

Expanding Rural Consumer Markets: The Role of E-commerce Development and Market Transparency

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Abstract: *The rise of e-commerce, underpinned by information technologies such as the internet and big data, has profoundly reshaped traditional consumption patterns and spurred the growth of rural consumer markets in China. Using provincial panel data from 2013 to 2022, this study empirically examines the impact of e-commerce development on the expansion of rural consumer markets, with a particular focus on the mediating role of market transparency. The results indicate that e-commerce significantly contributes to market expansion by broadening product availability and facilitating access to consumption channels—a finding that remains robust across a series of stability checks. Further analysis reveals that e-commerce fosters greater price competition and enhances market transparency, which in turn mediates its positive effect on rural market growth. Based on these insights, the study concludes with policy recommendations aimed at strengthening e-commerce infrastructure, advancing digital literacy and skills training, and implementing supportive incentives to further promote the development of rural consumer markets.*

Keywords: E-commerce, Rural consumption, Market transparency, Mediating effect.

1. Introduction

Against the backdrop of accelerated digital development, e-commerce, as a key driving force for economic growth, has a significant impact on optimizing the economic structure, transforming consumption patterns, and fostering business innovation. This has been widely validated in urban and rural economic development practices. Currently, the proportion of the population in rural areas of our country remains relatively high. The expansion and optimization of the rural consumer market are crucial for achieving balanced regional economic development and enhancing the overall vitality of the domestic market. With the government promoting the rural revitalization strategy and the construction of digital villages, the in-depth development of e-commerce in rural areas provides new context and practical needs for research (Chen Shaoming et al., 2023). Liu Dongying et al. (2023) pointed out that the development of e-commerce can positively promote the demonstration effect of urban and rural consumption, especially in education, culture, and healthcare. Furthermore, the development of e-commerce will change traditional agricultural product sales models, alter traditional production methods, and drive agricultural transformation and upgrading (Liu Genrong, 2017). Regarding transmission mechanisms, Tian Ye et al. (2024) found that rural e-commerce promotes common prosperity in rural areas by boosting employment among rural residents, thereby enhancing consumption capacity. Besides direct impacts, e-commerce also influences rural consumption by reducing transaction costs, improving payment capabilities, and enriching product choices (Ma Biao et al., 2023). However, under the current market-oriented development context, few articles discuss the mediating effect of market transparency in how e-commerce affects the expansion of rural consumer markets. Therefore, an in-depth exploration of how e-commerce influences the expansion of rural consumer markets, particularly through the role of market transparency in consumption expansion, holds significant practical importance.

To fill this research gap, based on China's provincial panel data from 2013 to 2022, this paper constructs a two-way fixed-effects econometric model to empirically examine the

specific impact of e-commerce development on the expansion of rural consumer markets and explores the mediating role of market transparency. A potential innovation of this study is the introduction of market transparency into research on how e-commerce affects the expansion of rural consumer markets. As e-commerce further expands and deepens in rural areas, the findings will provide policymakers with decision-making references, facilitate the modernization of the rural economy, promote the rational allocation of economic resources, and enhance the vitality of rural markets, offering insights for achieving balanced development between rural and urban areas.

2. Research Design

2.1 Variable Selection

1) Explained variable: Expansion of the rural consumer market (Rural). With the growth of China's economic volume, the market consumption potential continues to expand. Shi Haiyan (2024) demonstrated the fact of the expansion of the rural consumer market scale using total retail sales of rural consumer goods. To control for the impact of different population sizes across provinces on the rural consumer market, this paper uses the natural logarithm of per capita consumption expenditure of rural residents as a proxy variable for the expansion of the rural consumer market.

2) Explanatory variable: E-commerce development (Ecom). The development of e-commerce has changed traditional consumption and business models, providing significant impetus for urban and rural employment and consumption. This paper refers to the method of Liu Xiaoyang et al. (2018), measuring e-commerce development from two aspects: online merchant index and online shopping index. Among them, the online merchant index includes the online merchant density index (number of B2B online merchants / population) and the online merchant transaction level index (number of retailers with annual turnover exceeding 240,000 / number of retail online merchants); the online shopping index includes the online shopping density index (number of online shoppers / population) and the online shopping consumption level index

(number of consumers with annual online shopping amount exceeding 10,000 / number of online shoppers).

