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Research on the Impact of Empowering Rural Revitalization with New Quality Productivity

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Abstract

As a new economic form, the new quality productivity provides a promoting role for the comprehensive revitalization of rural areas. Based on the connotation of the theory of new quality productivity, from the perspective of system theory elements, this paper analyzes the composition characteristics of the system elements of new quality productivity, formulates evaluation indicators, and uses balanced panel data from 30 provinces from 2012 to 2022 to calculate the development level of new quality productivity and rural revitalization using the entropy method, empirically testing the impact and mechanism of new quality productivity on rural revitalization. Research has found that: (1) New quality productivity has a significant promoting effect on the development of rural revitalization. After introducing a series of control variables such as instrumental variables for robustness testing, the results are still significant; (2) New quality productivity can promote the development of rural revitalization by advancing the level of urbanization and transportation infrastructure; (3) The empowering effect of new quality productivity on the development of rural revitalization exhibits spatial and dimensional heterogeneity. From a regional perspective, the promotion effect of new quality productivity on rural revitalization development is strongest in the central region, followed by the eastern region; (4) There is a threshold effect of new quality productivity on the development of rural revitalization, and excessive government intervention will weaken the promoting effect of new quality productivity on rural revitalization under certain conditions.

Keywords

New Quality Productivity; Rural Revitalization Urbanization Level; Degree of Government Intervention.

1. Introduction

Rural revitalization is an important cornerstone and inevitable requirement for national rejuvenation. The major strategic deployment to accelerate the construction of a strong agricultural country is not only a historical mission entrusted to us by the new era, but also a necessary path to achieve the great rejuvenation of the Chinese nation[1]. In this context, in-depth exploration of how new quality productivity promotes rural revitalization has significant theoretical value and practical significance. In September 2023, the concept of "new quality productivity" was first proposed, emphasizing the integration of scientific and technological innovation resources, leading the development of strategic emerging industries and future industries. This concept has the characteristics of high technology, high efficiency, and high quality, and is in line with the new development concept. Compared with traditional productivity, new quality productivity involves new fields, high technological content, and relies on innovation to drive, representing a leap in productivity.

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In the process of promoting the rural revitalization strategy, the traditional mode of productivity development faces many challenges, such as intensified resource and environmental constraints, a single industrial structure, and low production efficiency. The introduction of new quality productivity has injected new vitality into China's economic development and provided new theoretical support and practical directions for the implementation of the rural revitalization strategy. By driving innovation, we can achieve the transformation and upgrading of rural industries, protect and improve the ecological environment, inherit and develop rural customs and civilization, and modernize rural governance, thereby promoting the comprehensive development of rural economy and society. However, despite the increasing importance of new quality productivity in rural revitalization, there are still many shortcomings in current research on the relationship between the two. On the one hand, existing research mostly focuses on unilateral exploration of new quality productivity or rural revitalization, and there is relatively little in-depth research on the intrinsic connection and interaction mechanism between the two; On the other hand, in terms of empirical research, there is a lack of systematic quantitative analysis, making it difficult to accurately evaluate the specific promotion effect and impact path of new quality productivity on rural revitalization. Therefore, this article aims to use a combination of theory and empirical methods to deeply analyze the internal logic, mechanism, and implementation path of the promotion of rural revitalization by new quality productivity, in order to provide useful references for relevant policy formulation and practical development, and to assist in the smooth realization of China's rural revitalization strategic goals and the vigorous development of new quality productivity in rural areas.

2. Literature Review

Research on new quality productivity. This is mainly reflected in the following three aspects: firstly, the exploration of the concept of new quality productivity. New quality productivity is an innovation relative to traditional productivity, involving new fields and high technological content. It is a productivity that plays a leading role in technological innovation and represents a level leap in the evolution of productivity[2]. The second is the measurement of new quality productivity. Many scholars, based on Marxist theory, measure the construction of an evaluation system for new quality productivity from the perspectives of the three basic elements of productivity and new elements. The third is the empirical analysis of new quality productivity, which focuses more on the development and innovation of new quality productivity, and the promotion of high-quality economic development. Through literature review, it can be concluded that the measurement of new quality productivity accounting is not yet unified, and there is a lack of research perspectives on rural revitalization.

