The Impact and Mechanism of Rural E-Commerce Development on Rural Industrial Revitalization: Evidence from China

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Abstract: Rural industry revitalization is central to the overall effort of rejuvenating rural areas, and the advancement of digital villages provides a key strategic pathway to attain this goal. Serving as a key point of integration between the digital economy and rural sectors, rural e-commerce has gradually become an effective pathway for improving productivity in rural areas. This study utilizes provincial-level panel data from China for the period 2014–2022 as its research sample and employs a two-way fixed effects model to empirically examine the impact of rural e-commerce expansion on rural industrial revitalization, while also exploring the mechanisms through which this effect is transmitted. The results suggest that rural e-commerce expansion significantly boosts rural industrial revitalization, which remain consistent across various robustness tests. Second, further analysis indicates that the development of e-commerce shapes rural industrial progress primarily through digital financial inclusion as well as the vibrancy of rural startups and job markets, which act as crucial conduits. Third, there are pronounced spatial and temporal variations in the influence of rural e-commerce. The strongest effect appears in the east, followed by the central region, whereas the west experiences no significant influence. Furthermore, the empowering role of rural e-commerce becomes evident only in regions with moderate to high levels of e-commerce development. As this level increases, the corresponding driving effect strengthens, indicating clear threshold characteristics. In light of these findings, policy efforts should prioritize the enhancement of rural e-commerce infrastructure, adopt region-specific support measures, and reinforce the synergy between financial services and employment initiatives. These measures would enable rural e-commerce to play a stronger role in propelling rural industrial renewal.

Keywords: Rural E-Commerce; Rural Industrial Revitalization; Digital Inclusive Finance; Entrepreneurship and Employment

1. Introduction

Rural industrial revitalization occupies a central position in advancing overall rural revitalization, while the “digital countryside” initiative provides the key strategic direction for this process. Recent years have seen steady growth in rural e-commerce, driven by the swift evolution of mobile internet technologies. In its role as a crucial connector of the digital economy to rural production systems, it has increasingly contributed to raising farmers’ incomes and injecting fresh momentum into rural industrial development [1]. Policy initiatives have further accelerated this development. The 2024 No. 1 Central Document introduced, for the first time, the “High-Quality Development Project for Rural E-commerce,” marking a transition from rapid scale expansion toward a phase focused on quality improvement and efficiency enhancement. In response, local governments have actively introduced context-specific supporting policies, creating unprecedented opportunities for the advancement of smart agriculture and rural industrial transformation.

Rural e-commerce, grounded in local contexts and oriented toward addressing the “Three Rural Issues”, represents an industrial model built upon distinctive rural resources and agricultural products. By leveraging internet technologies to connect production and consumption more efficiently, it helps overcome long-standing bottlenecks in traditional distribution systems. Meanwhile, it supports the dual-directional exchange of urban–rural resources and encourages the coordinated development of supporting industries such as warehousing,

logistics, and packaging, thereby helping to build an integrated rural industrial ecosystem. Supported by favorable policies, technological progress, and expanding market demand, rural retail e-commerce has experienced rapid growth. Projections suggest that by 2025, the online retail value of agricultural products could surpass 800 billion yuan, reflecting a roughly 9.9% annual increase, and maintaining a growth rate that has exceeded the national average of online retail for more than a decade. As infrastructure and service systems continue to improve, a number of leading e-commerce enterprises and regionally branded agricultural products have emerged. Meanwhile, innovative business models—such as instant retail, direct procurement and supply, and collaborative distribution—are constantly evolving. Taken together, these changes position rural e-commerce as an increasingly vital engine for integrating rural industrial sectors and supporting superior-quality economic expansion in rural regions.

