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Digital Economy, Rural Industry Revitalisation and Rural Consumption-An Empirical Study

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Abstract

Gradually, the growth of rural sectors through digital methods has become a principal catalyst for the expansion of rural economies. The research develops an indicator framework and computes the aggregated index for the digital economy and the index for rural industrial rejuvenation across 30 Chinese provinces between 2012 and 2022 employing the entropy method. Drawing from this data, the analysis focused on investigating the potential of the digital economy to stimulate increased consumption in rural regions, leading to the introduction of a mediation effect model which aims to explore how the level of rural industrial rejuvenation functioned in this phenomenon. The study indicates that the digital economy is an effective engine driving rural consumption, which holds the promise of augmenting the consumption abilities of rural inhabitants by fostering the rejuvenation of rural industries. Furthermore, the pivotal role played by digital economy in stimulating the consumption of rural inhabitants is most pronounced in the central area, succeeded by the western area, with a comparatively lesser effect in the eastern area. The paper suggests these strategic measures: Initially, strengthening digital economy infrastructure; Next, focus on digital transformation of traditional agriculture. Lastly, advocating for the convergence of rural industries, with the goal of boosting the rejuvenation of rural industries and encouraging rural consumption.

CCS Concepts

• **Applied computing** → Computers in other domains; Agriculture.

Keywords

Digital Economy, Rural Industrial Revitalization, Rural Consumption, Mediation Effect

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1 Introduction

As the digital economy expands swiftly, the extensive use and widespread adoption of information technology are significantly influencing the manufacturing and consumption patterns across diverse sectors. This advent has opened up fresh avenues for transformation and enhancement in conventional sectors, while also markedly altering the spending patterns of people in rural areas. The rise of online shopping, mobile payment and other emerging consumption methods has made rural residents' consumption choices more diversified and convenient.

As an important link between countryside inhabitants and the market, the development level and structural adjustment of rural industries also affect the consumption ability and consumption structure of rural residents to a certain extent. The digital economy provides impetus for the innovation and upgrading of rural industries, which enables agricultural products to be sold to various places through more diversified channels, the income level of rural residents is expected to be improved, thus further promoting the growth of consumption. Consequently, examining how the digital economy affects the consumption of rural inhabitants is vital for revitalizing the rural market and boosting general happiness.

2 Review of the literature

2.1 The role of digital economy in the expansion and upgrade of rural consumption

Ji(2023)thoroughly analyzed the dual impact of the rural digital economy on both the growth and caliber of farmers' consumption and highlight that the digital economy has markedly enhanced the consumption scale expansion and structural optimization of farmers, with a noticeable upward trend in the digital economy's incremental impact on their consumption. [1] Zhen(2021) pointed out that digital payment promotes the expansion as well as upgrading of rural consumption, in which the rural e-commerce plays an effective mediating effect. [2] Fan(2023) found that digital inclusive finance can on the one hand significantly increase the level of rural consumption, especially subsistence consumption, and on the other hand, it can also indirectly promote the rural consumption by improving income and the advanced industrial structure. [3]

2.2 The role of digital economy in the rural industry revitalization

Digital economy, as a vital direction of rural revitalization strategy, holds profound significance for promoting the modernization of agriculture. Liu (2024) emphasized the central role of the digital

infrastructure and the digital financial environment in the revitalization of rural industries. [4] Zhang(2023) pointed out that the digital economy promotes the diversification and value-addedness of rural industries by improving access to information, reducing transaction costs, and enhancing market access for agricultural products. [5] Guo(2023) argued that the digital economy can expand the boundaries of production possibilities, ease information asymmetry, save costs, stabilize production expectations and unclog sales channels, and give rise to new industries and new modes of business. [6] In short, the digital economy comprehensively empowers the rural industry revitalization by enhancing agricultural production efficiency, optimizing resource allocation, promoting industrial integration, increasing farmers' income, improving rural governance, fostering new types of farmers, promoting infrastructure construction, stimulating innovation and entrepreneurship, realizing coordinated regional development, and facilitating green development, among other multidimensional roles.