Research on rural revitalization primarily focuses on two aspects: Firstly, the study of pathways to rural revitalization. Numerous scholars have conducted research on the multiple driving factors of rural revitalization, primarily including digital infrastructure and the integration of culture and tourism. Secondly, the construction of evaluation and measurement indicators for rural revitalization. Many scholars have taken the five dimensions of industrial prosperity, ecological livability, civilized rural customs, effective governance, and affluent living standards as entry points, conducting in-depth research and establishing a scientific and reasonable evaluation index system for rural revitalization, providing an effective tool for assessing the implementation of rural revitalization strategies.

As an emerging productive force, the new quality productivity, as an advanced productive force led by technological innovation, can not only enrich the traditional economic development model, but also empower various fields of digital rural construction, promote rural digital production, smart rural construction, and rural digital governance. Zhang Mingzhu explored

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that new quality productivity is an important driving force and new driving force for empowering high-quality development of rural revitalization, as well as bringing new opportunities for high-quality development[3]. While providing strong driving force, some scholars believe that in the process of empowerment, there are challenges such as limited development of rural industries, prominent shortcomings in agricultural technological innovation, insufficient supply of new workers, and low level of digital rural construction[4].

In summary, although some studies have touched upon the relationship between new quality productivity and rural revitalization, the exploration of whether new quality productivity can empower the development of rural revitalization, whether urbanization level and transportation infrastructure play a mediating role in the promotion process, and whether the promotion effect of new quality productivity on rural revitalization varies from place to place still lacks depth and comprehensiveness. This article aims to make marginal contributions based on existing research, mainly reflected in the following aspects: firstly, this article attempts to measure and analyze in detail how new quality productivity affects the development of rural revitalization from the provincial level; Secondly, this article reveals the potential path for the impact of new quality productivity on rural revitalization - indirectly promoting the development of new quality productivity by improving urbanization levels and optimizing transportation infrastructure; Finally, the degree of government intervention was introduced as a threshold variable to explore in depth the potential nonlinear spillover effects of new quality productivity in promoting rural revitalization and development. This study not only expands the analytical perspective of the relationship between new quality productivity and rural revitalization, but also provides strong evidence for understanding the differentiated impact of new quality productivity at different stages and dimensions of development. Through this study, we can comprehensively grasp the complex relationship between new quality productivity and rural revitalization, providing a more solid theoretical foundation for future policy formulation and academic research.

3. Theory and Research Hypothesis

3.1. The Direct Impact of New Quality Productivity on Rural Revitalization

New quality productivity empowers rural revitalization in multiple dimensions. In order to promote the prosperity of the industry, it is necessary to cultivate modern agricultural operators who master digital technology, promote the application of new labor materials such as intelligent agricultural machinery, improve total factor productivity, and cultivate endogenous driving forces for sustainable development of the industry. In terms of ecological livability, we will achieve the green transformation of traditional production factors, transform production methods through breakthrough technological innovation, accelerate the diffusion of green technologies, promote the green transformation of traditional industries, and transform ecological resources into advantages. In the field of rural civilization, cultivate new professional farmers and other talents to support cultural inheritance; Big data and other technologies empower cultural dissemination and promote the creative transformation of excellent culture; The rise of the digital cultural industry cultivates a civilized rural atmosphere. In rural governance, cultivating digital talents, deploying intelligent devices to solidify hardware, accurately identifying needs with big data, optimizing resource allocation with artificial intelligence, and forming a diversified collaborative governance system. In terms of affluent living, we should enhance human capital, reduce transaction costs, broaden channels for income growth, and form a diversified income distribution pattern.

