

How can rural e-commerce empower rural revitalization? —Based on the perspective of industrial prosperity

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Abstract

With the in-depth implementation of the rural revitalization strategy, rural e-commerce, as an important force to promote the development of agricultural economy, is gradually becoming a key factor in promoting rural revitalization. This paper discusses the role and intermediary effect of rural e-commerce in promoting rural revitalization from two aspects: the improvement of farmers' income and the transformation and upgrading of industrial structure. First of all, rural e-commerce promotes rural revitalization by increasing farmers' income, helping farmers expand sales channels and improving the market competitiveness of agricultural products. Secondly, rural e-commerce has also promoted the transformation and upgrading of the industrial structure, promoted the modernization of agricultural production methods, and gave birth to a new rural economic form. This paper further introduces the moderating effect and finds that in areas with high infrastructure level, the promotion effect of rural e-commerce on rural revitalization is more significant. Through the empirical analysis of the above effects, this paper reveals the far-reaching impact of rural e-commerce on rural revitalization, and provides a theoretical basis and practical guidance for further improving the rural revitalization policy.

Keywords

Rural e-commerce, rural revitalization, industrial upgrading

I.Introduction

The rural revitalization strategy is an important policy in China's development in the new era, which aims to promote the coordinated development of urban and rural areas by improving the rural economic, social, cultural and ecological environment. In this context, e-commerce, as an important part of the modern economy, is becoming a key force to promote rural revitalization. Rural e-commerce not only provides farmers with a new market channel, but also breaks the bottleneck of the traditional rural economy, and promotes agricultural industrialization, rural eco-

conomic diversification and farmers' income growth.

In recent years, with the continuous improvement of Internet infrastructure and the popularization of smartphones, rural e-commerce has developed rapidly. Through e-commerce platforms, farmers can not only sell their own agricultural products directly to urban markets, but also buy industrial products at reasonable prices and with a wide variety of products through the Internet. Especially in some economically backward areas, e-commerce platforms provide farmers with more convenient shopping and sales channels, and promote the overall development of the rural economy.

However, despite the huge potential of rural e-commerce, it still faces some challenges in the development process, such as imperfect logistics system, difficulty in ensuring the quality of agricultural products, and asymmetric market information. Therefore, how to further optimize the development path of rural e-commerce and solve these constraints has become an important topic to promote the implementation of the rural revitalization strategy.

This article will discuss the role of rural e-commerce in promoting rural revitalization, analyze its challenges and opportunities, and put forward corresponding policy recommendations. By studying how e-commerce can effectively promote agricultural efficiency, farmers' income and rural economic development, it is expected to provide theoretical support and practical guidance for rural revitalization.

II. Theoretical analysis

As an emerging business model, rural e-commerce has become an important force to promote the implementation of the rural revitalization strategy. In this process, e-commerce has not only opened up new markets and sales channels for farmers, but also had a profound impact on the agricultural industry, the rural economy and farmers' incomes. Based on the theoretical framework of the intermediary effect, this part will analyze how rural e-commerce can achieve the role of rural revitalization through intermediary mechanisms such as increasing farmers' income, promoting the rationalization of industrial structure, and promoting the upgrading of industrial structure.

In summary, this paper proposes hypothesis H1: the development of rural e-commerce can promote rural revitalization

One of the most direct effects of rural e-commerce is to help farmers increase their income levels by providing them with broader market channels. Whereas the traditional rural economy has relied heavily on local markets and middlemen, e-commerce platforms enable farmers to directly target a wider range of consumers by breaking down the asymmetry of space and information. In this process, the e-commerce platform not only reduces the cost of sales intermediaries, but also helps farmers expand product sales channels and improve the market competitiveness of agricultural products. Through e-commerce, farmers can directly sell agri-

cultural products with market demand to the national and even international markets, so as to achieve an increase in prices and sales, and ultimately lead to an increase in farmers' income.

The increase of e-commerce on farmers' income is mainly manifested in two aspects: on the one hand, farmers can get more economic benefits through e-commerce sales, especially for some high-quality characteristic agricultural products, e-commerce platforms can help them find accurate consumer groups; On the other hand, e-commerce platforms have helped farmers improve their sales skills and market awareness through training and technical support, further improving their market adaptability and income levels.

In summary, this paper proposes hypothesis H2: rural e-commerce promotes rural revitalization by increasing farmers' income.

