) Strengthen synergies among multiple factors and leverage the core guiding role of inclusive finance. The coordinated development of new productive forces at the county level and rural revitalization is the result of multiple factors interacting, with diverse pathways available. Therefore, local governments need to explore locally appropriate paths for coordinated development based on their own endowments, adapting to local conditions, timing, and circumstances, thereby fostering differentiated development where “each beauty shines in its own way.” On one hand, strengthen synergistic interactions among technological, organizational, and environmental factors. Explore locally distinctive pathways based on regional resource endowments and economic foundations. For instance, areas with weaker peer-competitive capabilities can enhance the coverage, usage depth, and effectiveness of inclusive finance to achieve “overtaking on the curve.” On the other hand, all configuration paths achieving high-level coordinated development share a common core condition: a high level of inclusive finance. Moreover, this influence intensifies over time. Therefore, governments and financial institutions should increase the dissemination and allocation of credit-related information, further streamline the application process for platform-based credit, and establish partnerships with more local financial institutions to fully leverage their role in stimulating credit demand. Simultaneously, tailored financial products should be developed based on the diversity of rural economies, emphasizing the coordinated development of agriculture, animal husbandry, and specialty industries. This will further optimize industrial structures, providing rural residents with more flexible and convenient loan services and preferential interest rate support.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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