Assumption H1: New quality productivity can promote the development of rural revitalization

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3.2. The Indirect Impact Effect of New Quality Productivity on Rural Revitalization

The new quality productivity provides important support for the implementation of the rural revitalization strategy by promoting the urbanization process. New quality productivity provides a material foundation for the integrated development of urban and rural areas by cultivating urbanization talents with digital skills, building smart city infrastructure, and developing green and environmentally friendly building materials. At the same time, big data analysis breaks down spatial barriers between urban and rural areas, optimizes the allocation of public resources, significantly improves the quality of urbanization, and through industrial gradient transfer, technology diffusion effects, and consumer market expansion, achieves the radiation and driving force of urbanization on rural revitalization, providing sustained momentum for achieving common prosperity.

Assumption H2a: New quality productivity can promote the development of rural revitalization by enhancing urbanization

New quality productivity provides critical support and endogenous power for rural revitalization through intelligent upgrading and systematic optimization of transportation infrastructure. The new quality productivity promotes the digital transformation of transportation infrastructure, significantly improving the accessibility and logistics efficiency of rural areas, achieving remote intelligent control of transportation facilities, ensuring the traceability of agricultural product logistics, and significantly reducing time and space costs. The new quality productivity promotes the reconstruction of regional transportation network system, not only solving the "last mile" problem in rural revitalization, but also providing a solid material foundation and innovative path for narrowing the urban-rural development gap and promoting agricultural and rural modernization by improving factor allocation efficiency and market scale effect.

Assumption H2b: New quality productivity can promote the development of rural revitalization by optimizing transportation infrastructure

3.3. The Nonlinear Spillover Effect of New Quality Productivity on Rural Revitalization

The impact of government intervention on promoting rural revitalization through new quality productivity shows an inverted U-shaped relationship of first promotion and then inhibition. Moderate government intervention can effectively overcome market failures in rural revitalization by providing digital infrastructure, improving factor market systems, and significantly reducing the diffusion costs and application risks of new quality productivity in rural areas. However, when government intervention exceeds the optimal intensity, the rigid constraints of administrative approval inhibit the innovation vitality of market entities and hinder the effective functioning of competition mechanisms. Therefore, in the initial diffusion stage, government guidance is needed to break through the dilemma of market deficiency, while in the mature application stage, it relies more on market mechanisms to optimize resource allocation. The discovery of this non-linear relationship provides an important theoretical basis for constructing a dynamic governance framework for the coordinated efforts of government and market.

H3: The promotion effect of new quality productivity on rural revitalization and development has non-linear characteristics.

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4. Models, Variables, and Data

4.1. Model Construction

4.1.1. Benchmark Model

To investigate the direct impact of new quality productivity on rural revitalization, a dual fixed effects model is constructed as follows:

$$Rur_{i,t} = \alpha_0 + \alpha_1 Nqp_{i,t} + \alpha_j Control_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

Where i represents the province, t represents the year, $Rur_{i,t}$ represents the level of rural revitalization development, $Nqp_{i,t}$ represents the level of development of new quality productivity, and α_1 represents the degree of impact of new quality productivity on rural revitalization; $Control_{i,t}$ represents a series of control variables; μ_i represents the fixed effect of the city;δ_t represents the fixed effect of the year;$\varepsilon_{i,t}$ represents the random perturbation term.

4.1.2. Mediation Effect Model

To further study the path of the impact of new quality productivity on rural revitalization, the design concept of the intermediary model is as follows

$$For_{i,t} = \beta_0 + \beta_1 Dig_{i,t} + \beta_j Control_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

$$Rur_{i,t} = \gamma_0 + \gamma_1 Nqp_{i,t} + \gamma_2 For_{i,t} + \gamma_j Control_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (3)$$

Among them, $For_{i,t}$represent mediator variables, while the other variables have the same meaning as in the equation.

