

THE ROLE OF NEW QUALITY PRODUCTIVITY IN THE REVITALIZATION OF RURAL INDUSTRIES: EVIDENCE FROM CHINA

WU, J.-Q.* – HUANG, F.-Y. – JIANG, H.

School of Business Administration, Jimei University, No. 183 Yinjiang Road, Jimei Street, Jimei District, Xiamen City, Fujian Province, China
(e-mail/phone: feiyan202806@163.com/+86-135-5980-8149; hangjiang@jmu.edu.cn/+86-139-0602-8063)

**Corresponding author*

e-mail: jqwu@jmu.edu.cn; phone: +86-135-1596-1033

(Received 25th Oct 2025; accepted 30th Jan 2026)

Abstract. As an advanced form integrating technological innovation, optimized factor allocation, and industrial transformation, new quality productivity has become an endogenous driving force for rural revitalization. Based on panel data from 31 Chinese provinces between 2013 and 2023, this study employs benchmark regression models and ArcGIS spatial analysis to examine the impact of the new quality productivity and its sub-dimensions—scientific and technological productivity, green productivity, and digital productivity—on rural revitalization. The findings reveal significant regional disparities in both the level of rural revitalization and the new quality productivity across China, characterized by a spatial gradient pattern of higher levels in the eastern regions and lower levels in the western areas. Empirical analysis indicates that the new quality productivity significantly promotes rural revitalization, with scientific, technological, and digital productivity playing particularly prominent driving roles. Based on these results, it is recommended to prioritize scientific, technological, and digital productivity as core engines, optimize regional collaboration mechanisms, and tailor strategies to local conditions, maximizing ‘could be used instead of ‘fully unleash’.

Keywords: *new quality productivity, rural revitalization, digital productivity, green productivity, scientific and technological productivity*

Introduction

In 2017, General Secretary Xi Jinping first proposed a rural revitalization strategy in the report of the 19th Party Congress. The report of the 20th Party Congress emphasized the need to promote comprehensive rural revitalization and pointed out that ‘challenging and demanding’ is suggested to be used instead of ‘arduous and burdensome. In addition, rural revitalization is an inevitable requirement in the new era to resolve the major social contradictions in China and to cope with unprecedented global changes’ is the suggested structure. In contrast, the revitalization of rural industries is the material foundation of comprehensive rural revitalization (Hou and Wang, 2024). However, this crucial endeavor faces a significant structural constraint: the rapid pace of urbanization, while fueling overall economic growth, has been accompanied by a sustained outflow of young, able-bodied labor from the countryside, leading to a pronounced human capital shortage that impedes the deeper development of rural industries. In the context of the new era, to revitalize rural industries, it is necessary to follow the trend of the times and give full play to the role of new quality productivity.

At present, China’s economy has entered the stage of high-quality development, and accelerating the formation of new quality productive forces has become the strategic orientation of China’s comprehensive construction of a modern socialist country. In

September 2023, General Secretary Xi Jinping proposed ‘new quality productivity’ for the first time, and emphasized the need to ‘integrate scientific and technological innovation resources, lead the development of strategic emerging industries and future industries, and accelerate the formation of new quality productivity’. In summary, the new qualitative productive forces are advanced, innovation-driven productive forces that have abandoned traditional economic growth modes and development paths and exhibit high-tech, high-efficiency, and high-quality characteristics, in line with the new development concept (Li et al., 2024). The proposal of this new quality productivity and its emergence have provided new opportunities and impetus for rural revitalization.

Crucially, the revitalization of rural industries has emerged as a significant global issue. In terms of industrial composition, contemporary China’s rural industries have long transcended the traditional boundaries of crop cultivation and animal husbandry, expanding into a diversified system encompassing modern agriculture, agricultural product processing, rural specialty industries, leisure agriculture, and rural tourism, as well as emerging rural service sectors (Zhang and Li, 2025). The spatial distribution and evolution of these industries exhibit a marked geographical gradient and regional heterogeneity: leveraging market and locational advantages, eastern and central regions have formed highly agglomerated and diversified hybrid industrial forms, emphasizing high-value-added processing and market integration; in contrast, western areas rely more on local ecological and cultural resources, pursuing an adaptive “small but beautiful” pathway, excelling in specialty cultivation and eco-tourism (Li and Gong, 2022). At a deeper level, the inherent developmental logic of rural industries—especially their small-scale, specialized segments—fundamentally differs from that of traditional large-scale industry, which pursues standardization, economies of scale, and efficiency optimization: they possess distinct place-based characteristics (Shao, 2022). They are deeply embedded within local social networks and ecosystems. Consequently, the mechanism through which new quality productive forces empower rural revitalization is not a simple transfer of technology or replication of efficiency models, but rather manifests more likely as an adaptive process of “suiting measures to local conditions”: digital technologies, green innovations, and other elements interact with localized resource endowments, industrial structures, and socio-cultural fabrics to activate and amplify the inherent differentiated advantages of rural industries.

Current academic research on new quality productivity is mainly focused on a sub-dimension of it in rural industrial revitalization. For example, in the study of digital productivity in rural industrial revitalization, one study found that the four paths to drive high-level rural industrial revitalization are digitalization-driven, digital government-talent-driven, digital enterprise-driven, and digital enterprise-talent-driven. Meanwhile, there are significant differences in the driving paths of rural revitalization in eastern, central, and western China (Luo et al., 2023); it has also been found that rural finance effectively promotes the development of rural logistics; rural finance affects the development of rural logistics by influencing the revitalization of rural industries, suggesting that rural industry revitalization plays a mediating role (Qin and Jin, 2022). In addition, some scholars have also studied the relationship between green productivity in new quality productivity and rural revitalization, examining the study of green NQP drivers and influence mechanisms of high-tech retail enterprises under China’s dual-carbon target (Wang et al., 2025); the relationship between NQP and environmental innovation is explored, with a particular focus on the role of management empowerment and board centralization in the context of Chinese A-share listed companies. This study

highlights the importance for policymakers to develop regulations that balance management empowerment and board centralization to facilitate the shift from NQP to environmental innovation (Yue et al., 2024); synergistic agglomeration significantly contributes to the high quality of manufacturing, with NQP playing a key mediating role and innovation ecosystems, directly and indirectly, moderating the relationship between the two (Liu and He, 2024).

In summary, the new quality productivity has become the key driver propelling rural revitalization. However, to date, most academic work has focused on theoretical discussions of the nexus between new quality productivity and rural revitalization. In contrast, empirically grounded studies that examine how new quality productivity actually affects rural revitalization remain scarce. Therefore, this paper takes China's 31 provincial-level regions from 2013 to 2023 as the sample, employs a benchmark regression model and ArcGIS spatial analysis, and examines the impacts of the new quality productivity and its sub-dimensions—scientific and technological productivity, green productivity, and digital productivity—on rural revitalization, aiming to provide both theoretical and empirical evidence for advancing rural revitalization.

