Research on the Impact of Digital Technology Application on the Rural Domestic Demand Market

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Abstract. Digital technology is reshaping rural economic development and unlocking rural domestic demand for rural revitalization. Using China's provincial panel data (2016–2021), this paper examines how digital technology affects the rural domestic demand market. Results show digital technology significantly boosts rural domestic demand by raising rural residents' per capita disposable income, expanding rural retail sales, and improving the rural revitalization index. Mechanistically, it promotes regional marketization and agricultural labor productivity to indirectly expand rural domestic demand. Heterogeneity analysis reveals stronger income effects in eastern and high-digital regions; central and western regions see marginal consumer market improvements; a unified national market enhances income conversion efficiency. This paper supports digital village construction and targeted policy design.

Keywords: Digital technology; Rural domestic market; Rural revitalization; Rural consumption potential

1 Introduction

Against the backdrop of a comprehensive victory in poverty alleviation, the focus of China's work on agriculture, rural areas and farmers has historically shifted to the comprehensive promotion of rural revitalization. Consolidating and expanding poverty alleviation achievements while advancing rural revitalization has become the central task of China's rural development. Since the 18th National Congress of the Communist Party of China, the central government has attached great importance to agricultural and rural informatization. In 2018, China formally put forward the Digital Village strategy, and in May 2019, it issued the Outline of the Digital Village Development Strategy, the first national strategic document for digital village construction, which clarifies phased goals and development paths. Supporting plans and construction guides have further translated strategies into feasible projects.

The digital economy serves as a new driving force for rural revitalization, and rural revitalization provides a broad application scenario for the digital economy. At present, rural areas still face problems such as the disconnection between small farmers and large markets, weak digital application infrastructure, lagging platform construction, and imperfect interest linkage mechanisms. Effectively breaking the constraints of the

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rural domestic demand market and empowering rural revitalization with digital technology has become a core proposition for academia and policymakers.

The main contributions of this paper are as follows. First, it empirically examines the impact of digital technology application on the rural domestic demand market, supplementing theoretical support for digital village construction and rural revitalization. Second, it enriches empirical research on rural per capita disposable income driven by digital technology. Third, it identifies the action mechanism of digital technology in releasing rural domestic demand and provides a reference for targeted policy intervention.

2 Literature Review

In an era of digitization, enterprises that adopt digital tools are better able to survive and thrive in a complex and dynamic global economy[1]. This demonstrates the profound impact of the digital economy in modern times, which deserves our reflection on how to use it rationally and provide theoretical support for the development of rural domestic demand. The digital economy has evolved through three stages: the e-commerce stage driven by information and communication technology, the social network value creation stage driven by knowledge, and the intelligent service platform stage driven by the Internet of Things[2]. Chen Xiaohong defined the digital economy as an economic activity that takes digital information and data elements as key resources, Internet platforms as important carriers, digital technology innovation as traction, and new business models as manifestations[3].

Digital technology serves as the foundation of the digital economy, empowering the real economy by integrating with enterprises and finance to foster new growth drivers [4]. It enhances enterprise total factor productivity by reducing internal control costs, improving asset efficiency and investment decisions, and optimizing labor resource allocation. Both basic and applied digital technology innovations contribute to productivity gains. Feng Chaorui propose pathways for digital empowerment in rural areas, including top-level design–grassroots execution–pilot feedback framework, infrastructure and information service upgrades, technology-embedded digital agriculture, and multi-party collaborative rural governance [5].

Existing studies confirm that digital technology empowers real economic transformation, improves enterprise total factor productivity, reduces transaction costs, and optimizes resource allocation. In the field of rural development, digital technology helps connect agricultural production and marketing, boost rural consumption, and support industrial revitalization. However, prominent problems remain, including the urban-rural digital divide, weak rural digital infrastructure, insufficient policy coordination, backward agricultural production and circulation, and low digital literacy of rural residents. These problems constitute key research gaps between digital technology and the rural domestic demand market, which this paper aims to address[6].