4.1.3. Threshold Effect Model

To test whether there is a non-linear dynamic spillover effect of new quality productivity on rural revitalization development, the following threshold effect model is constructed:

$$\begin{aligned} Rur_{i,t} = {} & \varphi_0 + \varphi_1 Nqp_{i,t} \times I(Z < \theta_1) + \\ & \varphi_2 Nqp_{i,t} \times I(\theta_1 \le Z < \theta_2) + \ldots\ldots + \\ & \varphi_n Nqp_{i,t} \times I(\theta_{n-1} \le Z < \theta_n) + \\ & \varphi_{n+1} Nqp_{i,t} \times I(Z \ge \theta_n) + \\ & \omega_j Control_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \end{aligned} \quad (4)$$

4.2. Variable Selection

4.2.1. Explained Variable

The dependent variable is rural revitalization (Rur). Drawing on the research of He Leihua, Zhang Ting, and others, a measurement index system for rural revitalization is constructed with 15 indicators in five dimensions: industrial prosperity, ecological livability, civilized rural culture, effective governance, and affluent living. The entropy method is used to measure the level of rural revitalization.

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Table 1. Evaluation Index System for Rural Revitalization

Dimension	First-level indicator	Secondary indicator	Attribute
Village revitalize	Prosperous Industry	Land productivity	positive
		Labor productivity	positive
		Grain yield	positive
	Ecological livability	Greening	positive
		Application rate of chemical fertilizer per unit area	negative
		Rural domestic water use	positive
	Rural style civilization	Allocation of educational resources	positive
		Rural cultural, educational and entertainment level	positive
		Coverage of rural entertainment facilities	positive
	Effective governance	Urban income inequality	negative
		Minimum living guarantee	negative
		Rural grassroots organizations	positive
	Affluent life	Income level of rural residents	positive
		Salary based income structure	positive
		Engel coefficient of rural households	negative

4.2.2. Explanatory VARIABLES

The core explanatory variable is the new quality productivity (Nqp).Drawing on the research methods of Wang Jue and Han Wenlong, an indicator system is constructed from two aspects: new elements and new structures. New elements are divided into physical elements and permeable elements, and a measurement indicator system for new quality productivity is constructed by combining 17 indicators from three dimensions of the new structure. The entropy method is used to measure the development level of new quality productivity.

Table 2. Evaluation Index System for the Development of New Quality Productivity

Dimension	First-level indicator	Secondary indicator	Attribute
Physical elements	Labor	R&D personnel	positive
		Per capita education level	positive
	Labor materials	Robot installation density	positive
		Number of artificial intelligence enterprises	positive
	Labor object	Proportion of new energy generation	positive
		New energy utilization efficiency	positive
		Number of new material enterprises	positive
Permeable elements	New technology	R&D investment	positive
		Per capita number of patents	positive
		High tech industry revenue	positive
	Production organization	Environmental protection efforts	positive
		pollution control	positive
New structure	Labor productivity	Per capita GDP	positive
		Per capita wage	positive
		Total factor productivity of each province	positive
	Transformation and upgrading	Employees in the tertiary industry	positive
		Entrepreneurial activity level	positive

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4.2.3. Control Variables

To comprehensively study the impact of new quality productivity on rural revitalization and development, combined with existing research, the following control variables are selected: (1) degree of openness to the outside world (Open), measured by (total import and export of goods * US dollar to RMB exchange rate)/regional GDP; (2) Tax burden level, measured by the ratio of tax revenue to regional GDP; (3) Marketization Index (Mar), measured using the Fan Gang Marketization Index; The level of development of the technology market (Tec) is measured by the ratio of technology market turnover to regional GDP; (4) Informationization level (Inf), measured by the total volume of postal and telecommunications services/regional GDP; (5) Industrial structure (Ind), measured by the output value of the tertiary industry/the output value of the secondary industry.