As digital technology deeply integrates with rural industries, rural e-commerce and industrial revitalization have become hot topics in academia, sparking rich discussions on the dilemmas faced by rural industrial development and the effectiveness and mechanisms of e-commerce empowerment. First, regarding the dilemmas of rural industrial revitalization: although China has achieved significant results in agricultural value chain construction, forming a basic integrated chain across multiple segments, several bottlenecks remain. The rural industrial system is still relatively weak; for instance, insufficient digital and logistical infrastructure reduces communication efficiency and complicates resource development for rural enterprises in production, circulation, processing, and sales [2], while competitiveness in product quality standards and brand marketing remains insufficient [3]. Furthermore, the poor circulation of data factors, inadequate extension of digital supply chains, and weak inter-industry cohesion pose challenges. Organizational conflicts exist between smallholders and large markets, such as mismatched production and demand, high costs for smallholders to access circulation chains, and a lack of consumer trust [4]. Additionally, financial needs for stable industrial development have not been effectively met [5], and there is a shortage of rural digital talent, manifested in insufficient total numbers, irrational structures, and low digital literacy [6]. These issues severely restrict rural industrial revitalization. Second, regarding the effectiveness and operational pathways of e-commerce empowerment: the development of e-commerce promotes the improvement of the three-tier (county, township, village) service system and logistics distribution networks, enhancing logistics efficiency and the circulation speed of agricultural products [7]. It expands marketing channels, helping manufacturers accurately forecast market demand to achieve production-sales alignment, thereby improving production efficiency and market competitiveness [8]. It also stimulates agricultural production from the demand side, fosters agricultural brands, and unearths the value of characteristic products [9]. Meanwhile, the internet provides a vast array of new quality signals, aggregating decentralized and personalized information to resolve information asymmetry [10], which monitors product quality while enhancing consumer trust. Accompanied by farmer learning and the participation of diverse entities, rural e-tailers have emerged as new transaction subjects, leading to shifts in industrial structures [11]. By encouraging the movement of farm produce into urban markets and the distribution of manufactured items to rural areas, it helps facilitate the upgrading of rural industries. Leveraging industrial agglomeration effects, this drives the development of other sectors and promotes the deep integration of three industries [12]. As rural regional economies undergo positive changes, entrepreneurial behavior diffuses. Rural e-commerce absorbs surplus rural labor [13] and promotes business incubation [14], which not only cultivates local human capital but also attracts the return of migrant workers, thereby increasing human capital intensity [15].

A large volume of scholarly work has looked into the interplay between rural e-commerce and industrial development, generating valuable insights and laying an important theoretical foundation. Nevertheless, several shortcomings persist. Much of the existing work remains largely conceptual, relying on qualitative approaches—such as deductive reasoning and case-based analysis—to explore empowerment pathways, practical constraints, and policy recommendations. Far less research has examined the precise relationship between online rural retail and the rejuvenation of rural

industry, so we still know little about the extent of its impact or the mechanisms that transmit it. To address these gaps, this study utilizes panel data from 30 provinces in China spanning the period from 2014 to 2022 to conduct a rigorous empirical analysis. By testing relevant theoretical hypotheses, it investigates both the impact of rural e-commerce expansion on rural industrial revitalization and the channels through which this influence operates. The conclusions are designed to furnish policymakers with fact-based recommendations to encourage rural e-commerce and thus promote the revitalization of rural industries.

2. Theoretical Analysis and Research Hypotheses

2.1 Direct Effects of Rural E-commerce on Rural Industrial Revitalization

The revitalization of rural industries represents a central component of comprehensive rural development, with improvements in industrial productivity and farmers' income as its primary objectives. Benefiting from features such as digitalized transactions, network connectivity, and shortened distribution chains, rural e-commerce is reconfiguring the very architecture of industry in the countryside. Supported by expanding digital infrastructure and modern logistics systems, e-commerce reduces the constraints associated with traditional agricultural distribution by enabling timely information exchange and efficient delivery services. This facilitates smoother market transactions, enhances the efficiency of product circulation, and strengthens the linkage between small-scale farmers and broader markets [16]. In doing so, it channels capital, information flows, and market attention into the upgrading and transformation of rural productive systems. Simultaneously, agricultural e-retailing accelerates the bidirectional circulation of goods—agricultural items heading outward and industrial goods moving inward—thereby speeding up the reallocation of production factors. This process aids in merging the agricultural, manufacturing, and service industries [17], encouraging rural sectors to evolve toward standardization, branding, and scaled operations. As an internet-driven development model, rural e-commerce is closely tied to the diffusion of information technologies. By reshaping production and supply mechanisms, it enables the emergence of "virtual clusters" that differ from traditional geographically bounded agglomerations. These clusters are characterized by data-driven operations, fragmented demand, flexible production, platform-based coordination, and full value-chain integration [18], effectively mitigating geographical constraints that have historically hindered rural industrial growth. Building on the preceding analysis, we put forward the following hypothesis

H1: Rural industrial rejuvenation receives a notable boost from the growth of agricultural e-commerce.

2.2 Indirect Effects of Rural E-commerce on Rural Industrial Revitalization

Agricultural e-retailing can also influence rural industrial revitalization through indirect channels. One important pathway operates via the progress of inclusive digital finance. Within the context of the digital economy, e-commerce functions as an important carrier for the growth of digital financial services [19]. As rural e-commerce grows, it generates increasing demand for financial products such as online credit and supply chain finance, prompting financial institutions to extend services to rural areas through technologies like big data analytics and mobile payment systems. This interaction improves the accessibility and coverage of digital financial inclusion, enabling more efficient matching between financial resources and rural economic activities. As a result, constraints related to financing, collateral requirements, and information asymmetry faced by rural enterprises can be alleviated. Improved access to capital enhances the resource endowment of rural industries and helps reduce structural financial exclusion. Moreover, through its role in market-based selection, digital finance promotes the efficient allocation of resources within rural e-commerce ecosystems, thereby facilitating industrial upgrading [20]. From the above, H2 is derived:

H2: Advancing digitally inclusive finance serves as a pathway through which online rural retail drives the revival of rural industries.