Research hypothesis and mechanism analysis

New-quality productivity and rural revitalization of industries

New quality productivity is a rich and meaningful economic category that represents a leap in productivity (Esfahani et al., 2024). New quality productivity often refers to production methods and elements based on emerging technologies such as information technology (IT) and artificial intelligence (AI), which can significantly enhance production efficiency and quality (Chang et al., 2023). From the profound correlation level, “new” represents new elements, new forms of business, and new technologies. “Quality” means the pursuit of high-quality development and sustainable development (Du et al., 2024). This new form of productivity centers on diverse innovation, with TFP as its primary vehicle, characterized by the emergence of numerous disruptive technologies and their industrialization, leading to the rapid development of emerging industries with higher technological levels, better economic benefits, and friendlier environmental practices, thereby promoting high-quality economic development (Yue et al., 2024).

Since the 19th Party Congress, General Secretary Xi Jinping has repeatedly pointed out that ‘industrial revitalization is the top priority of rural revitalization’. New quality productivity differs from traditional productivity due to its advanced characteristics, such as high technology, efficiency, quality, and sustainability, which align with the requirements of high-quality development. It is driven by advances in new quality labor, labor tools, and objects (Zhang et al., 2024). In the context of the new era, to achieve rural revitalization, it is necessary to keep pace with the times and give full play to the key role of new quality productivity. The new quality productivity can not only provide an optimal combination of new types of workers, new types of labor materials, and new types of labor objects, but also effectively promote the realization of rural industrial revitalization (Lin et al., 2024); it also empowers the construction of digital countryside through multiple paths such as industrial upgrading, rural development, and farmers’ progress, and it can promote the optimal allocation of urban and rural resource elements, promote the synergistic development of urban and rural industries (Liu and He, 2024), and then promote rural industrial revitalization. In addition, the new quality productivity

comprehensively accelerates the transformation of the traditional agricultural industry, carefully lays out the strategic emerging industries in agriculture, and successfully spawns new models and forms of rural industry, providing new kinetic energy for rural revitalization. At the same time, the new quality productivity provides a strong impetus for rural revitalization by advancing agricultural technology, upgrading the quality of talent (Xu et al., 2024), optimizing resource allocation, promoting the modernization of agriculture and rural areas, and realizing. It is worth noting that the new quality productivity not only focuses on current development but also on long-term sustainability. It continues to develop high-tech science and technology, cultivate a new-quality labor force, promote the transformation of agricultural modernization, and strengthen the concept of green development to give the comprehensive revitalization of the countryside the connotative characteristics of high innovation, high quality, and sustainability (Du et al., 2024). Based on this, the research hypothesis is proposed:

H1: New-quality productivity significantly facilitates rural industrial revitalization.

The new quality productivity sub-dimension and rural revitalization

The proposal for new quality productivity demonstrates unique, cutting-edge theoretical depth and a wide range of practical application value. Combined with General Secretary Xi Jinping's critical discourse and China's current economic development, the new quality productivity is an integrator that spans at least three major dimensions: science and technology, green, and digital.

Science and technology productivity and rural revitalization

The global history of rural revitalization demonstrates that scientific and technological innovation is a crucial engine for revitalizing rural industries (Xie et al., 2024). Science and technology productivity, a concept rooted in groundbreaking, disruptive technological breakthroughs, emphasizes the integration and application of new technologies, economic models, and business models. As the core of the new quality productivity, technological innovation is guided by China's national objectives and conditions to achieve rural industrial revitalization (Ahmad and Wu, 2022). The application of Science and technology in the circulation of agricultural products has significantly facilitated the flow of agricultural commodities and catalyzed the revitalization of rural industries (Zheng, 2024). Moreover, harnessing information technology, communication technology, big data analytics, and artificial intelligence has transformed agricultural production, processing, distribution, and marketing into more intelligent, efficient, and data-driven processes (Zhao et al., 2024). Advancements in science and technology have further enhanced crop yields and improved farming outcomes through sustainable practices (Vinod Chandra et al., 2024). Based on this, the research hypothesis is proposed:

H2: Scientific and technological productivity significantly facilitates rural industrial revitalization.

Green productivity and rural revitalization of industries

The new quality productivity is, in essence, green productivity—a form of productivity that realizes the harmonious coexistence of humanity and nature (Xie et al., 2024). Grounded in emerging science and technology, green productivity markedly increases resource-use efficiency, develops and utilizes clean energy, and achieves energy savings

and emission reductions by optimizing production processes. Simultaneously, it leverages intelligent means to prevent and control environmental pollution, efficiently attaining green production targets and thereby propelling industries toward green, low-carbon, circular development. Scholars have emphasized that green productivity is “a strategy to enhance productivity and environmental performance to promote overall socio-economic development”, and others argue that advancing rural revitalization requires green development as both its prerequisite and its foundation, insisting that “green” must be regarded as the fundamental color of rural industrial development (Shen et al., 2022). Moreover, the application of green productivity improves the quality and safety of agricultural products, meets consumer demand for high-quality produce, and strengthens their competitiveness. On this basis, we propose:

H3: Green productivity significantly facilitates rural industrial revitalization.

Digital productivity and rural revitalization

As an emerging form of productivity, digital productivity drives economic growth by deeply integrating digital technologies and reassembling factors of production to create a diverse array of goods and services that meet social needs. In agriculture, its empowering effect is especially pronounced: digital productivity fertilizes the development of smart farming, thereby energizing rural industrial revitalization. It also eases the information asymmetries farmers face in production, market information acquisition, and marketing, enabling them to allocate resources more efficiently and advancing rural industries (Harou et al., 2022). The rise in this productivity has become a key engine of global growth (Lyu et al., 2023), enhancing farmers’ entrepreneurial capacity by providing critical inputs such as production credit, modern technologies, and social capital (Cheng et al., 2024). Some scholars argue that digital-finance innovation can modernize agricultural supply and value chains by catalyzing new quality productivity (Zhang et al., 2025). Because digital productivity can be tailored to the specific stage and local conditions of rural revitalization, it enables phased, locality-specific strategies that steadily advance the digital transformation of agriculture and rural areas, injecting new momentum into rural revitalization (Geng et al., 2023). On this basis, we propose:

H4: Digital productivity significantly facilitates rural industrial revitalization.

Materials and methods

Data sources

To ensure data availability and temporal continuity, this study covers 31 provincial-level regions in China (excluding Hong Kong, Macao, and Taiwan) over the period 2013–2023. The principal sources are the China Rural Statistical Yearbook, the China Statistical Yearbook on Science and Technology, the China Energy Statistical Yearbook, the China Statistical Yearbook on Environment, and the China Industrial Statistical Yearbook. Missing values for individual provinces in specific years were filled by linear interpolation.

Data processing

This study employs the entropy-weight method to construct composite indices for both rural revitalization and the new quality productivity, providing the empirical foundation for subsequent analysis. This method objectively determines weights based on the dispersion of the indicator data itself, effectively avoiding bias introduced by subjective

weighting, and has thus been widely adopted in comprehensive evaluation studies, such as those on rural revitalization (Xiong et al., 2024). The resulting indices provide a robust empirical foundation for the subsequent panel data analysis.