The rationalization of the industrial structure refers to the adjustment of the structure of agricultural production according to the changes in market demand, so that the matching degree of agricultural production and consumption will continue to increase. Rural e-commerce can effectively promote the rationalization of industrial structure through big data and market feedback mechanism. In traditional agriculture, farmers often blindly follow the trend of production and lack an accurate grasp of market demand, resulting in an imbalance between supply and demand of a large number of agricultural products. Rural e-commerce transmits consumer demand information to farmers in a timely manner through online platforms, promoting the docking of agricultural production direction and market demand.

Through e-commerce platforms, farmers are able to keep abreast of which agricultural products are in high demand and which are in high market price, so they can adjust their production strategies, avoid over-production of certain agricultural products, and reduce inventory waste. In this process, the e-commerce platform not only provides farmers with accurate market demand information, but also promotes the diversification and differentiated production of agricultural products, and promotes the structural optimization of agricultural production. For example, through e-commerce platforms, consumers can choose more high-quality, green and pollution-free agricultural products, promote the transformation of farmers to more efficient and environmentally friendly production methods, and improve the overall efficiency of agricultural production.

The sophistication of industrial structure refers to the development of the industry in the direction of higher added value, higher technology content and higher efficiency. Rural e-commerce is not only a trading platform to promote agricultural products, but also a link for the deep integration of agriculture with modern service industry and manufacturing industry. In this process, e-commerce platforms have become a catalyst for the development of the agricultural industry to a higher level. On the one hand, e-commerce platforms have promoted the extension and optimization of the agricultural industry chain. Many traditional agricultural enterprises rely

on e-commerce platforms to process, package and brand agricultural products, creating higher value-added agricultural products. These agricultural products are sold all over the country through e-commerce platforms and even exported overseas, promoting the diversification and high-end of the agricultural industry. On the other hand, e-commerce platforms have also promoted the integration of agriculture and modern service industries. For example, e-commerce platforms have reduced farmers' production costs and improved production efficiency through logistics, warehousing, finance and other services. Farmers can obtain financing support through e-commerce platforms, which improves the financial security of production; Through the logistics system of e-commerce, the circulation efficiency of agricultural products has been greatly improved, which has further promoted the upgrading of the agricultural industry.

In addition, the rise of e-commerce has also promoted the development of agriculture-related technology and information services, such as the application of Internet technology, the popularization of data analysis, and the popularization of agricultural technology training. Through these services, the level of agricultural production has been improved, the quality of agricultural products has been guaranteed, and the production and marketing methods of farmers have been modernized, which has further promoted the high-level development of the industry.

On the whole, the role of rural e-commerce in promoting rural revitalization is gradually realized through the above-mentioned intermediary mechanism. Increasing the income of rural households through e-commerce and promoting the rationalization and upgrading of the industrial structure not only promote the rapid development of the rural economy, but also enhance the independent development ability of farmers and further enhance the modernization level of the agricultural industry. While connecting consumers and farmers, e-commerce platforms have gradually built a more diversified, flexible and efficient rural economic system, providing a steady stream of impetus for rural revitalization.

In summary, this paper proposes hypothesis H3: rural e-commerce can promote regional industrial transformation and upgrading, thereby promoting rural revitalization.

To sum up, rural e-commerce not only effectively promotes agricultural modernization and the transformation and upgrading of rural economy by increasing the income of rural households, promoting the rationalization of industrial structure, and promoting the upgrading of industrial structure, but also provides strong support for the implementation of the rural revitalization strategy. In the future development process, rural e-commerce will continue to play an important role in helping rural revitalization to a higher level.

III. Research design

1. Data source

The data in this study are mainly from the following aspects:

Level of rural revitalization(rur): According to Xu Xue et al.(2022)[1], the level of rural revitalization is measured by integrating economic, social, cultural, and ecological indicators. The data sources mainly include the China Statistical Yearbook, annual reports issued by local governments, and databases of relevant scientific research institutions. When specifically measuring the level of rural revitalization, the index system proposed by Xu Xue will be referred to.

Rural e-commerce development level(tb): The number of Taobao villages was selected as the core indicator to measure the development level of rural e-commerce. Referring to the research of Liu Yang et al.[2], the number of city-level Taobao villages was selected to measure the development level of rural e-commerce. Taobao Village refers to a rural e-commerce village with an annual transaction volume of more than 10 million yuan and more than 80% of rural households participating. The data comes from Alibaba Group's public Taobao Village database and research reports such as the China Taobao Village Development Report, combined with statistical data from different years.