Another important transmission mechanism lies in the stimulation of rural entrepreneurship and employment. Due to its relatively low entry barriers and flexible operational modes, rural e-commerce lowers the barriers to entrepreneurship and creates a more enabling

entrepreneurial environment [21]. It generates both demonstration and spillover effects, strengthening farmers' motivation and capacity to engage in entrepreneurial activities [22], and thereby enhancing the overall dynamism of rural employment and business creation. An increase in entrepreneurial activity introduces new business models, managerial expertise, and market linkages, while expanded employment opportunities directly raise household income and consumption levels. This, in turn, stimulates local demand for industrial goods and services. The combined effect is the accumulation of human capital and innovative capacity within rural areas, forming a virtuous cycle in which entrepreneurship drives industrial growth and employment sustains it. Following this line of reasoning, the following hypothesis is put forward:

H3: Increased entrepreneurial and employment activity in rural regions serves as a mechanism through which e-commerce in farming areas fosters industrial renewal.

3. Data Sources and Research Methodology

3.1 Model Construction

3.1.1 Core regression formulation

To empirically assess what rural e-commerce does for revitalizing rural industries, we construct the subsequent baseline econometric specification featuring two-way fixed effects:

$$Rir_{it} = \alpha_0 + \alpha_1 Rec_{it} + \alpha_2 X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (1)$$

Within formula (1), i denotes the province, while t indicates the year. The variable Rir captures how far the revival of rural industry has progressed, and Rec, our core explanatory factor, measures the level of development achieved by rural-focused internet selling platforms. α_1 is the coefficient to be estimated for the growth stage of online rural retail. X denotes multiple covariates included to account for other influencing factors, α_0 is the constant term, μ_i stands for provincial-level unobserved heterogeneity, σ_t captures temporal fixed factors across years, and ε_{it} denotes the residual random term.

3.1.2 Mechanism testing model

Based on the previous analysis, the development of rural e-commerce can promote rural industrial revitalization by driving the improvement of digital financial inclusion and enhancing the vitality of rural entrepreneurship and employment. Considering the endogeneity issues inherent in traditional mediation effects, this section follows the approach of Jiang (2022) by regressing the core explanatory variable against the mechanism variables to analyze how this factor shapes each of these mediating processes [23]. The model is specified as follows:

$$M_{it} = \beta_0 + \beta_1 Rec_{it} + \beta_2 X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (2)$$

3.2 Variable Selection and Descriptive Statistics

3.2.1 Explained variable

Rural Industrial Revitalization (Rir): Drawing on the research of Guo and Guo (2024) [24] and Zhang et al. (2018) [25], and considering both data availability and scientific rigor, a measurement framework for rural industrial revitalization was established across three dimensions: production capacity, development benefits, and supply structure (see Table 1).

Using the Entropy Weighting Technique, we derived measurements of how rural industries have revived across 30 provincial regions in China during the 2014–2022 period. Additionally, in the robustness test section, this paper further utilizes secondary indicators, such as development benefits and supply structure, as alternative measurement methods.

Table 1. Indicator Framework for Assessing Rural Industrial Revitalization

Primary Indicators	Secondary Indicators	Indicator Definition	Attribute
Production Capacity	Agricultural labor productivity (yuan/person)	The gross production value from farming, forestry, livestock raising, and fishing, divided by the count of laborers engaged in the primary industry	+
	Productivity of agricultural land (%)	Aggregate farm output per unit of cropland sown area	+
	Dependence on agricultural export	Export value of agricultural products / value-added of the primary industry	+
Development Benefits	Income level of rural residents (yuan)	The net income level received by each rural inhabitant on average	+

	Urban–rural income ratio (%)	Average net income of city residents, divided by the same measure for the countryside population	–
	Proportion of non-agricultural employment (%)	Rural population minus primary- sector employees, taken as a fraction of total rural inhabitants	+
Supply Structure	Agricultural industrial structure adjustment index (%)	The complement of the ratio formed by farming's gross output over the combined production value from agriculture, forestry, livestock, and fishing	+
	Share of the agricultural products processing sector (%)	Processed farm and by- product revenues divided by the aggregate value produced by crop cultivation, forestry, animal rearing, and aquatic harvesting	+
	Proportion of agricultural service industry (%)	Agricultural service output relative to the combined value produced by the primary sectors of farming, forestry, animal rearing, and aquatic harvesting	+

3.2.2 Core explanatory variable. Rural e-commerce development level (Rec)

Following the indicator selection logic and practices of Yan (2024) [26] and He (2020) [27], the number of "Taobao Villages" in each province is selected to measure the development level of rural e-commerce. A Taobao Village refers to a rural area, defined by the administrative village unit, that relies on e-commerce platforms (especially Taobao) to form a large-scale cluster of online merchants. This measure captures both the resource base and the operational dynamism of online rural retail in a given area. In this study, the original value is adjusted by adding one and then transformed using a natural logarithm; larger values correspond to a higher degree of maturity within the countryside's digital marketplace sector.