2.3 The role of rural industrial revitalization in promoting the rural consumption

The rejuvenation of rural industries significantly contributes to the growth and enhancement of consumer spending among rural inhabitants. Li (2024) found that the development of special industries can strengthen the consumption effect through the increase of farmers' income and the acceleration of county urbanization, as well as e-commerce to the countryside and agro-tourism integration. [7] Xu(2022) discovered that rejuvenating rural industries markedly enhances the scale expansion and structural optimization of consumption of rural inhabitants, notably influencing spending on apparel, home appliances, cultural aspects, education, leisure activities, and healthcare. [8]

In summary, the existing literature on the digital economy, rural industrial revitalization and rural residents' consumption have been relatively rich in research between the two of them, but there are few analyses of the three in a unified framework. This study, based on a comprehensive assessment of the digital economy development and rural industry revitalization, empirically examines how the digital economy affects rural consumption. It also explores in depth the specific role of rural industry effects as a mediating variable. This not only provides us with a new perspective to understand the significance of the digital economy in rural revitalization but also offers theoretical support and practical recommendations for advancing the rejuvenation of rural sectors and boosting the spending power of rural inhabitants.

3 Research Design

3.1 Model construction

For gaining a deeper understanding of the role of digital economy in the expansion of rural consumption, The study establishes the following model:

$$\text{cons}_{it} = \alpha_1 + \alpha_2 DE_{it} + \alpha_3 \text{controls}_{it} + \xi_{it} \quad (1)$$

Where cons_{it} represents the consumption level of rural residents, DE_{it} represents the level of development of the digital economy, controls_{it} represents the control variables and ξ_{it} is a random perturbation term.

The article explores the immediate effects of the digital economy on rural consumption and the extent to which rural industrial rejuvenation acts as an intermediary factor, thereby conducting a more comprehensive investigation into how the digital economy influences their consumption. As a result, we have formulated the subsequent model of mediating effects.

$$\text{Rir}_{it} = \beta_1 + \beta_2 DE_{it} + \beta_3 \text{controls}_{it} + \xi_{it} \quad (2)$$

$$\text{cons}_{it} = \gamma_1 + \gamma_2 DE_{it} + \gamma_3 \text{Rir}_{it} + \gamma_4 \text{controls}_{it} + \xi_{it} \quad (3)$$

Within the aforementioned equations, Rir_{it} represents the degree of rural industrial revitalization, while the remaining variables retain their definitions as in the model (1).

3.2 Description of variables

3.2.1 Explained variables. We select the rural residents' consumption level (referred to as cons here) as the dependent variable and employ spending per person as an indicator of this

3.2.2 Core explanatory and mediating variable. We select the level of development of the digital economy (abbreviated as DE in this paper) as the core explanatory variable. To measure the DE , this article develops an index framework encompassing four facets of digital innovation, digital industry, digital platforms, and digital inclusive financial growth, drawing on prior studies [9–11]. We identify the degree of rural industrial rejuvenation (referred to as Rir here) as the intermediary variable, referencing existing research and data accessibility, and formulate an indicator system which includes two dimensions of rural industrial development and rural industrial integration to assess the Rir . The DE and Rir are quantified using the entropy value technique.

3.2.3 Control variables. For a more comprehensive model, it's essential to regulate additional factors influencing the consumption of rural dwellers, and this study chooses these control variables:

Industry structure level (industrial): the contribution of the tertiary sector's added value to the gross domestic product reflects the regional economic structure, which may affect the consumption choices and consumption capacity of rural residents.

Government fiscal expenditure (gov): The proportion between the government's fiscal spending and its GDP, mirrors the robustness of governmental backing for rural regions, and may affect rural residents' consumption confidence and ability to consume.