3 Research Hypotheses

In recent years, the digital economy has reshaped the underlying logic of rural development by reconfiguring information flow, business flow and capital flow, and opened up the transmission path from income growth to domestic demand release and then to comprehensive revitalization. Digital technology reduces the transaction costs of agricultural products and expands sales channels through payment convenience, enabling small farmers to cross geographical barriers to enter the national market, which is directly reflected in the growth of disposable income of rural residents. Rural residents' disposable income is the basis of payment capacity for the expansion of rural domestic demand, and its change directly determines the scale of domestic demand release. Relevant studies have shown that the application of digital tools significantly improves the income level of rural e-commerce households, and there is a close positive correlation between rural residents' disposable income and consumption behavior.

Hypothesis 1: The application of digital technology significantly increases per capita disposable income in rural areas by reducing transaction costs and expanding sales channels for agricultural products, thereby increasing domestic demand in rural areas.

The total retail sales of consumer goods in rural areas is a core indicator to measure the vitality of rural domestic demand. The penetration of mobile payments and e-commerce infrastructure has broken the dual barriers of urban and rural consumption. On the one hand, digital payment tools reduce transaction costs and cash constraints, and accelerate the conversion of consumption intention into actual purchase; on the other hand, e-commerce and digital logistics break the category barriers of traditional county commerce, enrich consumption varieties, and promote the transformation of rural supply from meeting basic survival to matching quality life needs, thus driving the continuous growth of rural retail sales[7].

Hypothesis 2: The application of digital technology has improved payment convenience and enriched the supply of rural retail goods, significantly increasing the total retail sales of rural consumer goods, and thereby increasing rural domestic demand.

The realization of rural revitalization needs to establish a unified urban-rural factor market, innovate rural industries, and optimize public services. The improvement of rural revitalization level means the optimization of industrial foundation, consumption environment and factor allocation efficiency. The increase of rural residents' income and the expansion of consumption scale driven by digital technology will further promote the upgrading of rural industries and the improvement of public services, and then enhance the level of rural revitalization. The comprehensive development of rural revitalization will in turn create a better environment for the release of domestic demand and form a positive interaction[8].

Hypothesis 3: The application of digital technology significantly enhances the level of rural revitalization by increasing income and consumption, and raises the level of domestic demand in rural areas.

4 Empirical Research Design

4.1 Sample Data

This study selects indicators from all provinces and municipalities directly under the Central Government across the country from 2016 to 2021 as initial samples. The data sources mainly include the National Bureau of Statistics, CNIPA database, China Provincial Marketization Index Database and China Rural Statistical Yearbook.

4.2 Variable Definitions

(1) Explained variable: Rural domestic demand, measured by rural per capita disposable income, total retail sales of consumer goods, and rural revitalization index.

(2) Explanatory variable: Application of digital technology, measured by the level of data elements.

(3) Control variables: rural per capita income growth rate, rural infrastructure investment, provincial fixed effects and year fixed effects.

4.3 Model Construction

To analyze the impact of digital technology applications on rural domestic demand, we have developed the following model for analysis:

(1) $RuralRevitalization_{i,t} = \beta_0 + \beta_1 DataFactor_{i,t} + \sum Controls_{i,t} + \sum Region_i + \sum Year_t + \varepsilon_{i,t}$

(2) $RuralIncome_{i,t} = \beta_0 + \beta_1 DataFactor_{i,t} + \sum Controls_{i,t} + \sum Region_i + \sum Year_t + \varepsilon_{i,t}$

(3) $RuralRetail_{i,t} = \beta_0 + \beta_1 DataFactor_{i,t} + \sum Controls_{i,t} + \sum Region_i + \sum Year_t + \varepsilon_{i,t}$

Where $RuralRevitalization_{i,t}$ is the rural revitalization index, $RuralIncome_{i,t}$ is rural per capita disposable income, $RuralRetail_{i,t}$ is the total retail sales of consumer goods in rural areas, $DataFactor_{i,t}$ is the level of data elements, $Controls_{i,t}$ are control variables, $Region_i$ and $Year_t$ represent provincial and year fixed effects, and $\varepsilon_{i,t}$ is the random error term.

5 Empirical Results and Analyses

5.1 Descriptive Statistics

Descriptive statistics show significant differences in variable distribution. Income and sales data are relatively complete, while infrastructure investment is highly volatile. Some variables have missing values and extreme values, which are processed by standardization and outlier control. See Table 1 for detailed results.