Primary variables

Explained variable: rural industrial revitalization (Rri)

Referring to the indicator system of rural industrial revitalization established by Tian et al. (2022), the fundamental basis for rural industrial revitalization in China lies in agricultural development. Agricultural revitalization constitutes the essential connotation of rural industrial revitalization, and the key task of rural industries is to promote the high-quality development of the agricultural sector. The specific indicators are selected as follows: (1) In measuring agricultural production increase, two key indicators, the production per unit area of food crops and the production per unit area of cash crops, are selected to capture the improvement of agricultural production capacity accurately. (2) In measuring agricultural value-added, gross value per capita of the primary industry and value-added per capita of the primary industry were selected as core indicators to reveal the economic growth and value enhancement of rural industries. (3) In assessing the agricultural income increase, the important indicator of disposable income per capita of rural households was adopted to reflect the direct impact of agricultural industry development on farmers' income. A detailed breakdown of this measurement framework is provided in *Table 1*.

Table 1. Rural industry revitalization indicators

Variable meaning	Primary indicator	Secondary indicator	Unit
Rural industry revitalization	Agricultural production increase	Grain crop yield per unit area	Tons/hectare
		Economic crop yield per unit area	Tons/hectare
	Agricultural value increase	Per capita gross value added in primary industry Per capita value added in primary industry	Yuan/person Yuan/person
Agricultural income increase	Per capita disposable income of rural households	Yuan/person	

Explanatory variables: new quality productivity (NQP)

Referring to the NQP index system established by Lu et al. (2024), New Quality Productivity is conceptualized as a regional-level, comprehensive driver of development. It is not an attribute of any single sector, such as agriculture or industry, but encompasses three key dimensions: Scientific and Technological Productivity (TP), Green Productivity (GP), and Digital Productivity (DP). For a detailed list of the specific indicators and their measurements, please refer to *Table 2*. First, Technological Productivity is characterized by two aspects: innovation productivity and technological productivity. Specifically, innovation productivity is measured by indicators such as the Number of authorized patents by region and the Industrial innovation expenditure of above-scale industrial enterprises; technological productivity is gauged by metrics including High-tech industry business revenue and the Full-time equivalent of Research and Development (R&D) personnel in above-scale industrial enterprises. Second, Green Productivity is assessed from the perspectives of resource-saving and environment-friendly productivity. Resource-saving productivity is measured by Energy consumption/Gross Domestic Product (GDP) and Industrial water consumption/GDP; environment-friendly

productivity is evaluated using the Industrial solid waste comprehensive utilization rate, Industrial wastewater discharge/GDP, and Industrial SO₂ emissions/GDP. Third, Digital Productivity is described through digital industry productivity and industrial digital productivity. Digital industry productivity is measured by Integrated circuit production and Total telecommunications business; industrial digital productivity is captured by the Number of internet broadband access ports, Software business revenue, Optical cable line length/regional area, and E-commerce sales.

Table 2. *New quality productivity indicators*

Variable meaning	Primary indicator	Secondary indicator	Unit
New quality productivity	Technological productivity	Number of authorized patents by region	Units
		High-tech industry business revenue	Thousand yuan
		Industrial innovation expenditure of above-scale industrial enterprises	Ten thousand yuan
		Full-time equivalent of R&D personnel in above-scale industrial enterprises	Hours
	Green productivity	Energy consumption/GDP	%
		Industrial water consumption/GDP	%
		Industrial solid waste comprehensive utilization rate	%
		Industrial wastewater discharge/GDP	%
		Industrial SO ₂ emissions/GDP	%
	Digital productivity	Integrated circuit production	Hundred million units
		Total telecommunications business	Hundred million yuan
		Number of internet broadband access ports	Ten thousand
		Software business revenue	Ten thousand yuan
		Optical cable line length/regional area	Meters
		E-commerce sales	Ten thousand yuan

Control variables

Following Li (2024), we include the following controls in the model: the level of government intervention (GOV), measured by the ratio of fiscal expenditure to GDP; the urbanization rate (UR), proxied by the share of urban population; regional industrial structure (IND), represented by the ratio of value added in the secondary industry to that in the tertiary industry; foreign-investment intensity (Inv), captured by the ratio of foreign direct investment to regional GDP; and education attainment (Edu), measured by the natural logarithm of the number of students enrolled in regular institutions of higher education (in 10,000 persons). A detailed overview of these control variables is provided in *Table 3*.

Table 3. *Definition of control variables*

Variable name	Sign	Specific indicators
Fiscal expenditure	GOV	Ratio of fiscal expenditure to GDP
Urbanization level	UR	Share of urban population
Regional industrial structure	IND	Ratio of secondary-industry value-added to tertiary-industry value-added
Foreign-investment intensity	Inv	FDI divided by regional GDP
Education attainment	Edu	Natural logarithm of regular undergraduate and college enrollment

Design and construction of models

In order to deeply investigate the influence mechanism of new quality productivity on rural industrial revitalization, model (1) is established to investigate the influence of new quality productivity on rural industrial revitalization:

$$Rri_{it} = \alpha_0 + \alpha_1 NQP_{it} + \alpha_2 X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (\text{Eq.1})$$

In order to explore the impact of the three dimensions of new quality productivity (technological productivity, green productivity, and digital productivity) on rural industrial revitalization, the following model was constructed:

$$Rri_{it} = \beta_0 + \beta_1 TP_{it} + \beta_2 X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (\text{Eq.2})$$

$$Rri_{it} = \gamma_0 + \gamma_1 GP_{it} + \gamma_2 X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (\text{Eq.3})$$

$$Rri_{it} = \delta_0 + \delta_1 DP_{it} + \delta_2 X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (\text{Eq.4})$$

In this study, Rri_{it} denotes the level of rural revitalization in province i in year t , NQP_{it} denotes NQP in province i in year t , and TP_{it} , GP_{it} , DP_{it} denote science and technology productivity, green productivity, and digital productivity in province i in year t . To control for variables that may affect the results, this paper includes fiscal expenditure and urbanization level as control variables, denoted by X_{it} . At the same time, region and time-fixed effects are denoted by μ_i , σ_t , respectively to express them. In addition, a random disturbance term ε_{it} is introduced.