4.2.4. Mediating Variables

The mediator variables selected are urbanization level (Urb) and transportation infrastructure (Tra). The level of urbanization can be measured by the ratio of urban population to total population, while transportation infrastructure can be measured by the logarithm of road mileage and total freight volume.

4.3. Data Explanation

This paper selects the balanced panel data of 30 provinces in China (excluding Xizang, Hong Kong, Macao and Taiwan) from 2012 to 2022 for analysis. Other data comes from China Statistical Yearbook, China Science and Technology Statistical Yearbook, China Industrial Statistical Yearbook and provincial statistical yearbooks. For missing data in the data, linear interpolation method is used to make up. The data analysis software used Stata17.0 for research.

5. Empirical Analysis

5.1. Benchmark Regression Results

Table 3. Benchmark Regression Results

	(1) Rur	(2) Rur	(3) Rur	(4) Rur
Nqp	0.285*** (3.334)	0.227** (2.266)	0.250*** (3.017)	0.208** (2.071)
Open			0.086* (1.921)	0.109** (2.569)
Tax			0.480* (1.654)	-0.085 (-0.236)
Mar			-0.000 (-0.095)	0.007 (1.432)
Inf			0.010 (0.620)	0.000 (0.048)
Ind			0.003 (0.205)	-0.014 (-0.713)
_cons	0.393*** (8.479)	0.420*** (7.832)	0.249** (2.165)	0.345*** (2.682)
Individual fixed	YES	YES	YES	YES
Fixed time	NO	YES	NO	YES
N	330	330	330	330
R^2	0.906	0.914	0.911	0.919

Note: ***, **, and * respectively indicate significance at the 1%, 5%, and 10% levels; The value of t is in parentheses. The same below

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In the model setting stage, model selection tests such as Hausman test and F-test indicate that a bidirectional fixed effects model controlling individuals and time should be used for parameter estimation, and clustering robust standard error method should be used for processing. The results in Table 4 indicate that the regression coefficients for rural revitalization are significantly positive, confirming the sustained promoting effect of new quality productivity on rural revitalization development and validating research hypothesis H1.

5.2. Transmission Mechanism Results

After verifying the positive role of new quality productivity in promoting the development of rural revitalization, further analysis of its transmission mechanism is needed to clarify the mechanism of the two. Table 5 shows the test results of the mediation effect model. The coefficient of rural revitalization in column (2) is significant, indicating that the level of urbanization can serve as a mediating variable to achieve the development path of "new quality productivity urbanization level rural revitalization", verifying hypothesis H2a. The significant coefficient of rural revitalization in column (3) indicates that the development of new quality productivity can promote the comprehensive development of rural revitalization by improving and optimizing transportation infrastructure, which verifies hypothesis H2b.

Table 4. Results of Transmission Mechanism

	(1) Nqp	(2) Urb	(3) Tra
Rur	0.208** (2.071)	0.137*** (7.553)	0.293*** (2.627)
_cons	0.345*** (2.682)	0.652*** (19.740)	9.674*** (48.192)
control variable	YES	YES	YES
Individual fixed	YES	YES	YES
Fixed time	YES	YES	YES
N	330	330	330
R^2	0.919	0.995	0.997

5.3. Endogeneity Test

The benchmark regression results show that new quality productivity has a significant promoting effect on rural revitalization, but this result may have two endogeneity issues: first, there may be a reverse causal relationship between new quality productivity and rural revitalization development, that is, rural revitalization development may affect the development of new quality productivity; Secondly, there are many factors that affect rural revitalization, and although a series of control variables have been added, there is still a possibility of omitted variables, leading to a correlation between omitted variables and explanatory variables. In order to solve the endogeneity problem caused by missing variables and reverse causality, we use the interaction term between the total per capita telecommunications business output related to the Internet in each province in the previous year and the number of provincial post offices in 1984 to construct a quantity that changes over time as a tool variable of the new quality productivity development index in that year[5].

