



# Rural E-commerce Development and Urban Rural Digital Divide: From the Perspective of Income Gap

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**Abstract.** The disparity in digital access and literacy between urban and rural regions represents a continuation of the industrial economy's legacy within the contemporary context of digital economy progression. It has become an outstanding problem of rural revitalization. This paper, based on provincial panel data from 2016-2021, analyzes the mechanism and effects of rural electronic commerce development in narrowing the urban-rural digital divide and income gap through a theoretical framework and model. Research indicates that the proliferation of e-commerce in rural sectors can serve as a catalyst for narrowing the digital divide that exists between urban and rural communities. Furthermore, this development can indirectly contribute to mitigating the urban-rural digital divide by reducing the income disparity between residents of urban and rural locales. Strategies have been delineated to foster the robust growth of e-commerce within the agricultural sector, with the aim of diminishing the disparities between urban and rural regions. These measures are designed to ensure the equitable distribution of digital economic opportunities and to enhance the overall digital inclusivity across different geographical areas.

**Keywords:** Rural e-commerce; Digital divide between urban and rural areas; Income gap

## 1 Introduction

In 2023, the first central document, also known as the State Council's comprehensive strategy for rural revitalization, has emphasized on multiple occasions the imperative to escalate endeavors aimed at advancing the growth of electronic commerce within the agricultural sector. This directive also underscores the importance of executing the digital rural strategy to ensure the integration of digital advancements into the rural economy. Simultaneously, it aimed to accelerate the implementation of the "Internet +" project as the core initiative to integrate rural and urban areas, demonstrating the country's commitment to using digital technology to promote rural revitalization. Since the formal proposal of the "E-commerce Entry Into Rural Comprehensive Demonstration" project in 2017, the government has driven the development of national rural e-commerce. As a result, rural e-commerce has garnered increasing attention and become a

new driver, new focus, and new avenue to promote rural economic development. Nevertheless, the digital gap between urban and rural areas may lead to unequal resource distribution, limited access to information, and exacerbation of the income gap, posing a negative impact on rural revitalization. To address the income gap, this paper examines the impact of rural e-commerce development on narrowing the digital divide between urban and rural areas.

## 2 Review of the Relevant Literature

Current research seldom delves directly into the link between rural e-commerce and the urban-rural digital divide. This paper addresses two key aspects: the effect of rural e-commerce on income disparities between urban and rural areas, and the interrelation between these disparities and the broader digital divide.

### 2.1 Rural E-Commerce and Urban-Rural Income Gap

E-commerce has been proven to have the potential to raise farmers' income levels<sup>[1]</sup>. However, whether it is effective in alleviating income inequality between urban and rural areas remains controversial<sup>[2]</sup>. The development of e-commerce plays a role in narrowing the income gap between urban and rural areas. Many studies have pointed out that the current digital divide between urban and rural areas has been significantly reduced, which provides conditions for the popularization of e-commerce in rural areas, helps to achieve inclusive economic growth, and helps to reduce the income gap between urban and rural residents<sup>[3]</sup> and reduce the economic differences between urban and rural areas<sup>[4]</sup>

### 2.2 The Disparities in Digital Access and Income between Urban and Rural Regions

Some scholars used the provincial panel data from 2009 to 2017 to conduct empirical research and found that in the early stage of the digital economy, the digital divide between cities and rural areas was relatively obvious, which led to the widening of the income gap<sup>[5]</sup>; At the same time, through the empirical study of provincial panel data from 2003 to 2018, some experts found that with the wide spread and application of digital technology, rural areas can leverage their latecomer advantages to gradually narrow the digital gap between cities, so as to improve farmers' income and reduce income inequality<sup>[6]</sup>. In addition, according to the research of e-commerce policy, the cross-border e-commerce comprehensive pilot zone<sup>[7]</sup>Promote the comprehensive demonstration projects of rural e-commerce<sup>[8]</sup>, And the establishment of an e-commerce demonstration county<sup>[9]</sup>Such measures will help reduce income inequality between urban and rural areas.

### 3 Variable Selection and Model Design

#### 3.1 Variable Selection

**Dependent variable:** the digital divide between urban and rural areas. This term denotes the disparity in IT ownership and usage between urban and rural residents. Following Wang Jun and Xiao Huatang's study, this paper opts to measure the divide by the ratio of urban to rural broadband subscribers<sup>[10]</sup>.

**Independent variable:** the development level of rural e-commerce. This paper selects the number of provincial rural Taobao villages as the measure of the development of rural e-commerce.

**Mediator variable:** income gap between urban and rural residents. This paper employs the Theil Index to measure the urban-rural income disparity in China, favoring it over the urban-rural income ratio due to its consideration of population dynamics and differentiation between inter- and intra-group disparities. The Theil Index, a positive indicator where higher values signify wider disparities, is calculated using the following formula.

$$\text{Theil}_{i,t} = \sum_{i=1}^2 \left( \frac{y_{i,t}}{y_t} \right) \times \ln \left[ \frac{y_{i,t}/x_{i,t}}{x_t} \right] \quad (1)$$

**Control variables:** in this paper, control variables include urbanization level (represented by provincial urbanization rate, denoted as Urban), economic development level (represented by provincial per capita GDP, denoted as Pgdg), industrial structure level (represented by the value of primary industry in GDP, denoted as Igdp), information infrastructure level (represented by the number of mobile phone users at the provincial level, denoted as Mobn).