Empirical analysis and testing

Calculation results of the entropy weight method

This paper uses the entropy weight method to quantitatively assess the levels of rural industrial revitalization and new quality productive forces—comprising technological, green, and digital productivity—across different regions. Annual data were aggregated and averaged to produce comprehensive evaluation results, as shown in *Figure 1*. Overall, the findings reveal several pronounced patterns and interregional disparities. First, significant disparities exist among provinces in both new quality productive forces and rural industrial revitalization. For instance, Guangdong ranks first in both the Rural Revitalization Index (0.412) and the New Quality Productivity Index (0.696). At the same time, Qinghai has the lowest Rural Revitalization Index (0.018) and Xinjiang has the lowest New Quality Productivity Index (0.094)—only a fraction of Guangdong's corresponding values. This finding clearly indicates an imbalance among provinces in revitalizing rural industries and developing new quality productive forces. Second, although technological, green, and digital productive forces are inseparably linked to new quality productive forces, the gaps in new quality productivity levels are primarily attributable to technological and digital productive forces. Descriptive statistical analysis (*Table 4*) further supports this: the standard deviation of green productivity across provinces is only 0.001, much smaller than that of technological productivity (0.149) and digital productivity (0.018). Third, there are noticeable regional disparities in development levels. To more intuitively explore these differences, this study used

ArcGIS 10.8 to map levels of rural revitalization and new quality productive forces across 31 provinces and municipalities in China (Figs. 2 and 3), visually illustrating this trend. The maps clearly show that the eastern regions exhibit higher levels of rural revitalization and new, high-quality productive forces, whereas the western regions lag. Overall, both rural revitalization and new quality productive forces demonstrate a declining trend from east to west, with substantial interregional differences. These regional disparities not only reflect imbalances in regional development but, more importantly, indicate that higher levels of new, high-quality productive forces contribute to greater rural revitalization.

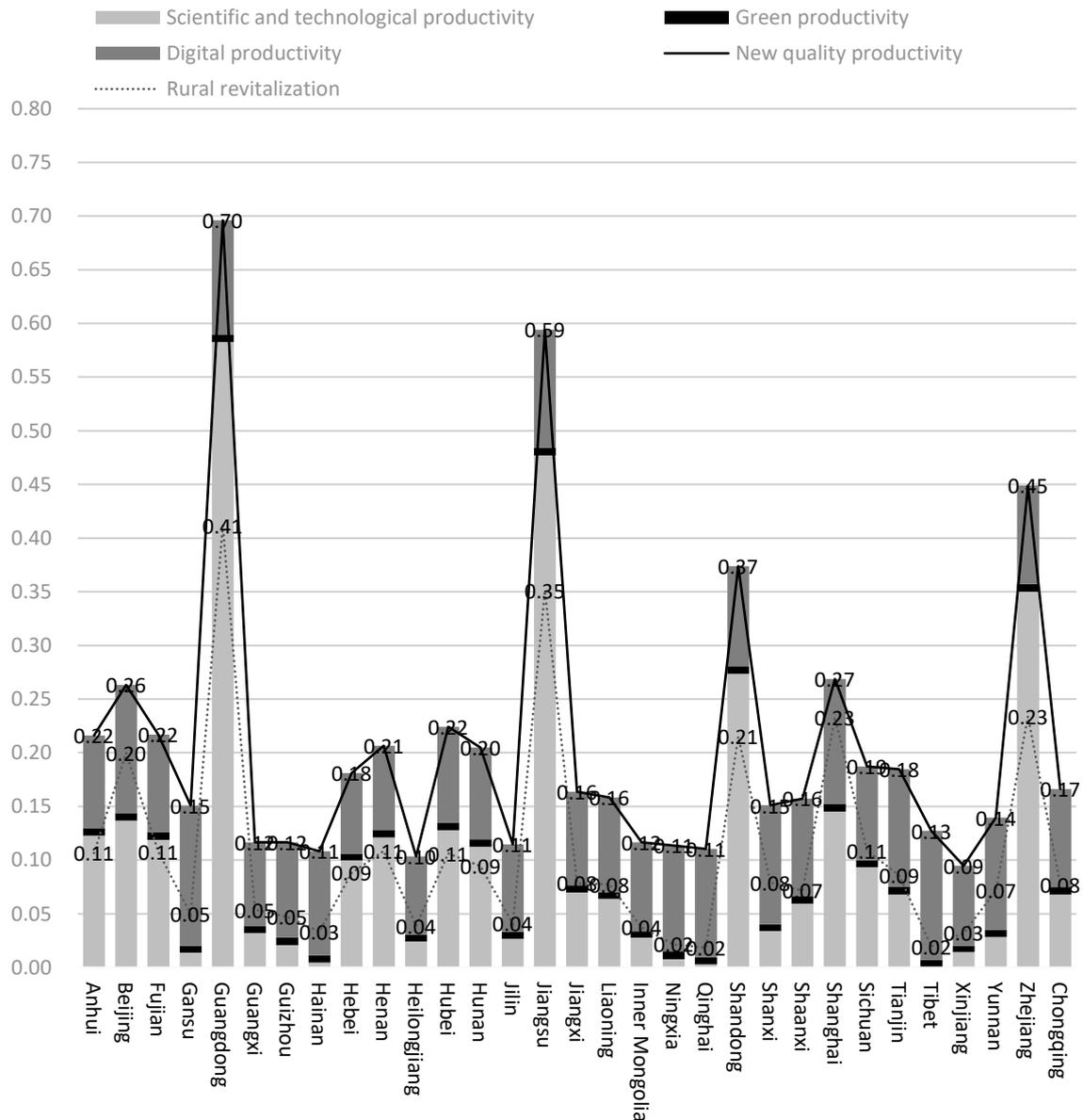


Figure 1. Composite index

Table 4. Descriptive statistics

Variable	Sample	Size	Mean standard deviation	Minimum	Maximum
Rri	341	0.310	0.142	0.031	0.852
NQP	341	0.209	0.153	0.083	1.065
TP	341	0.107	0.149	0.000	0.949
GP	341	0.007	0.001	0.005	0.012
DP	341	0.095	0.018	0.066	0.201
GOV	341	0.287	0.207	0.001	1.354
UR	341	0.609	0.123	0.239	0.896
IND	341	0.758	0.223	0.171	1.454
Inv	341	0.025	0.060	0.000	0.922
Edu	341	4.269	0.956	1.209	5.689

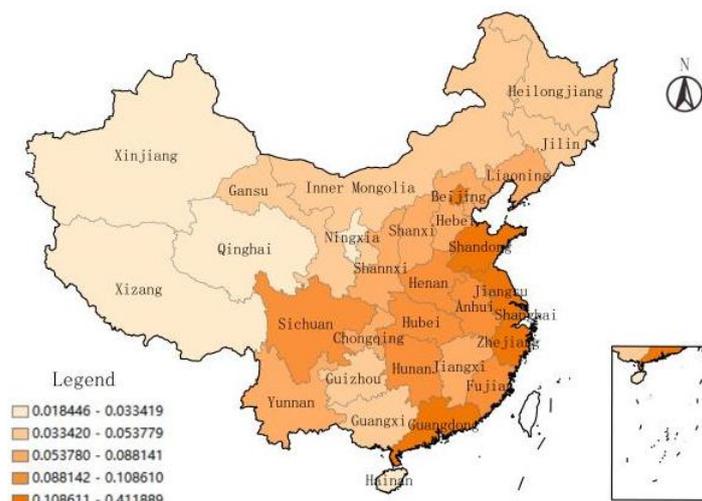


Figure 2. Level of rural revitalization. Based on the standard map with Approval Number GS (2023) 2767 downloaded from the Standard Map Service website of the Ministry of Natural Resources