3.3 Data sources

This article focuses on the 30 provinces in China, excluding Tibet, Hong Kong, Macau, and Taiwan, spanning 2012 to 2022 as the primary research subjects. The information originates from the Chinese Research Data Services (CNRDS) Platform, CEInet Statistics Database and The Peking University Digital Financial Inclusion Index of China [12].

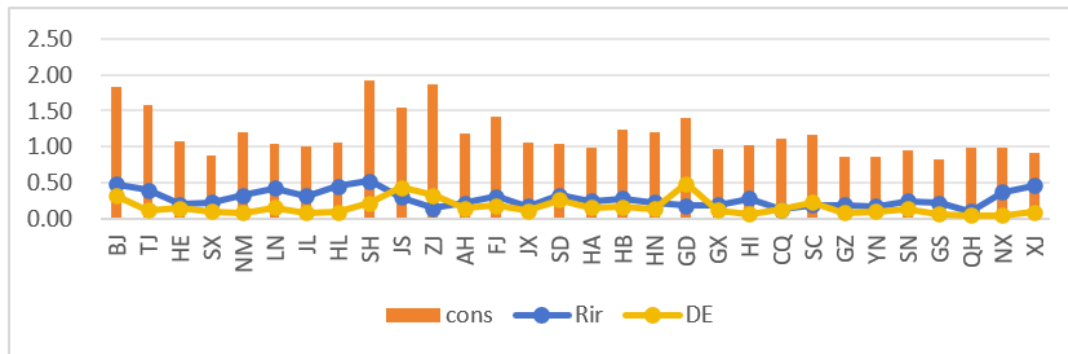
The data in table 2 indicates notable regional variances in the rural consumption throughout various regions of China. This situation is likely caused by the uneven economic growth in rural China. Furthermore, the DE and Rir show distinct differences across regions. Upon further examination of the control variables, we can observe that the various provinces in China exhibit notable regional disparities in industrial layout and government fiscal expenditures.

Table 1: Indicator System Descriptive

Primary indicators	Secondary indicators	Tertiary indicators	Indicator properties
digital economy composite index	Digital innovation digital industry	Quantity of Innovations Associated with the Digital Economy	+
		Revenue from software operations	+
		The share of the internet and computer industry in the legal entities	+
	digital platform	Mobile phone penetration rate	+
		Length of fibre-optic lines (kilometres)	+
		Number of Internet broadband access users	+
the index of rural industrial revitalisation	Digital Inclusive Financial Growth	China Digital Inclusive Finance Index	+
	Rural industrial development	The per capita production in sectors like agriculture, forestry, livestock rearing, and fishing	+
		Growth index of primary sector value added	+
	Rural industrial integration	Ratio of agricultural, forestry, animal husbandry and fishery services output to value added of the primary sector	+

Table 2: Descriptive statistics of variables

Variables	Obs	Mean	Std. dev.	Min	Max
cons	330	1.173789	0.4391801	0.4355	2.748337
DE	330	0.1660086	0.1322598	0.0279644	0.8439392
Rir	330	0.282616	0.1219647	0.0611237	0.6124122
industrial	330	0.5004	0.08896	0.345	0.839
gov	330	0.2600079	0.1110682	0.1050057	0.7583024

**Figure 1: Composite Index**

Rural consumption may be influenced by these differences, which to some extent provides an explanation for the regional variation in consumption levels.

4 Analysis of empirical results

4.1 Entropy value method measurement results

This research, founded upon the creation of an indicator system, employs the entropy value method to quantify the DE and Rir in diverse regions. It also calculates the average values of these indices for the period from 2012 to 2022, as shown in Figure 1

From the data in figure 1, we can observe the following points: firstly, the DE, Rir and cons in all regions show a common trend of change, except for differences in a few provinces. Secondly, the DE in Xinjiang and Hainan is low, but the Rir is relatively high, which is mainly due to the fact that Xinjiang bases itself on local characteristic agricultural resources and empowers the synergistic evolution of rural primary, secondary, and tertiary industries, while Hainan takes advantage of its unique tropical climate, rich biodiversity and valuable marine resources to develop specialty