3) Mediating variable: Market transparency (Market). The development of e-commerce has changed traditional sales and consumption models, facilitated commodity circulation channels, and optimized the market environment to a certain extent. This paper refers to the method of Zhao Yunhui et al. (2019), calculating the market transparency of provinces and regions in China from aspects such as the relationship between government and market, the development of the non-state-owned economy, the development level of product markets, the development level of factor markets, the development of market intermediary organizations, and the legal system environment.

4) Control variables. To accurately estimate the impact of e-commerce development on the expansion of the rural consumer market and improve the accuracy of model estimation, this paper also controls other variables, including urbanization rate (Urban), government intervention (Gov), degree of openness (Open), innovation level (RD), economic development level (Econ), and industrial structure (Indus). Among them, the urbanization rate is measured by the proportion of urban population to the total population; government intervention is measured by the proportion of government public budget expenditure to the regional GDP of the year; the degree of openness is measured by the proportion of total import and export of the region to GDP; the innovation level is measured by the proportion of science and technology innovation expenditure to GDP; the economic development level is measured by the natural logarithm of per capita income; and the industrial structure is measured by the ratio of the added value of the tertiary industry to the secondary industry.

2.2 Data Sources and Descriptive Statistics

Based on panel data from 2013 to 2022 covering 30 provinces, regions, and municipalities in China (due to data source limitations, this paper does not consider data observations from Tibet, Hong Kong, Taiwan, and Macao), this paper empirically examines the impact of e-commerce development on the expansion of the rural consumer market. To avoid the influence of extreme values on model fitting results, this paper performs a two-sided 1% winsorization on all variables. Descriptive statistics of the variables are shown in Table 1.

Table 1: Descriptive Statistics of Variables

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Median	Maximum
Rural	300	9.3407	0.3530	8.5486	9.3463	10.1516
Ecom	300	7.2997	3.1036	3.3309	6.9350	16.7048
Urban	300	0.6140	0.1136	0.4047	0.5987	0.8930
Gov	300	0.2500	0.1149	0.0525	0.2271	0.6297
Open	300	0.2580	0.2537	0.0124	0.1434	1.1183
RD	300	0.0216	0.0152	0.0031	0.0176	0.0684
Econ	300	10.9461	0.4287	10.1521	10.8978	12.0785
Indus	300	1.4155	0.7469	0.7142	1.2427	5.0486
Market	300	8.3522	1.8180	3.8216	8.5513	12.3520

Table 2: Benchmark Regression

	(1)	(2)	(3)	(4)
	Rural	Rural	Rural	Rural
Ecom	0.0744*** (0.0050)	0.0341*** (0.0113)	0.0320*** (0.0061)	0.0481*** (0.0092)
Urban			0.3275* (0.1782)	2.2818*** (0.2499)
Gov			0.5017*** (0.1092)	0.3407** (0.1351)
Open			-0.4870*** (0.0695)	0.1408** (0.0653)
RD			-1.8472*** (0.6531)	2.7589** (1.0678)
Econ			0.8015*** (0.0427)	0.5335*** (0.0750)
Indus			-0.0064 (0.0147)	0.1705*** (0.0235)
cons	8.7978*** (0.0395)	9.0921*** (0.0824)	0.1818 (0.3987)	1.3265 (0.8407)
Individual fixed effects	NO	YES	NO	YES
Year fixed effects	NO	YES	NO	YES
R ²	0.427	0.576	0.449	0.589
N	300	300	300	300

Note: Values in parentheses are standard errors; * indicates $p < 0.1$, ** indicates $p < 0.05$, *** indicates $p < 0.01$. The same applies to the table below.