Control variables: In addition, the level of urbanization(urb), the degree of government intervention(goven), the intensity of fiscal investment(fis) and the level of education(edu) are also selected as the control variables.[3]

2.Research Methods

In order to test the relationship between rural e-commerce and rural revitalization, multiple linear regression analysis was adopted. The specific model is as follows:

$$country_{i,t} = \alpha_0 + \alpha_1 tb_{i,t} + \alpha_3 control_{i,t} + \varepsilon_0$$

Among them, $country_{i,t}$ represents the level of rural revitalization in i city t year, $tb_{i,t}$ represents the level of rural e-commerce development in i city t year, and ε_0 is a random error term.

IV.Empirical results

1.Baseline regression

This section will report the estimated results of the promotion of rural e-commerce to rural revitalization through different regression settings. In order to further analyze the relationship between e-commerce development and rural revitalization, we designed four different regression models, namely, the fixed-effect model that controlled only the city, the fixed-effect model that controlled only the year, the fixed-effect model that neither controlled the city nor the year, and the double-fixed-effect model. Each setting is a baseline regression model, and the detailed report is shown in Table 1.

Table 1. Baseline regression

rur			
(1)	(2)	(3)	(4)

tb	0.000*** (6.32)	0.000*** (8.75)	0.000** (2.27)	0.000*** (7.74)
urb	0.098*** (4.46)	0.281*** (20.24)	0.004 (0.28)	0.138*** (6.49)
govern	-0.164*** (-5.66)	0.110*** (6.24)	0.048*** (2.96)	-0.109*** (-3.87)
fis	-0.004*** (-3.85)	0.002*** (3.72)	-0.000 (-0.99)	-0.003** (-2.45)
edu	-0.096 (-0.88)	0.570*** (3.69)	-0.135 (-0.99)	-0.141 (-1.29)
Cons	0.348 (19.42)	0.140*** (17.26)	0.341*** (34.32)	0.304*** (18.00)
fixed effects for year	YES	NO	YES	NO
fixed effects for city	NO	YES	YES	NO
Observations	2234	2234	2,232	2234
R ²	0.1035	0.9527	0.9658	0.0841

Note: *, **, and *** correspond to 10%, 5%, and 1% significance levels, respectively, and the numbers in parentheses are t-values. The table below is the same.

The regression results show that the development of e-commerce generally has a significant positive impact on rural revitalization, and the hypothesis H1 is valid.

2. Robustness test

In this paper, we select the Internet penetration rate as the instrumental variable of rural e-commerce,[7] and use the two-stage least squares method (2SLS) for regression, and the regression results are shown in Table 2.

Table 2. Robustness test

	tb	rur	tb	rur
	(1)	(2)	(3)	(4)
int	0.520*** (8.75)		0.409*** (6.13)	
tb		0.003*** (7.39)		0.004*** (5.19)
Cons	-3.903** (-2.11)	0.312*** (53.54)	9.586 (1.58)	0.276*** (10.64)
Controls	NO	NO	YES	YES
fixed effects for year	YES	YES	YES	YES
fixed effects for city	YES	YES	YES	YES
Observations	2256	2256	2233	2233

When the control variables were not added, the F-value of the first-stage regression was 76.56, which was greater than the empirical value of 10, and the Cragg-Donald Wald $F > 10$ passed the instrumental variable test. When the control variables are added, the F-value of the first-stage regression is 37.54, which is greater than the empirical value of 10, which passes the weak instrumental variable test, and the Cragg-Donald Wald $F > 10$ passes the instrumental variable test, indicating that the

results of this paper are robust.

V.Mechanism checking

This section mainly conducts empirical analysis to examine the mechanism by which rural e-commerce promotes rural revitalization, with a particular focus on the mediating effects of increasing farmers' income(income), rationalizing the industrial structure(rat), upgrading the industrial structure(upg), and the moderating effect of infrastructure levels(inf). Therefore, this paper references Jiang Ting's research and employs a two-step method to verify the mediating effects of farmers' income increase and industrial structure transformation and upgrading, with the regression results shown in Table 3.[8]

Table 3. Mechanism checking

	income	rat	upg	inf
	(1)	(2)	(3)	(4)
tb	26.334 (15.46)	0.000*** (4.41)	0.001*** (4.88)	0.072* (1.82)
tb×inf				0.002* (1.66)
Controls	YES	YES	YES	YES
fixed effects	YES	YES	YES	YES
for year				
fixed effects	YES	YES	YES	YES
for city				
Observations	2224	2232	2232	756
R ²	0.9680	0.8387	0.8789	0.9572

The regression results indicate that rural e-commerce, as an important means of modern agricultural development, can directly promote the increase of farmers' income by expanding sales channels, reducing information asymmetry, and enhancing the added value of agricultural products. In this study, we examine the mediating role of rural e-commerce in promoting farmers' income through path analysis. Specifically, e-commerce platforms expand the market reach of agricultural products, enabling farmers to directly connect with a wider range of consumers, thereby increasing sales volume and revenue.

