



Study on the Impact of the Digital Economy Level on the Rural Revitalization in Guangxi

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Abstract. This study examines the mechanisms of action between rural rejuvenation and the digital economy by combining theories from both fields. The panel data from 14 cities in Guangxi, China, is the source of the survey data. An econometric model was built, and pertinent model testing and analysis were carried out using the statistical analysis program SPSS 26.0. According to the research findings, Guangxi's rural areas are experiencing a significant and positive boost in their level of digital economy, which also helps to improve the efficiency of agricultural production, foster rural economic growth, and raise the standard of living for farmers. This study offers references for the development of rural revitalization in other regions as well as a theoretical foundation for the thorough implementation of the strategy in Guangxi.

Keywords: Digital Economy; Rural Revitalization; Impact Mechanism.

1 Introduction

The national level has placed a high priority on the growth of the digital economy in recent years and has specifically suggested implementing the rural revitalization strategy to encourage the modernization of rural areas and agriculture. As an important province in the western part of our country, Guangxi is rich in agricultural resources but is limited by the level of economic development, resulting in a relatively slow process of rural revitalization. In light of this, research on how Guangxi's rural revival is affected by the digital economy level is highly relevant. According to the research of Li, Li^[1], the digital economy helps to promote the upgrading of the agricultural industry and the development of the rural economy by optimizing resource allocation and improving production efficiency. Therefore, it is imperative to investigate how the digital economy level affects Guangxi's rural regeneration in order to support the social and economic advancement of the province's rural areas. This study is to investigate how the digital economy affects Guangxi's rural regeneration in the hopes of offering theoretical underpinnings and useful recommendations for advancing the province's overall rural revitalization. This study will identify the mechanism of action of the digital economy in Guangxi's rural rejuvenation by sifting through current literature and empirical

analysis. It will also offer references for the development and application of relevant policies.

2 Literature Review

2.1 Theories Related to the Digital Economy

The effect of the digital economy as a new economic form on rural revival has drawn scholarly interest. The information age gave rise to the digital economy, which is fueled by the efficient use of information and communication technology, modern information networks as a vital carrier, and digital knowledge and information as the primary factors of production [2]. Bowman [3] systematically elaborated the concept, characteristics, addressing the influence of the digital economy on economic growth for the first time in his book "The Digital Economy". As technology advances, scholars have continuously deepened their research on the digital economy. Li [4] believed that the digital economy promotes economic growth through ways such as improving resource allocation efficiency, reducing transaction costs, and innovating business models.

2.2 Theories Related to Rural Revitalization

The comprehensive understanding of rural work in the new period of nation is the rural revitalization plan. Xi [5] pointed out that rural revitalization should follow the overall requirements of thriving industries, ecological liveability, contemporary rural communities and agriculture more quickly while preserving rich rural lifestyles, civilized rural customs, and efficient government. At the theoretical level, scholars have discussed rural revitalization from different perspectives. Huang [6] believed that rural revitalization should focus on endogenous development momentum and leverage the comparative advantages of rural areas. Han [7] emphasized that rural revitalization requires the innovation of systems and mechanisms to stimulate the vitality of rural elements.

2.3 The Link Between Rural Revitalization and the Digital Economy

Rao [8] found that the development of information technology helps to improve agricultural production efficiency and promote rural economic growth. On the other hand, Van Dijk and Hacker [9] highlighted that the problem of the "digital divide" is particularly prominent in rural areas. This restricts the benefits of the digital economy for the resurgence of rural areas. Similarly, Zhang and Liu [10] suggested that although the internet economy gives rural revival new impetus, it still faces obstacles including a talent shortage and the digital gap. Li [11] felt that rural rejuvenation benefits greatly from the internet economy through promoting the integration of the agricultural industry chain and innovating rural financial services. The digital economy can drive rural revitalization by promoting agricultural modernization, enhancing the level of rural informatization, and cultivating new types of rural business entities [12]. Li and Lei [13] discovered through empirical research that the digital economy significantly boosts rural

rejuvenation, particularly by raising farmer standards and encouraging the development of rural industries.

In summary, the existing literature provides a rich theoretical foundation and analytical framework for this study, and certain achievements have been made. Nevertheless, there is currently insufficient research on how Guangxi's rural areas are being revitalized in relation to the digital economy. In order to provide a theoretical foundation for the development of policy, the purpose of this study is to investigate how the digital economy is affecting the revival of rural areas in Guangxi.

3 Research Methodology

3.1 Model Construction

The following econometric model is developed in this study based on the theoretical analysis of the digital economy's influence mechanism on rural revival presented above:

$$Y_{it} = \alpha_0 + \alpha_1 * DE_{it} + \alpha_2 * \text{Control Variables} + \epsilon_{it} \tag{1}$$

Where, Y_{it} is the explained variable, representing the level of rural revitalization in the t period of District i ; DE_{it} is the core explanatory variable, which represents the development level of the digital economy of region i in the t period.; Control variables include the intercept term (α_0), the coefficients to be estimated (α_1, α_2), and the error term (ϵ_{it}).

Using the findings of Shu, Zhang ^[14], the article selected 15 tertiary indicators and gave weights to the evaluation indicators of rural rejuvenation using the entropy technique. Table 1 displays the specific measurement markers.