2.3 Model Design

1. Baseline regression model. To empirically test the direct impact of e-commerce development on the expansion of rural consumer markets, this paper establishes a two-way fixed-effects econometric model, as shown in Equation (1):

$$Rural_{i,t} = \alpha_0 + \alpha_1 Ecom_{i,t} + \sum_j \alpha_j control_{i,t} + \mu_i + \nu_t + \varepsilon_{i,t} \quad (1)$$

Where, i and t represent province i and year t , respectively. Rural represents the expansion of the rural consumer market; Ecom represents the provincial e-commerce development index; control represents all control variables selected in this paper; μ and ν represent individual and time fixed effects, respectively; α represents the estimated coefficients of each variable; ε represents the random error term.

2. Mediation effect model. To explore the mediating role of market transparency in the impact of e-commerce on the expansion of rural consumer markets, this paper uses a segmented testing method to verify the mediation effect and establishes the following model.

$$Market_{i,t} = \beta_0 + \beta_1 Ecom_{i,t} + \sum_j \beta_j control_{i,t} + \mu_i + \nu_t + \varepsilon_{i,t} \quad (2)$$

$$Rural_{i,t} = \delta_0 + \delta_1 Ecom_{i,t} + \delta_2 Market_{i,t} + \sum_j \delta_j control_{i,t} + \mu_i + \nu_t + \varepsilon_{i,t} \quad (3)$$

In Equation (2), Market represents the mediating variable, namely market transparency; β and δ represent coefficients to be estimated. When β_1 in Equation (2) and δ_2 in Equation (3) are both significant, it indicates that market transparency has a mediating effect. Finally, this paper uses the instrumental variable method to test the robustness of the mediation effect.

3. Empirical Results Analysis

3.1 Baseline Regression

Through the econometric model constructed by Equation (1), Table 2 shows the model fitting results under different control conditions, empirically estimating the impact coefficient of e-commerce development on the expansion of rural consumer markets. Without including control variables, the data results in column (1) do not consider individual and time control effects, while the data in column (2) considers individual and time fixed effects. The impact coefficients of the core explanatory variables are 0.0744 and 0.0341, respectively, both passing the significance test. When the control variables selected in this paper are included, the data in columns (3) and (4) show that the impact coefficients of the core explanatory variables are 0.0320 and 0.0481, respectively. Therefore, the estimation results of this paper’s model indicate that an increase in the level of e-commerce development significantly promotes the expansion of rural consumer markets.

The promotion of e-commerce in rural areas has profoundly changed residents’ shopping habits and consumption experiences. Rural residents access goods through e-commerce platforms, enjoying the convenience of price comparison on the platform, breaking traditional geographical and logistics restrictions, and enhancing shopping satisfaction. With the increasing demand for fast delivery services, the logistics infrastructure in rural areas has significantly improved, and the optimization of the distribution network directly reduces logistics costs and improves delivery efficiency. The convenient e-commerce shopping method, combined with increasingly improved consumer protection policies, effectively enhances the purchasing confidence of

rural consumers.

3.2 Robustness Test

This article preliminarily obtains direct evidence that the development of e-commerce promotes the expansion of rural consumer markets. This section conducts robustness tests on the model using various methods to support the stability of the model and conclusions.

First, test the stability of variable selection by replacing the dependent variable. Using the natural logarithm of rural consumption scale as the dependent variable (Scale), the model was refitted. Column (1) of Table 3 shows the model fitting results after replacing the dependent variable, with the impact coefficient of e-commerce development on the dependent variable being 0.0455, passing the significance test, and the estimation results did not change significantly.

Second, change the estimation method of the independent variable. The benchmark model uses a comprehensive evaluation index system to measure e-commerce development; in the robustness test section, this article selects individual indicators, namely the online merchant density index (Density), as the proxy variable for e-commerce development. Column (2) of Table 3 shows that after replacing the independent variable, the impact coefficient of the core independent variable changed to 0.2580, while the direction and significance of the impact remained unchanged, and the model is still robust.