3.2.3 Mediating variables

First, Digital Financial Inclusion (Digi-fini):

Peking University's index for digitally inclusive finance provides the measurement of its regional distribution. Second, Rural Entrepreneurship and Employment Vitality (Rev): As per the strategy outlined in Huang et al. (2023) [28], the vitality of rural entrepreneurship is proxied by the share of individuals employed in rural private businesses and self-employment relative to the overall rural population. A larger ratio indicates higher entrepreneurship and employment vitality in the region.

3.2.4 Control variables

To reduce the influence of omitted variables and more clearly identify what rural e-commerce does for the rejuvenation of farming-sector industry, additional variables that might influence outcomes are also introduced into the framework. These include fiscal support for agriculture (Fsa), rural human capital (Rhc), the degree of urbanization (Urban), infrastructure development (Tra), the degree of openness (Open), and overall economic development (Eco). More specifically, Fiscal assistance to the agricultural sector is calculated using the portion of regional general budget expenditures that go into farming, forestry, and water-related initiatives. Rural human capital is derived by applying a logarithmic transformation to the average number of years of education completed by rural residents. To capture how urbanized an area is, we take the share of residents living in cities relative to the total population. Infrastructure development is approximated by transport density, calculated as the combined mileage of highways and railways divided by the provincial land area. We also gauge external openness by dividing the sum of imports and exports by regional gross domestic product. For economic development, we take the natural log of per-capita GDP across each province.

3.3 Data Acquisition and Treatment

To enhance data reliability and accessibility, the study focuses on panel data from China comprising 30 regions for the 2014–2022 timeframe. Multiple high-quality references contribute to this dataset, including the *China Statistical Yearbook*, *China Rural Statistical Yearbook*, the ZJU-CARD/CCER China Agricultural Enterprise Database, the Alibaba Taobao Village database, plus separately issued provincial statistical yearbooks. To address the few gaps present in the dataset, the linear interpolation method was used for supplementation. Additionally, continuous indicators underwent bilateral winsorizing at the 1% threshold, which limits the effect that anomalous values could exert upon our results. The basic statistical properties of all analysis

variables can be found summarized in Table 2.

Table 2. Descriptive Statistical Results of the Variables

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Rir	270	0.2830	0.1833	0.0690	0.8838
Rec	270	2.2513	2.2029	0.0000	7.3956
Digi-fini	270	292.0716	71.9774	160.45	447.73
Rev	270	0.3150	0.4823	0.0326	2.8385
Fsa	270	11.4815	3.5051	4.2622	18.6579
Rhc	270	1.6189	0.2579	1.1644	2.1517
Urban	270	0.6204	0.1101	0.4273	0.8930
Tra	270	1.0224	0.5318	0.1103	2.1929
Open	270	0.2476	0.2379	0.0123	0.9964
Eco	270	11.0019	0.4235	10.2416	12.1608

4. Empirical Analysis and Hypothesis Testing

4.1 Baseline Regression Results

The baseline regression results of rural e-commerce on rural industrial revitalization are shown in Table 3. In column (4), after jointly including province dummies and year dummies in the specification, the estimated coefficient for rural e-commerce development in relation to rural industrial revitalization is 0.0088, and its statistical significance is established at the one-percent level, indicating a clear positive effect. This initially indicates that the development level of rural-focused internet selling yields a powerful beneficial effect upon restoring rural industrial vitality, thus verifying Hypothesis H1.

Table 3. Baseline Regression Results

Variable		(1)	(2)	(3)	(4)
Rec		0.0340***	-0.0095***	0.0039	0.0088***
		(0.0041)	(0.0035)	(0.0031)	(0.0031)
Fsa			-0.0083***	0.0073***	0.0047**
			(0.0032)	(0.0022)	(0.0021)
Rhc			0.2624***	0.0067	0.0554
			(0.0293)	(0.0426)	(0.0365)
Urban			0.1564	-0.5109	-0.4737
			(0.1112)	(0.3617)	(0.3968)
Tra			0.0300*	0.0019	-0.0137
			(0.0178)	(0.0268)	(0.0222)
Open			0.3003***	0.0102	0.0156
			(0.0718)	(0.0164)	(0.0115)
Eco			0.0043	0.0241	0.2411**
			(0.0297)	(0.0605)	(0.0879)
Constant		0.2064***	-0.2749	0.2265	-2.3170**
		(0.0154)	(0.2859)	(0.4554)	(0.8674)
Province FE		NO	NO	YES	YES
Year FE		NO	NO	NO	YES
N		270	270	270	270
R^2		0.1673	0.8312	0.1796	0.4332

Explanation: Statistical relevance at the 0.10, 0.05, and 0.01 levels is marked by *, **, and *** in that order. Values in brackets are standard errors. The same notation is used throughout the remainder of the paper.