The rationalization of industrial structure is one of the important goals of rural revitalization. Through the analysis of the mechanism of rural e-commerce, it is found that e-commerce platforms can promote the rationalization of industrial structure to a certain extent, even if agricultural production and product sales are more in line with market demand and more efficient.

The upgrading of the industrial structure mainly refers to the transformation of agriculture from a low-value-added and low-tech production model to a high-value-added and high-tech production model. Rural e-commerce not only provides a broader market for farmers, but also promotes the development of agricultural production methods in a more efficient and modern direction.

Infrastructure construction is the foundation of rural e-commerce development, and good infrastructure can effectively improve the operational efficiency of e-commerce platforms and promote the deep integration of e-commerce and agriculture. This study also discusses the moderating effect of infrastructure level in the promotion of rural e-commerce in rural revitalization.

From the perspective of the moderating effect, the improvement of infrastructure has significantly enhanced the role of rural e-commerce in promoting rural revitalization, particularly in increasing farmers' income and optimizing the industrial structure, where the improvement of infrastructure has played a crucial facilitating role.

VI. Conclusions and policy recommendations

Through the study of rural e-commerce to promote rural revitalization, this paper deeply discusses the mechanism of rural e-commerce, and analyzes its specific impact path through the mediating effect and moderating effect. The results show that the role of rural e-commerce in rural revitalization cannot be ignored, which is mainly reflected in the following aspects: First, rural e-commerce can effectively improve the income level of rural households, and this intermediary effect shows that e-commerce platforms can help farmers expand the market and increase the added value of products by broadening sales channels, thereby increasing farmers' income. The increase in farmers' income not only improves the economic situation of families, but also enhances the economic vitality of rural areas and provides financial guarantee for rural revitalization. Second, rural e-commerce not only drives the development of the agricultural industry, but also promotes the extension and upgrading of the agricultural industry chain. E-commerce platforms provide development space for agricultural product processing industry, logistics and distribution, brand building and other related industries. Especially in the field of agricultural product processing and deep processing, e-commerce has played a significant role in promoting it, which has promoted the structural optimization, transformation and upgrading of rural industries, and promoted the diversified development of regional economy. Third, the moderating effect of infrastructure level on the role of rural e-commerce: The study also found that in areas with higher infrastructure levels, rural e-commerce has a more obvious role in promoting rural revitalization. Good infrastructure, such as transportation, Internet, logistics and other infrastructure, can provide a guarantee for the smooth operation of e-commerce. The improvement of infrastructure not only improves the operational efficiency of e-commerce, but also strengthens the connectivity of the market, providing strong support for the vigorous development of rural e-commerce.

In order to further play the role of rural e-commerce in rural revitalization, this paper puts forward the following policy suggestions. First, the government should further increase investment in rural infrastructure, especially transportation, com-

munications, logistics and Internet facilities, improve the rural infrastructure network, and provide support for the smooth operation of e-commerce platforms. In particular, it is necessary to strengthen the infrastructure construction in poor areas and remote villages, narrow the infrastructure gap between urban and rural areas, and improve the comprehensive competitiveness of rural e-commerce. Second, in order to increase farmers' participation in e-commerce, the government and social organizations should strengthen digital skills training for farmers, especially in the use of e-commerce platforms, product shooting, online marketing, etc. By improving farmers' digital literacy, they can better use e-commerce platforms to expand their markets and increase their income. Third, encourage e-commerce platforms to combine with local characteristic industries and traditional agriculture to form agricultural product brands with local characteristics. The government should provide relevant policy support, encourage e-commerce platforms to strengthen cooperation with agricultural enterprises, cooperatives and farmers, and promote the extension and upgrading of rural industrial chains. Fourth, the government should encourage e-commerce platforms to carry out diversified e-commerce businesses in different fields, especially in emerging fields such as intensive processing of agricultural products and rural tourism, so as to promote the diversified development of the rural economy. Promote the sustainable development of rural revitalization by strengthening the integrated development of e-commerce and rural culture, tourism and other industries. Finally, the government should establish a sound policy support system to provide financial support, tax incentives and logistics subsidies for rural e-commerce. Especially for start-up rural e-commerce enterprises, they can reduce the cost of entrepreneurship and stimulate the vitality of rural e-commerce through capital subsidies and loan concessions.

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