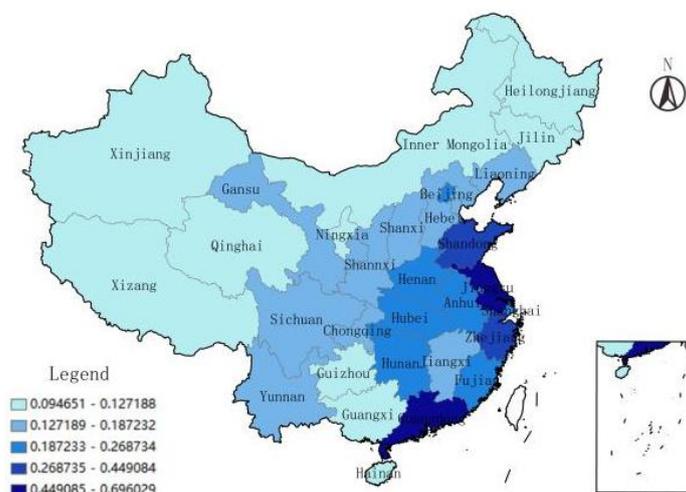


Figure 3. Level of new quality productivity

Analysis of benchmark regression results

This study employs a baseline regression model to examine the impact of new quality productivity on rural industrial revitalization. The results are presented in *Table 5*. Column (1) reports the estimate for the core explanatory variable with no control variables. The coefficient for new quality productivity is 0.255 and statistically significant at the 1% level. To further validate this finding and account for other potential factors, control variables are gradually introduced in columns (2) through (6). The estimate remains positive and significant at the 1% level across all specifications. Economically, this implies that a one-unit increase in the new quality productivity index is associated with approximately a 26.0% increase in the rural industrial revitalization index. This stable and substantial effect provides robust evidence for Hypothesis H1. Further analysis of the control variables reveals their significant moderating role in the process through which new quality productivity exerts its effect. Specifically, urbanization level has a significant negative influence, confirming the “resource siphoning effect” of urbanization, particularly the ongoing outflow of labor and talent, which exacerbates the human capital bottleneck in rural areas and poses a practical constraint. In contrast, foreign investment demonstrates a significant compensatory positive effect through the injection of capital and technology. These findings highlight that, while promoting new quality productivity, it is essential to coordinate urban-rural development and actively foster endogenous dynamism in rural areas to alleviate labor constraints.

Table 5. *Impact of new quality productivity on rural revitalization of industries*

	(1)	(2)	(3)	(4)	(5)	(6)
	Rri	Rri	Rri	Rri	Rri	Rri
NQP	0.255*** (0.033)	0.263*** (0.034)	0.257*** (0.034)	0.255*** (0.035)	0.262*** (0.035)	0.260*** (0.035)
GOV		-0.079 (0.056)	-0.083 (0.056)	-0.088 (0.059)	-0.094 (0.059)	-0.089 (0.059)
UR			-0.134 (0.136)	-0.141 (0.139)	-0.152 (0.138)	-0.282 (0.173)
IND				-0.006 (0.025)	-0.011 (0.025)	-0.013 (0.025)
Inv					0.084** (0.039)	0.081** (0.039)
Edu						0.040 (0.032)
Constant	0.154*** (0.008)	0.176*** (0.017)	0.251*** (0.079)	0.263*** (0.090)	0.271*** (0.090)	0.181 (0.116)
Area fixed effects	YES	YES	YES	YES	YES	YES
Time fixed effect	YES	YES	YES	YES	YES	YES
N	341	341	341	341	341	341
R ²	0.878	0.878	0.878	0.878	0.879	0.880

*, **, *** denote significance at the 10%, 5%, and 1% levels, respectively, with standard errors in parentheses

This study further employs a baseline regression model to analyze the impact of various dimensions of the new quality productivity on rural revitalization. The results

are presented in *Table 6*. Columns (1) and (2) show the effect of scientific and technological productivity on rural revitalization. Without control variables, the estimated coefficient is 0.268 and statistically significant at the 1% level, implying an approximate 26.8% increase in the revitalization index per unit improvement. After introducing control variables, the coefficient remains highly significant. Thus, Hypothesis H2 is preliminarily validated. Columns (3) and (4) examine the impact of green productivity. The coefficient is positive but statistically insignificant, thus failing to support Hypothesis H3. This may be attributed to the high costs, diffusion challenges, and long payback periods associated with green technologies, whose positive effects have not yet fully materialized into observable short-term industrial economic gains within the current measurement framework. This also suggests that the benefits of green development may be more pronounced in terms of long-term ecological and social value. Columns (5) and (6) examine the impact of digital productivity. Without control variables, the estimated coefficient is 0.525 and statistically significant at the 1% level, suggesting a 52.5% increase per unit. After including controls, the coefficient remains significant, indicating a 45.8% increase. This substantial and robust effect provides conclusive evidence for Hypothesis H4. Based on the regression results in *Table 6*, this study finds that new quality productive forces have a positive impact on rural industrial revitalization, primarily through the roles of technological and digital productive forces.

Table 6. Impact of NQP sub-dimensions on rural revitalization

	(1)	(2)	(3)	(4)	(5)	(6)
	Rri	Rri	Rri	Rri	Rri	Rri
TP	0.268*** (0.036)	0.272*** (0.037)				
GP			5.579 (5.531)	2.315 (5.635)		
DP					0.525*** (0.198)	0.458** (0.202)
GOV		-0.081 (0.059)		-0.043 (0.064)		-0.059 (0.063)
UR		-0.315* (0.173)		-0.516*** (0.188)		-0.456** (0.187)
IND		-0.015 (0.025)		-0.038 (0.027)		-0.035 (0.027)
Inv		0.080** (0.039)		0.051 (0.043)		0.055 (0.042)
Edu		0.046 (0.032)		0.051 (0.035)		0.041 (0.035)
Constant	0.181*** (0.006)	0.200* (0.115)	0.158*** (0.039)	0.303** (0.134)	0.144*** (0.021)	0.284** (0.125)
Area fixed effects	YES	YES	YES	YES	YES	YES
Time fixed effect	341	341	341	341	341	341
R ²	0.877	0.879	0.855	0.857	0.858	0.859

Endogeneity test

Although this study controls for the effects of rural development levels, financial support, and other factors on rural industrial revitalization, potential endogeneity issues may remain due to the nature of the comprehensive indices (both the core explanatory and the explained variables) calculated using the entropy method. These concerns primarily arise from omitted variables (e.g., unobserved regional characteristics such as human capital or resource endowments), potential measurement errors inherent in composite index construction and data imputation, and, most critically, two-way causality. To address potential endogeneity concerns, this study employs a Two-Stage Least Squares (2SLS) approach. Following established econometric practices in related research (Kang and Han, 2025), the one-period lagged values of the new quality productivity index and its sub-dimensions (L.NQP, L.TP, L.GP, L.DP) are used as instrumental variables. The results (*Table 7*) show that, even after accounting for potential endogeneity, the contribution of new quality productivity to rural industrial revitalization remains significant, a conclusion further validated and strengthened.