4.2 Endogeneity Treatment

Although a two-dimensional fixed-effects framework is applied in this research, which mitigates endogeneity in the econometric model to some extent, further treatment for endogeneity remains necessary. This paper adopts the following two methods. First, the Propensity Score Matching (PSM) method. Specifically, a median split assigns each observation to either a "high-intensity" or "low-intensity" rural e-commerce category. Using control variables as covariates, 1:1 nearest neighbor matching was performed, stratified by year. The regression results are

presented in columns (1)-(2) of Table 4. The data indicate that the coefficient for the rural e-commerce development level remains significantly positive regardless of whether additional background factors are accounted for. This suggests that after mitigating sample self-selection bias, countryside-based internet selling remains significantly promotes rural industrial revitalization. Second, the Heckman Two-step procedure. Columns (3)-(4) of Table 4 display the output generated by the Heckman two-step estimation. In the first step, a binary indicator is defined according to whether the measured intensity of countryside e-commerce exceeds the sample's midpoint and is incorporated into the selection equation, while the previous period's observation of online rural retail progress is introduced as an instrumental variable to estimate a Probit model. In the second stage, the Inverse Mills Ratio (IMR) is added back into the main equation for re-regression to test for the significant existence of sample selection bias. The estimation results show that the coefficient of the Inverse Mills Ratio is 0.0026 and is not significant, indicating that sample selection bias is not serious. Rural e-commerce expansion still yields a statistically meaningful positive impact at the 99% confidence level.

Table 4. Endogeneity Treatment Results

Variable	(1)	(2)	(3)	(4)
	PSM		Heckman	
	Rir	Rir	First Stage	Second Stage
Rec	0.0242**	0.0235*		0.0108***
	(0.0106)	(0.0129)		(0.0036)
IMR				0.0026
				(0.0053)
Constant	0.3488***	-0.8873	-16.3178	-1.7392*
	(0.0142)	(1.0928)	(13.0545)	(0.9206)
Control Variables	NO	YES	YES	YES
Province FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	119	119	240	240
R^2	0.5546	0.6069	0.9142	0.4478

4.3 Robustness Tests

Three types of robustness exercises are carried out to examine whether the core results hold under alternative specifications: modifying the sample period, adopting alternative estimation techniques, and substituting variable measurements. The related estimation outcomes are presented in Table 5. First, regarding the adjustment of the sample period, observations from the initial and final years are excluded, and the sample is redefined to cover 2015–2021. The model is then re-estimated using this restricted dataset. As indicated in column (2) of Table 5, the key estimates exhibit no substantial alteration. Second, to assess the sensitivity of the estimation approach, a Random Effects model is employed in place of the fixed effects specification. As reported in column (3), the estimated coefficient for countryside internet selling development stands at 0.0094, staying above zero with statistical significance at $p < 0.01$, providing additional confirmation that the benchmark estimates hold up. Third, alternative measures of the dependent variable are considered. Given that the baseline indicator is constructed using a composite index based on the entropy weighting method, the analysis is extended by disaggregating this index. Specifically, the two primary components "development performance" and "supply structure" are used as substitute dependent variables in the regression. As shown in columns (4) and (5), the estimated results exhibit little variation, implying that alternative operationalizations of the variables do not alter the main findings.

Table 5. Results of Robustness Examinations

Variable	(1)	(2)	(3)	(4)	(5)
	Baseline Regression	Changing Sample Period	Changing Estimation Model	Replacing Variable	Replacing Variable
Rec	0.0088***	0.0130***	0.0094***	0.0101***	0.0113**

	(0.0031)	(0.0038)	(0.0033)	(0.0021)	(0.0050)
Constant	-2.3170**	-2.0787**	-3.0706***	-0.0544	-2.4837*
	(0.8674)	(0.9559)	(1.0343)	(0.5518)	(1.2323)
Control Variables	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	270	210	270	270	270
R^2	0.4332	0.4301	0.7966	0.4072	0.2155

	(239.8128)	(3.4948)	(0.8674)
Control Variables	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	270	270	270
R^2	0.9929	0.6052	0.4332