Table 1. Descriptive Statistics of Main Variables

Variables	Observations	Mean	Standard deviation	Minimum value	Maximum
income	310	17536.306	6981.853	6936	45644
sales	310	2876.73	2267.396	221.67	8857.61
revitalization	196	16.916	3.727	8.262	25.08
data	248	905.492	1689.426	3	10481
rate	279	.107	.422	-.005	7.13
investment	139	56465.968	96721.511	19	632825

5.2 Robustness Test

Replace the Measure of Rural Domestic Demand. Regression results show that data elements have a significant positive impact on rural income, sales and revitalization index at the 1% level, and the model fitting effect is good. This indicates that the application of digital technology consistently promotes rural domestic demand across different measurement dimensions. The control variables also show expected signs, and the model fit indices (R^2 and F-statistics) suggest reasonable explanatory power. These results support the baseline conclusion and demonstrate that the positive effect of digital technology is not sensitive to the specific measure of rural domestic demand. The regression results are presented in Table 2.

Table 2. Baseline Regression Results of Digital Technology Application on Rural Domestic Demand

	income	sales	revitalization
data	1.824 * * *	0.110 * * *	0.001 * * *
	(7.769)	(3.263)	(5.234)
rate	34371.245 * * *	6664.782 * * *	0.251
	(3.079)	(4.172)	(0.754)
investment	0.009 * * *	0.001 * * *	0.001 * *
	(-4.505)	(-4.335)	(2.294)
_cons	10835.177 * * *	2539.422 * * *	16.627 * * *
	(10.615)	(17.384)	(545.210)
N	139	139	139
R^2	0.504	0.351	0.221
F	36.901	19.628	10.332

Note: ***, **, and * represent significance levels of 1%, 5%, and 10% respectively. $^{*}p < 0.10$,$^{**}p < 0.05$,$^{***}p < 0.01$.

Panel Regression Analysis. Quantile regression indicates that the driving effect of digital technology is stronger in regions with lower domestic demand levels, and the significance decreases with the increase of quantiles. At the 25th quantile, the coefficient of sales is positive and statistically significant, indicating that digital technology

has a stronger promoting effect in regions with lower initial domestic demand levels. As the quantile increases, the coefficient decreases in magnitude and loses significance, suggesting that the marginal driving effect of digital technology diminishes in regions where domestic demand is already high. This finding implies that digital technology may play a more critical role in unlocking demand potential in less developed rural areas. Table 3 reports these quantile regression results.

Table 3. Quantile Regression Results Based on Rural Consumption Levels

	income	income	income
sales	0.401**	0.143	-0.172
	(0.181)	(0.189)	(0.194)
_cons	4418.3*	5347.3**	5280.9**
	(2258.9)	(2347.2)	(2414.4)
N	139	139	139

Exclude Municipalities Directly under the Central Government. To account for potential bias introduced by the unique administrative and economic status of municipalities directly under the central government (Beijing, Tianjin, Shanghai, and Chongqing), these samples are excluded from the regression. As shown in Table 4, the direction, magnitude, and significance of the core explanatory variable remain largely unchanged, confirming that the benchmark results are not driven by these special regions. This further validates the robustness of the main findings. The results are shown in Table 4.

Table 4. Robustness Check Excluding Municipalities Directly under the Central Government

Variables	income	sales	revitalization
sales	2.997 * * *	0.163 * * *	0.293
	(4.860)	(4.202)	(1.073)
_cons	94456.555	26090.183 * * *	16.527 * * *
	(1.570)	(2.802)	(261.056)
N	133	133	133
R^2	0.642	0.416	0.314
F	30.147	14.533	11.775

5.3 Mechanism Analysis

Replace Rural Domestic Demand with the Fan Gang Index as a Mechanism. To explore in depth the pathways by which data elements influence the rural domestic demand Market, this paper further introduces the Fan Gang Market Index as a mechanism variable to examine whether data elements influence rural domestic demand by promoting the marketization process. The degree of marketization reflects the efficiency of resource allocation, the quality of the institutional environment and the

convenience of factor flow, and is an important bridge connecting digital technology and the real economy. If the data element can significantly enhance the level of marketization, it implies that it may indirectly promote the expansion of domestic demand in rural areas through channels such as optimizing the institutional environment and reducing transaction costs. The regression results are shown in the table.