Table 3: Baseline regression results

Variables	(1)cons	(2)Rir	(3)cons	(4)cons	(5)Rir	(6)cons
DE	3.527*** (0.122)	0.375*** (0.0331)	2.697*** (-0.117)	2.272*** (0.116)	0.134*** (0.0381)	2.103*** (0.108)
Rir			2.214*** (0.171))			1.258*** (0.162)
industrial				3.550*** (0.223)	0.676*** (0.0730)	2.699*** (0.231)
gov				-2.712*** (0.283)	-0.552*** (0.0925)	-2.018*** (0.273)
R2	0.737	0.301	0.831	0.863	0.474	0.887
F-statistic	836.26***	128.72***	735.12***	625.58***	88.25***	578.19***

Note: Standard deviations are in parentheses in the above table, *, **, and *** indicate that the variables are significant at the 10 per cent, 5 per cent, and 1 per cent levels, respectively.

Table 4: Robustness analysis results

Variables	(1)cons	(2)Rir	(3)cons	(4)cons	(5)Rir	(6)cons
DE	2.847*** (0.170)	0.383*** (0.0344)	1.785*** (0.171)	2.793*** (0.174)	0.361*** (0.0343)	1.786*** (0.173)
Rir			2.772*** (0.250)			2.791*** (0.259)
industrial				-0.400 (0.251)	-0.157*** (0.0495)	0.0379 (0.214)
gov				-0.729 (0.510)	-0.299*** (0.101)	0.105 (0.434)
R2	0.510	0.315	0.664	0.518	0.360	0.664
F-statistic	280.14***	123.93***	265.06***	95.74***	49.99***	131.6***

industries, like tropical fruits, winter melons and vegetables, animal husbandry, marine fisheries and rural tourism, etc. Finally, the peaks of the DE appear in Guangdong, Jiangsu and Zhejiang, probably because these provinces are more open to the outside world and have stronger strengths in electronic information manufacturing and digital service industries.

4.2 Benchmark regression results

The study employs a fixed effects model and performs an empirical analysis using Stata 17. The findings are detailed in the table that follows.

The outcomes of the regression analysis, focusing solely on key explanatory and mediating variables, are displayed in columns 1 through 3 of table 3, whereas columns 4 to 6 reveal the results post the inclusion of control variables. The details presented in the first and fourth columns reveal that the DE significantly improves the Rir. Additionally, the findings from the second and fifth columns suggest that the DE plays a crucial role in Rir. Furthermore, the information in the third and sixth columns of table 3 illustrates how the growth of the DE, coupled with the Rir, influences rural consumption.

Examining the regression located in columns four through six reveals that the DE's direct effect on the consumption of rural inhabitants stands at 2.272. The influence of the DE on the Rir stands

at 0.134. Post the introduction of the intermediary variable, the Rir, the DE's effect on the rural consumption shifts to 2.103, and the effect of Rir on rural consumption reaches 1.258. Consequently, it's deducible that the intermediary impact of rural industrial rejuvenation constitutes 7.42% of the overall effect. These results indicate that rural industrial revitalization plays a partial mediating role.

4.3 Robustness analysis

To evaluate the solidity of the prior study's findings, this study utilizes a technique of substituting the test's dependent variable the per capita consumption of rural residents with the per capita spending on education, culture, and entertainment by rural dwellers in 30 Chinese provinces in 2013–2022, with the outcomes presented in the subsequent table:

Upon examination of the regression data table, it is observed that, even after changing the dependent variable, the DE still exerts a positive influence on the consumption level of individuals residing in rural areas. Furthermore, the Rir has played a bridge role between these two aspects, which aligns with previous research findings and further confirms that the viewpoint of this study is solid.