The test results are shown in column (1) of Table 6. The regression results indicate that the promotion effect of the development of new quality productivity on rural revitalization is valid, and the coefficient is significantly positive; And strongly rejecting the hypothesis that instrumental variables are unidentifiable and weak instrumental variables does not exist.

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Table 5. endogeneity test and robustness test

	Phase 1 Nqp	Phase 2 Rur	(1) Rur0	(2) Rur	(3) Rur	(4) Rur
Iv	0.0432*** (0.014)					
Nqp		2.7432*** (0.766)	0.6324** (2.0511)	0.2086** (2.6393)	0.2143** (2.0494)	0.2266** (2.3717)
Kleibergen-Paap rk LM statistic	12.767 [0.000]					
Cragg-Donald Wald F statistic	17.250 {16.38}					
_cons	0.1542*** (0.038)	-0.4243*** (0.134)	-0.3508 (-0.8752)	0.1564* (1.7770)	0.3408*** (2.7631)	0.8287*** (3.9612)
control variable	YES	YES	YES	YES	YES	YES
Individual fixed	YES	YES	YES	YES	YES	YES
Fixed time	YES	YES	YES	YES	YES	YES
N	330	330	330	330	330	330
R^2	0.586	0.685	0.966	0.952	0.920	0.924

Note: The P-value is in square brackets, and the critical value at the 10% level of the Stock Logo weak recognition test is in curly brackets.

5.4. Robustness Test

5.4.1. Replace Key Variables

Re measure the dependent variable of rural revitalization. In the previous benchmark regression, the core dependent variable, the Rural Revitalization and Development Index, was calculated based on the entropy method. Now, the calculation method has been transformed and principal component analysis has been used for dimensionality reduction analysis to extract principal components, calculate indicator weights, and recalculate the Rural Revitalization and Development Index. Regression analysis has been conducted again, and the results are shown in column (2) of Table 6. The regression coefficients are still significant and consistent with the benchmark regression results.

5.4.2. Change the Regression Method

To eliminate possible heteroscedasticity and autocorrelation issues in the model, high-dimensional fixed effects linear regression was used for re estimation. The results are shown in column (3) of Table 6, and it can be observed that the results are still significant, indicating the robustness of this conclusion.

5.4.3. Remove Abnormal Samples

Considering that outliers in the sample may affect the reliability of the baseline regression results, a robustness test was conducted by removing outliers below the 1st percentile and above the 99th percentile of the independent, dependent, and control variables. If the estimated coefficients for rural revitalization in column (4) of Table 6 show no sign change, then the benchmark regression is robust.

5.4.4. Increase Control Variables

Adding the control variable of industrialization level (Lpi) to the benchmark regression, the benchmark regression was re conducted, and the results are shown in column (5) of Table 6. The rural revitalization coefficient is significantly positive, indicating the robustness of the benchmark regression results.

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5.5. Regional Heterogeneity Analysis

The 30 provinces in China (except Xizang) are divided into three regions, namely, the east, the middle and the west, according to their geographical regions for regional heterogeneity analysis. The impact of new quality productivity on rural revitalization and development is investigated respectively. The test results are shown in Table 7. The coefficient of the New Quality Productivity Development Index is significantly positive in the eastern and central regions, but not significant in the western region.

In terms of economic foundation, the eastern region has a high level of economic development and a large amount of funds can be invested in rural development to promote the modernization of agriculture, rural e-commerce and other industries; As the main agricultural production area, the central region has a complete agricultural industry system, which is conducive to the connection between new quality productivity and traditional agriculture; The economy in the western region is relatively backward, with limited fiscal revenue and low industrial added value. In terms of infrastructure, the developed transportation and communication infrastructure in the eastern region is conducive to the application and promotion of new technologies and business models in rural areas; The central region's position as a transportation hub gives it an advantage in the transportation and sales of agricultural products; The western region has a vast territory but complex natural conditions, making infrastructure construction difficult and costly.