5. Further Analysis

5.1 Mechanism Testing

To verify the mediating effects of digital financial inclusion and rural entrepreneurship and employment vitality in the process of rural e-commerce promoting rural industrial revitalization, a two-step method is employed for empirical analysis. Theoretical arguments previously established that digital financial inclusion can provide financial guarantees for expanding production, technological transformation, and brand building by alleviating financing constraints for rural business entities, optimizing capital factor allocation, and improving the digital infrastructure that handles rural loan approvals, thereby driving rural industrial revitalization. Meanwhile, rural entrepreneurship and employment vitality primarily impact rural industrial revitalization by cultivating new types of business entities, creating diverse job opportunities, introducing advanced management concepts and market resources, and enhancing rural human capital levels to activate the endogenous development momentum of rural industries. Therefore, to test hypotheses H2 and H3, this paper uses Model (2) to examine whether rural e-commerce development significantly enhances the level of digital financial inclusion and the vitality of rural entrepreneurship and employment. The outcomes can be found in Table 6. According to the results in columns (1), (2), and (3), rural e-commerce development has a significantly positive impact on the level of digital financial inclusion, rural entrepreneurial vitality, and industrial revitalization, respectively. Thus, hypotheses H2 and H3 are supported.

Table 6. Mechanism Testing Results

Variable	(1)	(2)	(3)
	Digi-fini	Rev	Rir
Rec	4.7234***	0.0194*	0.0088***
	(1.4671)	(0.0105)	(0.0031)
Constant	-16.6841	1.3948	-2.3170***

5.2 Heterogeneity Analysis

In order to better isolate the distinct ways that rural internet selling shapes the rejuvenation of local industries, this paper conducts heterogeneity tests from the two dimensions of geographical location and the intensity of online rural retail, with Table 7 displaying the outcomes.

5.2.1 Heterogeneity analysis considering geographical location

The sample is partitioned into three segments according to the National Bureau of Statistics' official classification system for regions: Eastern, Central, and Western region. As can be seen from columns (1), (2), and (3) in Table 7, there are obvious spatial differences in the promotional effect of rural e-commerce on rural industrial revitalization. The regression coefficient of rural e-commerce development level in the Eastern region is 0.0243, which is significantly positive at the 1% statistical level; the Central region yields a parameter estimate of 0.0111, showing a positive coefficient that reaches the 90% confidence threshold; the Western region, meanwhile, produces a parameter value of 0.0020, and the result is not significant. Hence, the industrial revitalization power of online rural retail appears most pronounced across eastern provinces, somewhat less so in the middle region, while no substantial push has emerged from the western part of the country. One possible explanation is that the coastal eastern zone, by virtue of its perfect digital infrastructure, mature logistics and distribution system, and broad consumer market, can fully release the leading role of rural internet selling performs; the Central region's e-commerce empowerment effect is gradually

emerging by relying on policy support and industrial undertaking; while the Western region is limited by realistic constraints such as weak infrastructure and insufficient industrial matching, and the driving role of rural e-commerce on rural industrial revitalization has not yet been fully exerted.

Table 7. Outcomes of Heterogeneity Assessments

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	East	Central	West	Low E-com	Mid E-com	High E-com
Rec	0.0243***	0.0111*	0.0020	-0.0005	0.0108***	0.0268***
	(0.0048)	(0.0051)	(0.0035)	(0.0037)	(0.0030)	(0.0079)
Constant	-5.6225*	-0.8462	-1.4270*	-2.3552***	-1.7002	-2.4744
	(2.5728)	(0.7089)	(0.7338)	(0.6468)	(1.6831)	(2.5051)
Control Variables	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
N	99	72	99	90	90	90
R^2	0.6095	0.7161	0.5577	0.5943	0.6078	0.5320

5.2.2 Heterogeneity analysis considering rural e-commerce development level

Using the annual average level of rural e-commerce development across provinces, the sample is classified into three groups—low, medium, and high—using a tertile-based classification approach. According to Table 7, columns (4)-(6), there are striking disparities in the estimated results across these groupings. Specifically, within localities that have yet to achieve a high degree of countryside e-commerce penetration, the estimated coefficient is −0.0005 and statistically insignificant, suggesting a negligible impact. In contrast, areas at the intermediate stage exhibit a coefficient of 0.0108, which is positively significant with a p-value below 0.01. For provinces with advanced e-commerce development, the coefficient increases to 0.0268, similarly significant with $p < 0.01$ and substantially larger than that of the medium-level group. These findings point to a clear threshold effect within the link connecting online rural retail to the revival of farming-sector industries. In regions where e-commerce development remains limited, underdeveloped markets and incomplete industrial chains constrain its ability to generate meaningful spillover effects. As development progresses to a moderate level, the positive influence of e-commerce begins to materialize more clearly. In highly developed regions, where the e-commerce ecosystem is more mature and resource integration is stronger, its role in promoting rural industrial upgrading becomes even more pronounced.