Table 3: Robustness Test

	(1)	(2)	(3)	(4)	(5)	(6)
	Replace dependent variable	Replace independent variable	Dynamic effect	IV-1	IV-2	IV-1, 2
	Scale	Rural	Rural	Rural	Rural	Rural
Ecom	0.0455*** (0.0093)		0.0285*** (0.0070)	0.0498*** (0.0144)	0.0754*** (0.0191)	0.0538*** (0.0142)
Density		0.2580** (0.1252)				
L. Rural			0.4180*** (0.0457)			
Urban	2.1978*** (0.2514)	2.1856*** (0.2609)	1.3900*** (0.2211)	2.4693*** (0.2858)	2.5368*** (0.2905)	2.4798*** (0.2859)
Gov	0.2782** (0.1360)	0.3571** (0.1410)	0.1729* (0.1023)	0.3299** (0.1638)	0.2811* (0.1671)	0.3222** (0.1638)
Open	0.1611** (0.0657)	0.0931 (0.0674)	-0.0198 (0.0560)	0.0453 (0.0788)	0.0793 (0.0812)	0.0506 (0.0787)
RD	2.9972*** (1.0745)	4.4078*** (1.0540)	1.3125 (0.8331)	2.4601* (1.4923)	1.4004 (1.5923)	2.2939 (1.4899)
Econ	0.5210*** (0.0755)	0.5341*** (0.0783)	0.2404*** (0.0628)	0.5632*** (0.0615)	0.5040*** (0.0684)	0.5539*** (0.0613)
Indus	0.1791*** (0.0236)	0.1928*** (0.0242)	0.1276*** (0.0201)	0.1634*** (0.0275)	0.1490*** (0.0286)	0.1611*** (0.0274)
_cons	1.5265* (0.8460)	1.6237* (0.8752)	1.5430** (0.7104)			
LM P-value				0.000	0.000	0.000
CD-F				606.366	177.448	330.669
Hansen J P-value						0.1847
Individual fixed effect	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
R ²	0.589	0.488	0.593	0.457	0.557	0.547
N	300	300	270	300	300	300

Table 4: Mediation Effect Test

	(1)	(2)	(3)	(4)
	Market	Market	Rural	Rural
Ecom	0.2109** (0.0919)	0.2610** (0.1036)	0.0451*** (0.0092)	0.0499*** (0.0145)
Market			0.0143** (0.0062)	0.0174** (0.0083)
Urban	13.7933*** (2.4906)	12.0256*** (2.0861)	2.0843*** (0.2623)	2.2728*** (0.3019)
Gov	-4.2919*** (1.3472)	-3.6089*** (1.1955)	0.4022*** (0.1367)	0.3837** (0.1656)
Open	-0.1847 (0.6506)	0.5361 (0.5745)	0.1434** (0.0647)	0.0421 (0.0783)
RD	18.5696* (10.6447)	17.7367 (10.8719)	2.4931** (1.0653)	1.9609 (1.4780)
Econ	-1.8596** (0.7479)	-0.0946 (0.4471)	0.5601*** (0.0753)	0.5541*** (0.0608)
Indus	-0.4683** (0.2340)	-0.5760*** (0.2002)	0.1772*** (0.0235)	0.1708*** (0.0278)
_cons	20.0824** (8.3808)		1.0391 (0.8432)	
LMP Value			0.000	0.000
CD-F			330.669	321.148
Hansen J P Value			0.1020	0.1298
Individual Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
R ²	0.657	0.639	0.689	0.658
N	300	300	300	300

Third, examine the impact of dynamic effects. To avoid the dynamic effect present in the expansion of the rural consumer market, where market growth is driven by past market size, this article controls for the first-order lag of rural consumer market expansion to observe changes in the influence coefficient of core explanatory variables. The data in column (3) of Table 3 shows the model fitting results. After controlling for dynamic effects, the impact coefficient of e-commerce development on rural consumer market expansion changes to 0.0285, which is statistically significant, and the conclusion of the baseline model remains supported.

Fourth, the instrumental variable method addresses endogeneity issues. The internet and big data technologies provide a data foundation for e-commerce development. This article constructs the instrumental variable IV1 by multiplying the number of internet users in China each year by the number of fixed telephones per 10,000 people in 1984, and constructs IV2 by multiplying the number of internet users by the number of post offices per million people in 1984. As the number of fixed telephones and post offices in 1984 represents historical state data, it meets the exogeneity assumption. Columns (4)-(6) of Table 3 show the model fitting results when adding individual and both instrumental variables. Data indicates that the instrumental variables meet the exogeneity assumption without over-identification issues, and the positive impact of e-commerce development on rural consumer market expansion remains statistically significant, confirming robustness.