Table 6. Heterogeneity Analysis Results

	(1) Rur	(2) Rur	(3) Rur
Nqp	0.244** (2.591)	0.443*** (4.501)	0.135 (0.700)
_cons	0.504*** (2.836)	0.317*** (4.394)	0.302*** (4.239)
control variable	YES	YES	YES
Individual fixed	YES	YES	YES
Fixed time	YES	YES	YES
N	121	88	121
R^2	0.924	0.874	0.677

5.6. Threshold Effect Analysis

Based on theoretical analysis, the empowering effect of the development of new quality productivity on rural revitalization may be influenced to some extent by threshold effects of other variables. The threshold variable of government intervention did not pass the triple threshold variable, but passed the double threshold and single threshold tests. The test results are shown in Table 8. When the degree of government intervention is below the first threshold, the regression coefficient of new quality productivity is significantly positive. When the degree of government intervention reaches the first and second thresholds, the coefficient of new quality productivity is negative.

In the practical process of driving rural revitalization with new quality productivity, the degree of government intervention presents a phased threshold effect. Moderate policy intervention can break through development barriers such as weak rural digital infrastructure and market entities' fear of risks. Through fiscal leverage, resource integration, standard norms and other means, it can quickly activate the penetration of digital technology into the entire agricultural industry chain, stimulate new quality formats such as e-commerce to assist agriculture, and inject "policy leverage dividends" into rural industrial transformation; A number of pre

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intensities failed to shrink dynamically with market maturity, and it is easy to form alienation risks such as "policy dependence trap" and "digital foam" due to administrative orders replacing market selection, data element flow control, etc., which inhibit the innovation vitality of market players and the efficiency of technology iteration, and hinder the deep integration of digital economy and rural real economy.

Table 7. Threshold Effect Analysis Results

Variable	Gov	
	(1)	(2)
	Threshold value	P value
Single threshold value	0.0128	0.000
Dual threshold value	0.0141	0.004
For<0.0128	0.273*** (0.0631)	
0.0128<For≤0.0141	-1.619*** (0.550)	
0.0141≤For	0.114 (0.123)	
_cons	-0.00255 (0.0105)	
control variable	YES	
Individual fixed	YES	
Fixed time	YES	
N	330	
R^2	0.255	

6. Conclusion and Implications

6.1. Conclusion

Based on balanced panel data from 30 provinces from 2012 to 2022, this study empirically examines and discusses the promoting effect, mediating effect, heterogeneity, and threshold effect of new quality productivity on rural revitalization. The following conclusions can be drawn: firstly, the new quality productivity has a significant promoting effect on rural revitalization, and after conducting a series of robustness tests including control variables and instrumental variables, the structure remains significant; Secondly, after testing through the intermediary model, it was found that the new quality productivity can indirectly promote the development of rural revitalization by improving the level of urbanization and transportation infrastructure; Thirdly, the promoting effect of new quality productivity on rural revitalization varies in different regions and dimensions. Looking at different regions, it is most significant in the eastern and central regions, and more pronounced in the western regions; Fourthly, the role of new quality productivity in rural revitalization and development has non-linear characteristics.

6.2. Suggestion

Based on the above analysis and discussion, in order to fully leverage the promoting role of new quality productivity in rural revitalization, the following suggestions are proposed:

Firstly, we need to solidify the new quality digital infrastructure, strengthen technological innovation, and enhance its role in promoting rural revitalization. Implement a comprehensive digital coverage project, with a focus on promoting the construction of information and

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communication networks in rural areas, including infrastructure upgrades such as the popularization of fiber optic broadband and optimization of mobile communication base stations. Pay special attention to the quality of network coverage in remote areas and provide hardware support for the application of new technologies; Simply improving hardware facilities is not enough to support the leap in productivity. It is necessary to simultaneously enhance farmers' digital literacy and technological application capabilities, establish a scientific and technological innovation system that meets the needs of agriculture and rural areas, focus on breakthroughs in key technologies such as smart agricultural equipment, deep processing of agricultural products, and rural environmental governance, guide market entities to develop suitable agricultural technology solutions, promote the organic integration of modern agricultural technology and rural social services, and thus form a virtuous interaction pattern between technological innovation and social development.