#### 3.2 Model Building

To examine the potential of rural e-commerce development in reducing the urban-rural digital divide, a benchmark regression model is formulated to directly assess its influence on this divide:

$$D- Div_{i,t} = \alpha_0 + \alpha_1 E- Com_{i,t} + \alpha_2 X_{i,t} + \varepsilon_{i,t} \quad (2)$$

Among them, D-Div is explanatory variables, represents the urban and rural digital divide level, E-Com as the core explanatory variables, represents the rural e-commerce development level, X for a set of control variables, including urbanization level (Urban), economic development level (Pgdg), industrial structure (Igdp), information infrastructure (Mobn), for random disturbance.

In addition to the direct positive promotion effect, this paper also assumes that the intermediary effect of the income gap between urban and rural residents in the development of rural e-commerce to bridge the digital divide between urban and rural areas.

In order to verify its correctness, this paper selects the intermediary effect model for empirical test:

$$I-Gap_{i,t}=\beta_0+\beta_1E-Com_{i,t}+\beta_2X_{i,t}+\varepsilon_{i,t} \tag{3}$$

$$D-Div_{i,t}=\gamma_0+\gamma_1E-Com_{i,t}+\gamma_2I-Gap_{i,t}+\gamma_3X_{i,t}+\varepsilon_{i,t} \tag{4}$$

Based on theoretical analysis, rural e-commerce development significantly impacts the narrowing of both the urban-rural digital divide and the income gap. These effects satisfy the conditions for a mediating role in bridging the digital divide. If the income gap's influence is not significant, it indicates full mediation; if significant, it suggests partial mediation.

### 3.3 Empirical Study

As show in table 1.

**Table 1.** Descriptive statistics of the main variables

variable	sample number	average value	standard error	least value	crest value
D-Div	186	9.99	37.09	0.49	235
E-Com	186	125.75	316.68	0	2203
I-Gap	186	0.08	0.03	0.02	0.17
Theil	186	0.08	0.03	0.02	0.17
Urban	186	0.6	0.12	0.29	0.87
Pgdp	186	0.52	0.09	0.35	0.88
Igdp	186	67276.15	32004.28	27643	186470
Mobn	186	4915.99	3330.9	284.4	16823.3
lnPgdp	186	11.03	0.49	10.23	12.14
lnMobn	186	8.23	0.84	5.65	9.73
ECom2	186	5249.99	7054.8	73.1	37886

**Table 2.** Benchmark regression results

Explained variable	D-Div	
	(1)	(2)
E-Com	-0.299** (-2.12)	-0.246** (-2.57)
Controlled variable	NO	YES
P price	0.027	0.011
Observations	186	186
Period number	6	6
Number of provinces	31	31
F price	41.21	16.01
Adj-R <sup>2</sup>	0.281	0.289

Note: \*\*\*, \*\* and \* are significant at the level of 1%, 5% and 10% respectively. The t value indicated in parentheses, the same below.

First of all, the direct effect of the development of rural e-commerce on bridging the digital divide between urban and rural areas is verified. From Table 2, the development of rural e-commerce has a significant negative impact on the digital divide between urban and rural areas, regardless of whether control variables are added or not. In model (2), when control variables are added to the empirical test, the digital divide between urban and rural areas will be reduced by 0.246 units for each unit of the development level of rural e-commerce, and the results are significant at the level of 5%. Therefore, the research hypothesis 1 holds true: the development of rural e-commerce can positively promote the bridging of the digital divide between urban and rural areas. The development of rural electricity can improve the Internet penetration, strengthen the construction of digital infrastructure, digital financial services, improve farmers' e-commerce training skills, improve the digital human cost gap, strengthen government departments, enterprises, social organizations and other cooperation, jointly promote digital rural construction, mix, jointly narrow the digital divide between urban and rural areas.

**Table 3.** Results of the mediation effect test

Explained variable	D-Div	I-Gap	D-Div
	(3)	(4)	(5)
E-Com	-0.246** (-2.57)	-0.336*** (-4.40)	-0.223** (-2.49)
I-Gap			0.254*** (1.85)
Controlled variable	YES	YES	YES
Observations	186	186	186
Period number	6	6	6
Number of provinces	31	31	31
F price	16.01	19.39	12.39
Adj-R <sup>2</sup>	0.289	0.091	0.269

In addition to the above verified development of rural e-commerce can positively bridge the digital divide between urban and rural areas, this paper also assumes that the development of rural e-commerce will have a direct impact on narrowing the digital gap between urban and rural areas by narrowing the income gap between urban and rural residents. By table 2 model (2) verify the rural electronic commerce development of the urban and rural digital divide has a significant effect under the premise of the negative, table 3 model (4) proved that rural electronic commerce development can significantly narrow the income gap between urban and rural residents, rural e-commerce each increase 1 unit, the income gap between urban and rural residents will fall 0.336 units. Finally in table 3 model (5) the regression test results show that the income gap between urban and rural residents can significantly increase the digital divide between urban and rural areas, in other words, the narrowing of the income gap between urban and rural residents will also lead to the urban and rural digital divide, model shows that the income gap between urban and rural residents each lower per unit, the

digital divide between urban and rural areas will fall 0.254 units. Study Hypothesis 2 holds true.

## 4 Conclusions

Utilizing provincial panel data from the years 2016 to 2021, this study empirically investigates the mediating mechanism through which rural e-commerce development ameliorates the urban-rural digital divide. The findings indicate two primary outcomes: firstly, the advancement of rural e-commerce is instrumental in narrowing the digital divide, facilitating the digital transformation of agricultural products, enhancing rural digital infrastructure, and mitigating the asymmetry of digital information between urban and rural regions. Secondly, rural e-commerce development attenuates the income disparity between urban and rural dwellers, thereby indirectly narrowing the digital divide. This indirect effect is further amplified by the stimulation of entrepreneurial activities among farmers, leading to an increase in their income.

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