The results of the mechanism analysis suggest that the boosting effect of data elements on domestic demand in rural areas is at least partially achieved by enhancing the level of marketization. This finding has implications for deepening the policy design of digital rural construction: while promoting the accumulation and application of data elements, attention should be paid to the supporting reform of the institutional environment, giving full play to the fundamental role of the market mechanism in resource allocation, in order to enhance the pull effect of digital technology on rural domestic demand. The mechanism test results are presented in Table 5.

Replace Rural Domestic Demand with Labor Productivity as the Mechanism. To further examine the mechanism by which the expansion of rural domestic demand affects rural economic development, this paper introduces labor productivity as a mediating variable and examines its transmission effect between rural domestic demand and rural economic growth. The table reports the regression results with labor productivity as the explained variable. The data show that the regression coefficient of the core explanatory variable "data" is 0.013 and significant at the 1% statistical level, indicating that the increase in domestic demand in rural areas has a significant positive promoting effect on rural labor productivity. The constant term is 84.525, also significant at the 1% level, the overall goodfit R^2 of the model is 0.050, and the F value is 10.986, indicating that the model setting has some explanatory power. The results suggest that the expansion of domestic demand in rural areas can help improve the productivity of rural labor force, and thus may promote high-quality development of the rural economy through the mechanism of labor productivity. Therefore, the increase in labor productivity can be regarded as an important mediating path through which rural domestic demand affects rural economic development. See Table 5.

Table 5. Mechanism Analysis Results of Digital Technology Affecting Rural Domestic Demand

Variables	Market	labor
data	0.00 * * *	0.013 * * *
	(7.619)	(3.314)
_cons	8.096 * * *	84.525 * * *
	(165.523)	(15.988)
N	248	240
R^2	0.212	0.050
F	58.048	10.986

5.4 Heterogeneity Analysis

Divide by Regional Distribution. To examine the regional heterogeneity of the impact of digital technology application on the rural domestic demand market, this paper divided the samples by the criteria of eastern, central and western regions and conducted group regression respectively. The results are shown in the table.

Heterogeneity analysis results show significant regional differences in the impact of digital technology application on the rural domestic demand market: the promoting effect of data elements is concentrated in the eastern region, the income effect of the consumer market is mainly reflected in the central region, the short-term transformation cost of rural revitalization is more prominent in the western region, and the inhibitory effect of digital investment mainly troubles the central and western regions. This finding suggests that policymakers should fully consider the differences in regional development stages and adopt location-specific strategies to avoid "one-size-fits-all" policy interventions. The heterogeneity results are reported in Table 6.

Divide by digital Technology Level. Based on differences in the level of digital technology application, this paper divides the sample into two groups, high digital technology level and low digital technology level, to explore the heterogeneous impact of digital technology in rural e-commerce markets. The regression results are shown in the table, where the two groups of samples show significant differences in several core variables.

In the high digital technology level group, the impact of sales on rural income was significantly positive (coefficient 3.901, $p<0.01$), while in the low technology level group, the impact was still significant but the coefficient was smaller (2.761, $p<0.05$), indicating that the application of high digital technology is more conducive to income growth. The rural revitalization index (revitalization) was significantly negative in the high-tech group (coefficient -6.526, $p<0.01$), possibly reflecting the relatively weakened direct pull effect of rural revitalization policies on e-commerce income in the context of high digitalization, or due to the shift in resource allocation; The variable was also significantly negative in the low-tech group (-2.260, $p<0.05$), but the impact was smaller.

In summary, the application of digital technology has a significant heterogeneous effect in the development of rural e-commerce. The high-tech-level group is more dependent on technology-driven and institutional synergy, while the low-tech-level group is more dependent on capital investment and infrastructure improvement. Therefore, future policies should be adapted to local conditions to promote the deep integration of digital technology with the rural economy and narrow the "digital divide". See Table 6.