Secondly, to enhance the level of urbanization and optimize transportation infrastructure, in order to ensure the realization of multiple paths for the promotion of rural revitalization by new quality productivity. On the one hand, focusing on the systematic improvement of urbanization level, by optimizing the radiation and driving functions of urban agglomerations and metropolitan areas, strengthening the industrial undertaking and factor aggregation capabilities of county-level economies, promoting the gradient transfer and efficient allocation of production factors such as population, capital, and technology between urban and rural areas, and forming a virtuous cycle mechanism of "using cities to lead rural areas and industry to promote agriculture". By relying on the construction of smart cities and digital villages, we can promote the equalization of urban and rural public services and enhance the accumulation of human capital among rural populations; Through the coordinated development of industrial parks and characteristic towns, guide urban industries to extend to rural areas, cultivate new formats and models in rural areas, and inject endogenous power into rural revitalization. On the other hand, taking the modernization and upgrading of transportation infrastructure as a breakthrough point, we will focus on promoting "hard connectivity" projects such as high-speed railways, intercity railways, and rural roads, improve county-level logistics hubs and cold chain warehousing systems, reduce the cost of agricultural product circulation, and enhance the market response speed of rural industries; Synchronize and deepen the integration of "transportation+digital", achieve precise scheduling and real-time tracking of urban and rural logistics through intelligent transportation systems and IoT technology, and break the temporal and spatial limitations of traditional logistics. On this basis, we should also pay attention to the coordinated planning of transportation corridors, ecological corridors, and cultural corridors, and build transportation infrastructure into a "development artery" that connects urban and rural resources and promotes the flow of factors. It provides a flow entrance for characteristic industries such as rural ecological tourism and cultural experience, and promotes the transformation of rural areas from single agricultural production to multi-functional composite development.

Thirdly, it is necessary to reasonably plan the degree of government intervention to ensure the promoting effect of new quality productivity on rural revitalization. In the process of driving rural revitalization with new quality productivity, moderate intervention will have a positive effect. If the intervention intensity is not dynamically adjusted with market maturity, it will ultimately have a negative impact. Therefore, in order to reasonably play the positive role of government intervention in empowering rural revitalization with new quality productivity, in-depth research and planning should be conducted in the early stage, infrastructure construction should be strengthened, and policy support should be provided to guide the flow of resources to rural areas; Establish a dynamic monitoring mechanism in the mid-term, flexibly adjust intervention policies, and promote multi-party collaboration and cooperation; In the later stage, efforts will be made to cultivate endogenous driving forces in rural areas, improve

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the rural governance system, promote brand building and market expansion, in order to avoid the negative effects of excessive intervention and achieve a positive interaction between rural revitalization and the development of new quality productivity.

Fourthly, there is significant spatial heterogeneity in the role of new quality productivity in promoting rural revitalization, and the formulation of different plans should be tailored to local conditions. Due to the varying promotion effects of new quality productivity on rural revitalization in different regions, policies need to be tailored accordingly. For regions with a solid foundation in the digital economy, emphasis should be placed on institutional innovation and ecological cultivation; For key areas of industrial transformation, it is necessary to strengthen the diffusion of technology and the creation of application scenarios; For areas with weak foundations, priority should be given to improving digital infrastructure and talent reserves. Only by establishing a policy toolbox that matches the regional development stage can we maximize the promoting effect of new quality productivity on rural revitalization and avoid the efficiency loss caused by the "one size fits all" policy.

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