Table 7. Endogeneity test results

	(1)	(2)	(3)	(4)
	Rri	Rri	Rri	Rri
L.NQP	0.289*** (0.061)			
L.TP		0.250*** (0.048)		
L.GP			2.512 (5.263)	
L.DP				0.593** (0.193)
Constant	0.095 (0.132)	0.124 (0.128)	0.240 (0.130)	0.214 (0.128)
Control variable	YES	YES	YES	YES
Area fixed effects	YES	YES	YES	YES
Time fixed effect	YES	YES	YES	YES
N	310	310	310	310
R ²	0.955	0.958	0.951	0.952

Robustness test

In order to further verify the validity of the baseline regression model and enhance the reliability of the research results, this study also adopts the measurement of rural revitalization by Xu and Wang (2023) and replaces the indicators with another one to measure the level of rural revitalization (Rri1). These indicators include per capita total power of agricultural machinery, comprehensive grain production capacity (in tons), agricultural labor productivity, and the primary business income of agricultural product processing enterprises above the scale. This alternative system constructs the index from three dimensions: agricultural production capacity, efficiency, and industrial integration,

using corresponding indicators distinct from those in *Table 1*. From the test results presented in *Table 8*, we can see that the impact of new quality productivity and each sub-dimension (digital productivity, green productivity, and digital productivity) on rural industrial revitalization remains significant, even after replacing the measurement of explanatory variables. This finding further confirms the important role of new quality productivity in promoting rural revitalization and demonstrates the robustness of the benchmark regression model.

Table 8. Robustness test results

	(1)	(2)	(3)	(4)	(5)
	Rri1	Rri1	Rri1	Rri1	Rri1
NQP	0.152*** (0.024)	0.106*** (0.023)			
TP			0.059*** (0.022)		
GP				3.415 (3.196)	
DP					0.764*** (0.104)
Constant	0.193*** (0.005)	0.358*** (0.070)	0.387*** (0.071)	0.380*** (0.077)	0.357*** (0.066)
Control variable	No	YES	YES	YES	YES
Area fixed effects	YES	YES	YES	YES	YES
Time fixed effect	YES	YES	YES	YES	YES
N	341	341	341	341	341
R ²	0.794	0.823	0.815	0.811	0.840

Discussion

Heterogeneity test

There are significant disparities in socioeconomic development across China, and the impact of new quality productivity on rural revitalization may vary by region. This paper conducts regional tests, and the results, as shown in *Tables 9* and *10*, indicate that new quality productivity has a significant positive impact on rural revitalization in both the eastern and central regions, with the effect being more pronounced in the central region than in the eastern region. In contrast, the impact is not significant in the western region. This regional differentiation in econometric results is highly consistent with the “high-east, low-west” distribution pattern revealed by ArcGIS spatial analysis (*Figs. 2* and *3*). Specifically, rural revitalization in the central region primarily benefits from the driving forces of scientific and technological productivity and digital productivity. Scientific and technological productivity significantly enhances agricultural output efficiency by introducing advanced equipment and biotechnology. In contrast, digital productivity effectively opens up channels for agricultural product distribution via e-commerce platforms and intelligent logistics systems. Together, these factors promote the development of the agricultural industry. The eastern coastal regions possess superior

resource endowments in technology, talent, and capital (Cheng et al., 2024), and have taken a leading position in previous technological revolutions and productivity leaps. Scientific and technological productivity, as well as digital productivity, similarly serve as core drivers in these regions, particularly through mature models in innovative agricultural equipment and agricultural e-commerce.

Table 9. Heterogeneity test results of the impact of new quality productivity on rural revitalization

	(1)	(2)	(3)
	Eastern	Central	Western
NQP	0.197*** (0.065)	0.265*** (0.084)	0.171 (0.136)
GOV	-0.929*** (0.190)	-0.105 (0.110)	0.094** (0.043)
UR	-0.192 (0.398)	-0.040 (0.639)	0.048 (0.185)
IND	-0.284** (0.110)	-0.039 (0.030)	0.131*** (0.026)
Inv	0.201 (0.134)	-0.936*** (0.324)	-0.222 (0.400)
Edu	0.217* (0.114)	0.056 (0.087)	0.017 (0.018)
Constant	-0.175 (0.458)	0.000 (0.267)	-0.134 (0.095)
Area fixed effects	YES	YES	YES
Time fixed effect	YES	YES	YES
N	121	88	132
R ²	0.887	0.945	0.963

In contrast, the impact is not significant in the western region, likely due to its comparative deficiencies in resource endowments, economic strength, and the deployment of smart agriculture compared to the eastern and central regions. These limitations hinder the practical application and promotion of new technologies and models associated with new quality productivity in rural areas of the western region.

Critically, these heterogeneous findings directly address the broader question of research contribution. While the positive role of technologies like digitalization in development may be broadly anticipated, our study moves beyond affirming a general direction to specify the contingent conditions under which new quality productivity translates into tangible rural industrial revitalization. The stark regional contrast demonstrates that its impact is not universal or automatic; rather, it is contingent upon a region's foundational capacities in infrastructure, human capital, and economic structure. Thus, the value of this analysis lies not in discovering whether new quality productivity matters in principle, but in empirically delineating where and to what extent it matters, thereby shifting the academic and policy discourse from normative expectation to conditional implementation and targeted capacity-building.

Table 10. Heterogeneity test results of the impact of NQP sub-dimensions on the rural revitalization of industries

	Eastern			Central			Western		
	Rri	Rri	Rri	Rri	Rri	Rri	Rri	Rri	Rri
TP	0.173*** (0.065)			0.381** (0.152)			0.282 (0.177)		
GP		9.520 (46.231)			25.785 (15.747)			-4.689* (2.766)	
DP			2.862** (1.366)			0.384*** (0.133)			0.220 (0.242)
Constant	-0.127 (0.506)	-0.690 (0.596)	-0.931* (0.500)	0.102 (0.270)	-0.145 (0.278)	0.065 (0.263)	-0.224** (0.108)	-0.169 (0.108)	-0.240** (0.116)
Control variable	YES	YES	YES	YES	YES	YES	YES	YES	YES
Area fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	121	121	121	88	88	88	132	132	132
R ²	0.864	0.854	0.860	0.944	0.941	0.946	0.963	0.964	0.963

Conclusions and recommendations

Research conclusions

Based on an in-depth analysis of agricultural and rural development data from 31 provinces in China from 2013 to 2023, this paper developed a set of scientific indicator systems to comprehensively measure the development levels of rural revitalization industries and new-quality productivity. On this basis, this study adopts a double fixed-effects model, which effectively controls for individual and time effects, thereby more accurately assessing the impact of new quality productivity on rural revitalization. By analyzing the role of new quality productivity as a whole on rural industrial revitalization, as well as further exploring the specific impact of its dimensions—technological productivity, green productivity, and digital productivity—on rural industrial revitalization, this paper draws the following conclusions:

First, significant disparities exist in the levels of new quality productivity and rural revitalization across different regions. Using the entropy weight method to measure the development levels of rural revitalization and new quality productivity across provinces reveals severe imbalances. Overall, both rural revitalization and new quality productivity exhibit a declining trend from the east to the west. This trend can be attributed to differences in regional resource endowments. The western regions, with relatively scarce resources, lag behind the eastern regions, which benefit from more favorable development conditions, attracting greater capital, technology, and talent, thereby driving rapid progress in new quality productivity and rural revitalization.