4.4 Heterogeneity test

As the relationship between the DE and cons may vary considerably across regions. This paper studies the impact of the DE on cons by

Table 5: Heterogeneity regression results

Variables	cons		
	Eastern Region	Central Region	Western Regionn
DE	1.833*** (0.165)	3.679*** (0.309)	3.112*** (0.309)
industrial	4.818*** (0.502)	2.333*** (0.354)	2.463*** (0.400)
gov	-1.037 (0.709)	-2.107*** (0.677)	-2.406*** (0.297)
R2	0.864	0.897	0.913
F-statistic	226.01***	282.15***	303.4***

region, and the outcomes of the regression analysis are depicted in the table below:

As shown in the table above, the DE significantly promotes rural residents' consumption in all regions at a 1% level. Among them, the central region has the strongest driving effect, followed by the western region, with the eastern region having the weakest effect. First, the central region is in a period of rapid economic development and industrial structure transformation. The development of digital inclusive finance, policy support, and labor force migration, among other factors, have jointly contributed to the significant impact of the DE on rural residents' consumption. Second, the digitization in western China started relatively late but has developed rapidly. It has effectively reduced transaction costs, alleviated liquidity constraints, and improved the efficiency of resource allocation, thus creating a latecomer advantage that has greatly driven rural residents' consumption. Finally, the infrastructure in the eastern region is already well-developed, and the marginal benefits brought by the DE are relatively small, with its impact on consumption being less noticeable.

5 Conclusions and policy implications

5.1 Conclusion

This research utilizes panel data from 30 provinces in China, spanning from 2012 to 2022, to assess the effect of DE on the consumption of rural inhabitants, with Rir acting as the mediating factor, and mainly draws the following conclusions:

First, driven by the DE, the consumption levels of rural residents have been significantly impacted. Through heterogeneous analysis, we found that this impact is most pronounced in the central region, followed by the western region, while the eastern region shows a relatively weaker impact.

Second, in the mediation effect model, Rir exerts a substantial promotional influence on the consumption of rural residents, signifying that the DE can foster the growth of rural residents' consumption via Rir, and the intermediary impact of rural industrial rejuvenation constitutes 7.42% of the overall.

5.2 Recommendations

5.2.1 Strengthening digital economy infrastructure. First, the government should further increase the construction of digital infrastructure such as Internet and mobile communications in rural areas

of central and western China, accelerate the coverage speed of 5G networks, and continuously improve the quality of networks in rural areas, so as to furnish tepid soil conducive to the robust growth of countryside industries.

Second, the government can promote the continuous penetration of smart terminal devices such as smartwatches and smart homes into the rural market by providing subsidies and other means, so as to improve the digital living standards of farmers.

Finally, through training and the establishment of information-sharing platforms, it can improve farmers' cognitive ability and application level of information technology, gradually enhance the digital literacy of rural residents, and narrow the digital divide between them and urban residents.

5.2.2 Promoting the digital transformation of traditional agriculture. Utilizing digital technology to its fullest to effectively integrate the resources in the rural industrial chain, to optimize the whole process of agricultural products from the field to the market at all stages. At the planting stage, big data and cloud computing technologies can be used to help farmers optimize planting decisions; at the crop growth stage, advanced technologies, like drone technology, can be implemented to accurately manage crop growth; and at the sales stage of agricultural products, e-commerce platforms and self-media can be promoted to expand the avenues for selling agricultural goods, and so on.

5.2.3 Advocating for the convergence of rural industries. Gradually building an industrial integration model of "agriculture plus". For example, through the amalgamation of conventional farming and tourism, projects in rural tourism can be developed by combining the characteristic resource advantages of each place; through the integration of agriculture with education and culture, the educational connotations of farming culture can be deeply explored, integrated into classroom ideology and politics, and practical teaching projects can be created; and the integration of agriculture with the self-media can be used to publicize local characteristic agricultural products by recording rural life and reflecting local conditions and customs. Through advocating for the cohesive growth of countryside industries, the employment environment in rural areas will be optimized, and farmers' sources of income will be increased, thus promoting consumption.

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