6. Conclusion and Policy Implications

Utilizing a provincial panel dataset spanning 2014–2022, the study adopts a bidirectional fixed effects framework to investigate the impact of online rural retail growth upon rural industrial renewal. The key results of the analysis can be outlined as follows. To begin with, rural internet selling's upward trajectory strongly and favorably influences the renewal of local industrial systems, and this result remains robust under a variety of sensitivity tests. Second, the inclusiveness of digital finance, along with the energy of rural start-up activity and job markets serve as important transmission channels, mediating the influence of e-commerce development on industrial revitalization. Third, the effects of rural e-commerce display clear regional heterogeneity as well as stage-specific differences. The strongest positive impact is observed in the eastern region, followed by the central region, whereas the western area's coefficient fails to reach statistical significance levels. In addition, regions with intermediate or advanced e-commerce penetration are where the positive gains from countryside internet selling mostly emerge. The magnitude of the effect increases alongside the stage of online rural retail development, whereas regions at a low development stage do not experience significant gains. The subsequent section offers various policy implications grounded in the evidence above.

First, continuously improve rural e-commerce infrastructure to consolidate the foundation for industrial development. Efforts should focus on increasing investment in rural logistics systems, digital networks, warehousing, and cold chain facilities. It is essential to open up the “first mile”

for agricultural products going to cities and the "last mile" for consumer goods going to the countryside, narrowing the gap in digital facilities between urban and rural areas, thereby offering the physical foundation needed for sustained growth of online rural retail.

Second, deepen the activation of local resource value to release the endogenous development momentum of e-commerce for village revitalization. Local resources are the unique genes and development roots of the countryside. It is necessary to transform resource advantages into economic and cultural advantages through precise excavation, innovative transformation, and brand empowerment, effectively overcoming the development dilemma of "homogenization among thousands of villages." We should precisely identify industrial resources such as village cultural resources and characteristic agricultural products, clearly define the appropriate development direction for each type of resource, and open the conversion channel from resource to value. Furthermore, same-type local resources should be integrated to create regional public brands, strengthening brand empowerment and enhancing market recognition.

Third, adhere to the bottom line of regulatory norms to weave a secure network for the standardized development of e-commerce for village revitalization. Supervision is the bottom line for standardized development, and synergy is the key to improving efficiency. It is necessary to ensure orderly and sustainable rural development and avoid various potential risks through regulatory rulemaking and collaborative efforts. We must improve regulatory mechanisms, maintain the bottom line of quality control, and eliminate practices such as substituting high-quality goods with inferior ones or losing contact after sales. Simultaneously, the excavation of the unique value of non-standard products should be encouraged to help high-quality non-standard products leave the villages at fair prices, effectively promoting the quality and efficiency of the rural digital economy.

Fourth, strengthen mechanism empowerment to collaboratively promote digital financial inclusion and rural entrepreneurship and employment. Financial institutions should be encouraged to develop products such as micro-loans and supply chain finance based on rural e-commerce scenarios, simplifying the process for agriculture-related loans to effectively alleviate financing difficulties for rural industries. Meanwhile, support policies for returning home to start businesses should be improved, e-commerce entrepreneurship incubation platforms should be established, and skill training should be conducted to attract groups such as youth and college students to return to their hometowns to engage in e-commerce-related industries, thereby activating industrial momentum with talent vitality.

References

[1] Ma Gaiyan, Yang Qiuluan, Wang Hengbo. Internal Mechanism, Realistic Challenges, and Breakthrough Paths of Digital Economy Empowering Rural Industrial Revitalization. Contemporary Economic Management, 2023, 45(08): 33-38.

[2] Wu Yun, Zhu Hongyan. Theoretical Logic, Realistic Bottlenecks, and Development Paths of New Quality Productive Forces Empowering Rural Industrial Revitalization. Journal of Northern Minzu University, 2024, (04): 31-38.

[3] Wan Baorui. Reflections on Accelerating the Improvement of China's Agricultural Competitiveness. Issues in Agricultural Economy, 2016, 37(04): 4-8.

[4] Liu Ru, Guo Tichao, Xin Jianqi. Theoretical Logic and Practice Orientation of New Digital Infrastructure Promoting Rural Industrial Revitalization. Finance and Economics, 2024, (11): 57-71.

[5] Gan Ying. Integrated Empowerment: Practical Paths for Small Farmers to Effectively Connect with the E-commerce Market. Journal of Northwest A&F University (Social Science Edition), 2022, 22(01): 88-97.

[6] Chen Yiming. Mechanism Innovation of Integrated Development of Digital Economy and Rural Industries. Issues in Agricultural Economy, 2021, (12): 81-91.

[7] Xiang Jiyou. New Quality Productive Forces Empowering Digital Rural Construction: Theoretical Logic and Path Analysis. Guizhou Social Sciences, 2024, (08): 148-154.