Second, regression results from the two-way fixed effects model indicate that new quality productivity has a significantly positive impact on rural revitalization, primarily driven by scientific and technological productivity and digital productivity. Scientific and technological productivity, in particular, plays an outstanding role in enhancing agricultural production efficiency and quality, and in transforming outcomes. By 2020, the contribution rate of agricultural technological progress in China exceeded 60%,

surpassing the nationwide average. Technological advancement plays a crucial role in promoting agricultural production development. Additionally, digital productivity expands sales channels and enhances agricultural intelligence by building digital platforms, enabling rural industries to better adapt to market changes, improve competitiveness, and support sustainable development.

Third, robustness tests that classify samples by geographical location reveal that new quality productivity has a significantly positive effect on rural revitalization in both the eastern and central regions, with a more substantial effect in the central region. However, the impact is not statistically significant in the western region, indicating notable regional heterogeneity in the influence of new quality productivity. Specifically, scientific and technological productivity and digital productivity significantly drive rural revitalization in the central and eastern regions, while the western region lacks productivity factors that significantly promote rural revitalization. This may be related to multiple factors, such as resource endowments and economic strength in the western region.

Policy recommendations

The new quality productivity serves as a crucial engine of rural revitalization. Every region should therefore mobilize it to the fullest to advance revitalization. Building on our findings, we propose the following measures:

First, tailor development to local conditions and coordinate resource allocation. Different regions exhibit significant disparities in resource endowments, industrial foundations, and stages of development. Therefore, local initiatives should be based on actual conditions, with scientific allocation of factor resources to avoid homogenized competition. Specifically, each region should conduct an in-depth analysis of its comparative advantages, such as natural resources, geographical location, cultural traditions, and existing industries, to formulate differentiated and targeted development strategies. It is essential to actively introduce and fully utilize new-quality productive forces, such as digital, green, and intelligent technologies, to promote the transformation of rural industries toward higher-end, smarter, and greener production, thereby enhancing total factor productivity. Meanwhile, in the process of applying new-quality productive forces to rural revitalization, emphasis should be placed on the in-depth exploration, preservation, and dynamic inheritance of local traditional culture. This will facilitate the deep integration of agriculture with industries such as culture, tourism, and education, helping to build exclusive brands with regional characteristics and cultural connotations. Through brand enhancement, the added value and market competitiveness of agricultural products can be improved, achieving a win-win outcome for both economic benefits and cultural preservation.

Second, we should continue to promote the progress and innovation of scientific and technological productivity. On the one hand, we should proactively adjust the industrial policy, selectively retain the necessary traditional industrial planning, and more actively develop industries with core competitiveness, such as 5G technology, artificial intelligence, and new materials. On the other hand, in promoting rural scientific and technological innovation, we should not only focus on the development of high and new technologies and their integrated promotion and transformation, but also pay special attention to the integrated promotion, transformation, and application of medium and new technologies, as well as applicable technologies. In addition, it is necessary to strengthen the training and introduction of agricultural science and technology talents, accelerate the promotion of high-tech talent training, break through the traditional college-led theory

transmission and nurturing mechanism (Deng et al., 2024), establish and improve the incentive mechanism for agricultural science and technology talents, and encourage more outstanding talents to devote themselves to the cause of agricultural science and technology, to provide talent protection for rural revitalization of industries.

Third, it is imperative to unlock the potential of digital productivity continuously. Cutting-edge technologies such as big data, artificial intelligence, the Internet of Things, and cloud computing should be deeply integrated into key aspects of agricultural production, operational management, and supply chain distribution. Such integration will promote comprehensive and in-depth convergence between digital innovation and the agricultural sector, thereby upgrading traditional practices and enhancing systemic efficiency. Through digital empowerment, pioneering models such as smart agriculture and precision farming can be developed, driving innovation and growth in the agricultural industry. For instance, big data analytics can enable informed decision-making tailored to soil conditions, weather patterns, and market dynamics, thereby supporting precision agriculture. Meanwhile, artificial intelligence can facilitate automated monitoring and intelligent control of cropping systems, irrigation, and pest management. The Internet of Things allows real-time data acquisition and improves device interoperability, while cloud platforms provide scalable solutions for resource planning and cross-regional collaboration. It is crucial to activate the synergistic effects among all components of new quality productive forces, ensuring they operate in a coordinated and mutually reinforcing manner.

Author information. 1. Wu Jiangqiu, Ph.D., Associate Professor, School of Business Administration, Jimei University, engaged in research on rural revitalization, social capital, and strategic management. 2. Huang Feiyan, School of Business Administration, Jimei University, Master's degree, engaged in research on rural industrial revitalization. 3. Jiang Hang, Ph.D., Professor, School of Business Administration, Jimei University, engaged in research on foreign trade and green economy development.

Fund project. 2022 Fujian Social Science Fund Project "Research on Digital Economy Empowering Rural Revitalization" (FJ2022BF040).

REFERENCES

- [1] Ahmad, M., Wu, Y. (2022): Combined role of green productivity growth, economic globalization, and eco-innovation in achieving ecological sustainability for OECD economies. – *Journal of Environmental Management* 302: 113980. <https://doi.org/10.1016/j.jenvman.2021.113980>.
- [2] Chang, L., Taghizadeh-Hesary, F., Mohsin, M. (2023): Role of artificial intelligence on green economic development: joint determinates of natural resources and green total factor productivity. – *Resources Policy* 82: 103508. <https://doi.org/10.1016/j.resourpol.2023.103508>.
- [3] Cheng, C., Gao, Q., Ju, K., Ma, Y. (2024): How digital skills affect farmers' agricultural entrepreneurship? An explanation from factor availability. – *Journal of Innovation & Knowledge* 9(2): 100477. <https://doi.org/10.1016/j.jik.2024.100477>.
- [4] Deng, X., Huang, M., Peng, R. (2024): The impact of digital economy on rural revitalization: evidence from Guangdong, China. – *Heliyon* 10(7): e28216. <https://doi.org/10.1016/j.heliyon.2024.e28216>.
- [5] Du, Y., Liu, H., Huang, H., Zhang, J., Wang, Y. (2024): Research on provincial implied carbon emissions in China under the shared responsibility driven by new quality productivity: a new approach. – *Sustainable Futures* 8: 100303.