The Level of Building a Unified National Market. To further investigate the differences in the impact of digital technology application on the rural domestic demand market under different market environments, this paper divides the samples into high

and low groups according to the construction level of the national unified large market for heterogeneity testing. The regression results showed that in the high-level unified large market group, the impact coefficient of digital technology application (data) on the rural domestic market (sales) was 1.522, and it was significant at the 1% level; In the low-level unified large market group, the coefficient was 9.684, also significant at the 5% level. This suggests that the application of digital technology has a significant positive impact on rural domestic demand markets regardless of the level of market construction, but in terms of the size of the coefficient, the promoting effect is more prominent in the low-level market group.

The possible reason for this difference is that regions with a lower level of unified large market construction often face constraints such as information asymmetry, high circulation costs, and market segmentation. The introduction of digital technology can effectively break down geographical barriers and reduce transaction costs, thereby releasing greater domestic demand potential. In regions where the market is well-developed, traditional circulation channels are relatively mature, and the marginal improvement space of digital technology is relatively limited. As a result, the application of digital technology has shown a stronger "catch-up" effect in regions with low-level unified large markets, becoming an important driving force for activating domestic demand in rural areas. See Table 6.

Table 6. Heterogeneity Analysis Results by Region, Digital Technology Level, and Unified Market Condition

	East	Central	West	high	low	high	low
	income	income	income	income	income	income	income
sales	1.921	2.054 *	1.877	3.901 * * *	2.761 * *	4.133 * * *	-1.856
	(1.242)	(2.025)	(1.422)	(6.526)	(2.260)	(7.979)	(-0.441)
_cons	1.30e+05	-2.68e+05	1.72 e+05 * * *	63072.614	29013.119	67505.956	-1.52e+05
	(1.225)	(-1.073)	(2.889)	(1.240)	(0.435)	(1.500)	(-0.933)
N	37	45	57	64	75	85	54
R^2	0.714	0.591	0.615	0.874	0.619	0.844	0.563
F	11.994	9.246	13.077	47.322	13.559	56.038	7.089

6 Conclusions and Implications

The deep integration of digital technology is restructuring rural economic development and is critical to unlocking rural domestic demand and advancing rural revitalization. Using China's provincial panel data from 2016 to 2021, this paper measures digital technology application via data elements and analyzes its impact, mechanisms, and heterogeneity on the rural domestic demand market. The study finds that digital technology significantly boosts the vitality of the rural domestic demand market by raising rural residents' income, expanding rural consumption, and improving the rural revi-

talization index. Robustness tests verify the reliability of this conclusion. Mechanically, digital technology stimulates rural domestic demand by enhancing regional marketization and raising agricultural labor productivity, optimizing institutional environment and factor allocation efficiency. Heterogeneity analysis shows that the income effect is stronger in eastern and high-digital-level regions; the central and western regions mainly see consumer market improvement; and a higher level of the unified national market improves the efficiency of digital technology in driving rural income growth. The above conclusions provide systematic empirical evidence for understanding how digital technology empowers the domestic demand market in rural areas and also lead to the following policy implications:

First, strengthen the development of data elements to support rural domestic demand. Given the scattered and underutilized rural data resources, we should build a full-coverage agricultural and rural data sharing system and encourage cooperation among platforms, enterprises, and farmers to turn data resources into effective assets.

Second, optimize the structure of digital investment. Digital infrastructure shows short-term suppression but long-term benefits; policies should avoid overemphasizing hardware construction and strengthen digital training, scenario application, and operation to improve investment efficiency.

Third, advance market-oriented reform and unified national market development. Breaking local protection and market segmentation can enhance the cross-regional spillover of digital technology and boost the income effect for rural areas.

Fourth, adopt differentiated empowerment strategies. Central and western regions should focus on infrastructure supplementation; eastern and high-digital regions should deepen industrial integration and foster new business forms. Digital tools should also be used to upgrade labor skills for stable income growth.

Fifth, improve the digital rural governance system. Strengthen cross-department coordination, digital literacy training, and performance evaluation oriented toward actual effects to improve policy implementation.

Overall, the empowering effect of digital technology relies on the coordination of technology, institutions, capital, and talent. Future research may explore micro farmer behavior and long-term dynamic effects to support digital village construction.

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