[8] Tian Ye, Liu Qin, Huang Jin. The Mechanism of Digital Economy Empowering Rural Industrial Revitalization: A Case Study Based on

Three Typical Townships in Zigui County, Hubei Province. Issues in Agricultural Economy, 2023, (12): 36-46.
[9] Guo Chaoxian, Miao Yufei. Mechanism and Path of Digital Economy Promoting Rural Industrial Revitalization. Journal of Beijing University of Technology (Social Sciences Edition), 2023, 23(01): 98-108.
[10]Jiang Xiaojuan. Resource Reorganization and Service Sector Growth in a Highly Connected Society. Economic Research Journal, 2017, 52(03): 4-17.
[11]Cui Kai, Feng Xian. Logic and Trend of "Parallel Upward and Downward" Rural E-commerce from an Evolutionary Perspective. Chinese Rural Economy, 2018, (03): 29-44.
[12]Zhang Shuo, Qiao Han, Zhang Yingchen, et al. Research Status and Prospect of Rural E-commerce Assisting Poverty Alleviation and Rural Revitalization. Chinese Journal of Management, 2022, 19(04): 624-632.
[13]Lv Dan. Analysis of the Placement Path of Rural Surplus Labor Force Based on the Perspective of Rural E-commerce Development. Issues in Agricultural Economy, 2015, 36(03): 62-68.
[14]Wei Xiaobei, Wang Miao. Research on the Agglomeration "2+" Model of Rural E-commerce in the Rural Revitalization Strategy. Journal of Shandong University (Philosophy and Social Sciences Edition), 2018, (06): 130-137.
[15]Tang Hongtao, Guo Kaige, Zhang Junying. E-commerce and Rural Poverty Alleviation Efficiency: A Study on the Mediating Effects of Fiscal Input and Human Capital. Economic Geography, 2018, 38(11): 50-58.
[16]Luo Meng, Lin Wanlong. Development Status, Dilemmas, and Future Support Policies of Agricultural Product E-commerce. World Agriculture, 2024, (12): 37-50.
[17]Jiang Zelin. Further Exploration of the Integrated Development of Rural Primary, Secondary, and Tertiary Industries. Issues in Agricultural Economy, 2021, (06): 8-18.
[18]Wang Ruyu, Liang Qi, Li Guangqian. Virtual Agglomeration: A New Spatial Organizational Form of Deep Integration between New Generation Information Technology and the Real Economy. Management World, 2018, 34(02): 13-21.
[19]Zhou Yahong, Qiu Zixun, Jiang Shuaishuai, et al. Digital Economy Development and Rural Common Prosperity: A Synergetic Perspective of E-commerce and Digital Finance. Economic Research Journal, 2024, 59(07): 54-71.
[20]He Tielin. Mechanism and Spatial Spillover Effect of Inclusive Finance Empowering Rural E-commerce Industrial Upgrading. Journal of Business Economics, 2021, (11): 169-172.
[21]Bu Jiewen, Tang Long, Zhao Yanyan, et al. Can the Development of E-commerce in Rural Areas Alleviate the Outflow of Capital and Labor Factors? — A Case Study of the Comprehensive Demonstration Policy of E-commerce into Rural Areas. Journal of Financial Research, 2023, (10): 145-164.
[22]Song Ying, Xie Hao, Wang Yafei. Does Agricultural E-commerce Help Increase Farmers' Income in Poverty-stricken Areas? — On the Impact of Heterogeneity in Farmers' Participation Models. Journal of Agrotechnical Economics, 2022, (01): 65-80.
[23]Jiang Ting. Mediating Effects and Moderating Effects in Causal Inference Empirical Research. China Industrial Economics, 2022, (05): 100-120.
[24]Guo Xinmei, Guo Jinyang. Research on the Impact of Developing Rural E-commerce on Rural Industrial Revitalization: Based on the Analysis of the Moderating Effect of Urban-Rural Integrated Development. Price: Theory & Practice, 2024, (06): 34-38+224.
[25]Zhang Ting, Li Minrong, Xu Yanmei. Construction and Empirical Research of the Evaluation Index System for Rural Revitalization. Management World, 2018, 34(08): 99-105.
[26]Yan Guangshi. Research on the Impact Mechanism of Rural E-commerce Development on Rural Economic Resilience. Journal of Business Economics, 2024, (11): 101-104.
[27]He Yehong. Analysis of the Impact of Rural E-commerce Development on China's Urban-Rural Income Gap. Journal of Business Economics, 2020, (16): 91-94.
[28]Huang Dunping, Yin Kai. Can the Development of Digital Financial Inclusion Enhance Rural Entrepreneurial Vitality? Finance and Economy, 2023, (08): 43-53.