3.3 Mediation Effect Analysis

E-commerce development optimizes consumption patterns and alters market transparency, thereby promoting the expansion of the rural consumer market. This section builds a model to empirically test the mediating effect of market transparency and conducts robustness checks using the

instrumental variable method. Table 4 displays the estimation results of the mediation model and robustness tests. Column (1) results show that e-commerce development enhances market transparency, with an impact coefficient of 0.2109, passing significance tests; Column (2) uses instrumental variables IV1 and IV2 for robustness checks, showing that the effect of e-commerce on market transparency remains significantly valid. Column (3) models indicate that, after controlling for e-commerce development levels, the impact coefficient of market transparency on rural consumer market expansion is 0.0143, supported by robustness checks in Column (4). This suggests that e-commerce development promotes rural consumer market expansion by increasing market transparency.

The introduction and expansion of e-commerce in rural areas, through electronic network platforms, changes the business models and consumption habits in rural areas, providing residents far from urban centers with diverse choices of goods and services. The platform enhances market transparency by providing detailed product information, allowing consumers to make purchasing decisions based on comprehensive information. The intense price competition on e-commerce platforms brings more benefits to consumers as sellers attract buyers through price reduction strategies, promoting price transparency and market competition. This competition encourages sellers to offer lower prices, continuously improve product quality and customer service, driving market vitality and efficiency.

4. Conclusions and Policy Recommendations

4.1 Research Conclusions

Based on China’s provincial panel data from 2013-2022, this paper constructs a two-way fixed-effects econometric model to empirically test the impact of e-commerce development on the expansion of rural consumer markets and discusses the mediating effect of market transparency. The research results show that the development of e-commerce will change traditional consumption and circulation patterns, promote the expansion of rural consumer markets, and the conclusions remain valid under various robustness tests. Mediation effect analysis indicates that introducing e-commerce to rural markets broadens the consumption horizon in rural areas and increases consumption choices. Through platform competition, market transparency is enhanced, ultimately promoting the expansion of rural consumer markets.

4.2 Policy Recommendations

Strengthen infrastructure construction. To accelerate the popularity of e-commerce in rural areas, the government should increase investment to improve and expand internet infrastructure in rural areas, such as broadband and mobile internet coverage. Good network connectivity is key to the development of e-commerce, ensuring that rural consumers have stable access to the internet and can enjoy the convenience of e-commerce. Additionally, the government can subsidize logistics companies to build rural delivery networks, optimize delivery routes, and enhance parcel handling capabilities, reducing logistics costs and improving delivery efficiency; to promote the external sales of

agricultural products, establishing a cold chain logistics system can facilitate the online sales of agricultural products, effectively reduce losses during transportation, and increase farmers' income.

Promote digital education and skills training. As e-commerce continues to evolve, digital skills have become an essential tool for rural residents to integrate into the modern economy. The government should promote and support digital education in rural areas by providing customized e-commerce and internet usage training courses through schools, community centers, and online platforms. These courses should include basic computer operations and cybersecurity knowledge, as well as practical skills such as how to shop on e-commerce platforms, compare prices, identify false advertisements, and make secure payments. For rural businesses, the government should establish entrepreneurship guidance and e-commerce operation training to help them leverage electronic platforms to conduct business, enhance product market competitiveness, and drive regional economic development and consumption levels.

Advance policy support and incentive measures. The government should formulate policies such as tax reductions, provision of startup capital, and simplification of business registration and approval processes to support and incentivize the development of rural e-commerce, reducing the cost of entrepreneurship for rural entrepreneurs and small businesses and encouraging business expansion through e-commerce platforms. By establishing an e-commerce innovation fund, it can support technology research, development, and application in rural areas, promoting the upgrading of e-commerce technology and services, stimulating entrepreneurial enthusiasm in rural regions, attracting capital and resources to invest in the rural market, and forming a virtuous cycle that fosters sustainable and healthy development of the rural economy.

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