- <https://doi.org/10.1016/j.sftr.2024.100303>.
- [6] Esfahani, M., Fernald, J. G., Hobijn, B. (2024): World productivity: 1996–2014. – *American Economic Journal: Macroeconomics* 16(3): 160-189. <https://doi.org/10.24148/wp2020-17>.
- [7] Geng, Y., Liu, L., Chen, L. (2023): Rural revitalization of China: a new framework, measurement and forecast. – *Socio-Economic Planning Sciences* 89: 101696. <https://doi.org/10.1016/j.seps.2023.101696>.
- [8] Harou, A. P., Madajewicz, M., Michelson, H., Palm, C. A., Amuri, N., Magomba, C., Semoka, J. M., Tschirhart, K., Weil, R. (2022): The joint effects of information and financing constraints on technology adoption: evidence from a field experiment in rural Tanzania. – *Journal of Development Economics* 155: 102707. <https://doi.org/10.1016/j.jdeveco.2021.102707>.
- [9] Hou, D., Wang, X. (2024): Unveiling the role of agricultural insurance in driving rural industry revitalization in China. – *Heliyon* 10(14): e34483. <https://doi.org/10.1016/j.heliyon.2024.e34483>.
- [10] Kang, D., Han, Y. (2025): The impact of agricultural new quality productivity on rural residents' consumption upgrading. – *Journal of Commercial Economics* 11: 106-110 (in Chinese).
- [11] Li, J., Gong, Y. (2022): Spatial location differentiation and development decision optimization of characteristic villages and towns in China. – *Geography and Sustainability* 3(1): 21-31. <https://doi.org/10.1016/j.geosus.2022.01.002>.
- [12] Li, J., Noorliza, K., Zhang, X. (2024): Enhancing environmental, social, and governance performance through new quality productivity and green innovation. – *Sustainability* 16(11): 4843. <https://doi.org/10.3390/su16114843>.
- [13] Li, M. (2024): New productivity, rural industry revitalization and common prosperity of farmers. – *Technoeconomics & Management Research* 7: 1-6 (in Chinese).
- [14] Lin, L., Gu, T., Shi, Y. (2024): The influence of new quality productive forces on high-quality agricultural development in China: mechanisms and empirical testing. – *Agriculture* 14(7): 1022. <https://doi.org/10.3390/agriculture14071022>.
- [15] Liu, Y., He, Z. (2024): Synergistic industrial agglomeration, new quality productive forces and high-quality development of the manufacturing industry. – *International Review of Economics & Finance* 94: 103373. <https://doi.org/10.1016/j.iref.2024.103373>.
- [16] Lu, J., Guo, Z., Wang, Y. (2024): Levels of development of new quality productivity, regional differences and paths to enhancement. – *Journal of Chongqing University (Social Science Edition)* 30(3): 1-17. <https://doi.org/10.11835/j.issn.1008-5831.jg.2024.03.002> (in Chinese).
- [17] Luo, G., Yang, Y., Wang, L. (2023): Driving rural industry revitalization in the digital economy era: exploring strategies and pathways in China. – *PLoS One* 18(9): e0292241. <https://doi.org/10.1371/journal.pone.0292241>.
- [18] Lyu, Y., Wang, W., Wu, Y., Zhang, J. (2023): How does digital economy affect green total factor productivity? Evidence from China. – *Science of the Total Environment* 857: 159428. <https://doi.org/10.1016/j.scitotenv.2022.159428>.
- [19] Qin, Z., Jin, X. (2022): A study on rural finance, rural industry revitalization, and rural logistics development: an empirical analysis based on panel data from 30 provinces in China. – *International Academy of Global Business and Trade* 18: 39-58. <https://doi.org/10.20294/jgbt.2022.18.5.39>.
- [20] Shen, Z., Wang, S., Boussemart, J.-P., Hao, Y. (2022): Digital transition and green growth in Chinese agriculture. – *Technological Forecasting and Social Change* 181: 121742. <https://doi.org/10.1016/j.techfore.2022.121742>.
- [21] Tian, Y., Ye, Y., Huang, J., Liu, Q. (2022): The internal mechanism and empirical test of rural industrial revitalization driven by digital economy: based on the mediating effect of urban and rural integration development. – *Issues in Agricultural Economy* 10: 84-96. <https://doi.org/10.13246/j.cnki.iae.2022.10.003> (in Chinese).

- [22] Vinod Chandra, S. S., Anand Hareendran, S., Albaaji, G. F. (2024): Precision farming for sustainability: an agricultural intelligence model. – *Computers and Electronics in Agriculture* 226: 109386. <https://doi.org/10.1016/j.compag.2024.109386>.
- [23] Wang, J., Qiao, L., Zhu, G., Di, K., Zhang, X. (2025): Research on the driving factors and impact mechanisms of green new quality productive forces in high-tech retail enterprises under China's Dual Carbon Goals. – *Journal of Retailing and Consumer Services* 82: 104092. <https://doi.org/10.1016/j.jretconser.2024.104092>.
- [24] Xie, F., Jiang, N., Kuang, X. (2024): Towards an accurate understanding of 'new quality productive forces'. – *Economic and Political Studies* 13(1): 1-15. <https://doi.org/10.1080/20954816.2024.2386503>.
- [25] Xiong, Z., Huang, Y., Yang, L. (2024): Rural revitalization in China: measurement indicators, regional differences and dynamic evolution. – *Heliyon* 10(8): e29880. <https://doi.org/10.1016/j.heliyon.2024.e29880>.
- [26] Xu, Q., Zhong, M., Dong, Y. (2024): Digital finance and rural revitalization: empirical test and mechanism discussion. – *Technological Forecasting and Social Change* 201: 123248. <https://doi.org/10.1016/j.techfore.2024.123248>.
- [27] Xu, X., Wang, Y. (2023): Research on the logical mechanism, multidimensional measurement and regional coordinated development of urban-rural integration: from the perspective of coordinated promotion of new urbanization and rural vitalization. – *Issues in Agricultural Economy* 11: 49-62. <https://doi.org/10.13246/j.cnki.iae.20230301.001> (in Chinese).
- [28] Yue, S., Bajuri, N. H., Khatib, S. F. A., Lee, Y. (2024): New quality productivity and environmental innovation: the hostile moderating roles of managerial empowerment and board centralization. – *Journal of Environmental Management* 370: 122423. <https://doi.org/10.1016/j.jenvman.2024.122423>.
- [29] Zhang, J., Shan, Y., Jiang, S., Xin, B., Miao, Y., Zhang, Y. (2024): Study on the coordinated development degree of new quality productivity and manufacturing carbon emission efficiency in provincial regions of China. – *Environment, Development and Sustainability* 1-35. <https://doi.org/10.1007/s10668-024-05321-x>.
- [30] Zhang, Q., Li, L. (2025): Rural industry revitalization under the background of counter-urbanization: road selection, functional orientation and concept innovation. – *Reform of Economic System* 2: 138-145 (in Chinese).
- [31] Zhang, Y., Chen, Y., Ye, F. (2025): Digital financial innovation, productivity and modernization of industry chain and supply chain. – *Economic Analysis and Policy* 87: 1198-1211. <https://doi.org/10.1016/j.eap.2025.07.005>.
- [32] Zhao, S., Li, M., Cao, X. (2024): Empowering rural development: evidence from China on the impact of digital village construction on farmland scale operation. – *Land* 13(7): 903. <https://doi.org/10.3390/land13070903>.
- [33] Zheng, Z. (2024): Under the context of smart agriculture: assessment of agricultural product distribution efficiency in various regions of China. – *Frontiers in Sustainable Food Systems* 8: 1389763. <https://doi.org/10.3389/fsufs.2024.1389763>.