Table 1. Evaluation index system of rural revitalization

Primary index	Secondary index	Three-level index
Rural revitalization	Prosperous industry	Value added of primary industry/Rural population
		Overall grain production capacity
		Total power of agricultural machinery
	Ecological habitability	Forest coverage rate
		Harmless treatment rate of household garbage
		Number of health technicians per 1,000 rural population
	Effective governance	Local fiscal expenditure on education
		Per capita consumption expenditure on culture, education and entertainment of rural residents
		Overall population coverage of television programs
		Per capita disposable income of rural residents/Per capita disposable income of urban residents
live in affluence	live in affluence	Per capita consumption expenditure of rural residents/Per capita consumption expenditure of urban residents
		Minimum subsistence allowance for rural residents/Rural population
		Per capita disposable income of rural residents
		Food consumption expenditure of rural residents
		Population residential building area

The degree of digital economy (DE), which is determined by the number of Internet users, the penetration rate of digital infrastructure, and the amount of e-commerce transactions, is the main explanatory variable. In order to guarantee the experiment's stability, the natural logarithm of the level of digital economy is taken. Control variables: (1) Economic development level (GDP), which is measured by the natural logarithm of per capita GDP; (2) Financial development level (FDL), the ratio of M2 money supply to GDP is selected; (3) Infrastructure development (IC), using the natural logarithm of total public infrastructure investment; (4) For policy support (PS), the comprehensive index of policy intensity is adopted, including the scores of three dimensions: fiscal input, tax relief and policy number. Each dimension is assigned different weights according to policy intensity. Finally, the natural logarithm of the comprehensive score is taken.

3.2 Data Sources

The panel data of 14 districted cities in Guangxi, China (41 municipal districts, 10 county-level cities, 48 counties, and 12 autonomous counties) from 2018 to 2022 serves as the research sample for this work. The original data was obtained from Guangxi Zhuang Autonomous Region People's Government Network, China Statistical Yearbook, China Rural Statistical Yearbook, and other sources.

4 Result Analysis

4.1 Descriptive Statistical Analysis

SPSS26.0 was used for basic data analysis, and the descriptive statistical analysis results in Table 2 were obtained. The results show that there is a significant variation in the level of rural revitalization between counties and cities, as well as in the degree of financial development, infrastructure construction, economic development, and policy support in various regions. The mean value of rural revitalization is 4.675, the maximum value is 8.032, and the minimum value is 1.453.

Table 2. Descriptive statistical analysis

Variable type	Variable name	Variable symbol	Sample size	Mean value	Standard deviation	Minimum value	Maximum value
Explained variable	Rural revitalization	Y	111	4.675	1.143	1.453	8.032
Core explanatory variable	Digital economy level	DE	111	6.453	2.125	3.242	9.734
	Level of economic development	GDP	111	4.552	0.663	4.134	5.673
Control variable	Financial development level	FDL	111	4.342	0.436	3.982	5.135
	Infrastructure construction	IC	111	10.245	0.783	8.763	11.638
	Policy support	PS	111	1.278	0.146	1.104	2.382

4.2 Results of Benchmark Regression

In order to verify the relationship between the variables, baseline regression analysis was performed, as shown in Table 3.

Table 3. Baseline regression results

Variable	DE	GDP	FDL	IC	PS	_cons	prefecture	N	R2
Y	0.621*** (0.045)	0.246* (0.230)	0.211 (0.187)	0.145 (0.033)	0.204 (0.135)	0.569** (2.301)	YES	111	0.823

The individual fixed effect model in Table 3 shows that the level of the digital economy has an evidently positive estimated coefficient at the statistical significance level of 1%, suggesting that the level of the digital economy has a positive impact on rural revival.

4.3 Robustness Test

The results of benchmark regression may be subject to various influences and have some bias. Thus, to confirm if the conclusion that the degree of the digital economy fosters rural development and rejuvenation is sound, the study adopts the method of excluding 10 county-level cities for verification. Considering that these 10 county-level cities have unsurpassed advantages over other counties and districts in terms of geographical location and government support, the regression analysis is conducted again after excluding these 10 county-level cities. The findings indicate that, at the 1% significance level, the coefficient of the digital economy level is 0.061 and significant. As a result, it is evident that the robustness test results largely agree with the baseline regression results, offering enough proof to support the paper's conclusion that there is a substantial relationship between the amount of digital economy and rural rejuvenation.

Table 4. Robustness test results

Variable	DE	GDP	FDL	IC	PS	_cons	prefecture	N	R2
Y	0.684*** (0.061)	0.116* (0.230)	0.283 (0.125)	0.251 (0.087)	0.382 (0.321)	0.385* (1.981)	YES	101	0.933

4.4 Analysis of Heterogeneity

This study investigates the impact of the internet economy on rural revival from a spatial standpoint using heterogeneity analysis. Due to the large differences in regional development between districts and counties in Guangxi, the samples were further divided into municipal districts and counties to examine how the degree of the digital economy affects rural revival. The digital economy coefficients of county districts and municipal districts are both positive and significant at the 1% level, as shown by the heterogeneity results in Table 5. This suggests that, while the degree of promotion

varies, the digital economy level can support the growth of rural revitalization in both county districts and municipal districts.

Table 5. Results of heterogeneity test

Variable	DE	GDP	FDL	IC	PS	_cons	prefecture	N	R2
Y ₁	0.352*** (0.054)	0.101* (0.214)	0.204 (0.112)	0.239 (0.025)	0.249 (1.592)	0.385* (1.981)	YES	41	0.924
Y ₂	0.209*** (0.102)	0.320 (0.020)	0.319 (0.872)	0.812*** (4.214)	0.373** (2.91)	0.374* (2.307)	YES	60	0.916

(Note: Y₁ stands for Rural Revitalization in the municipal district, Y₂ stands for rural revitalization of prefecture-level counties)

4.5 Results of Spatial Panel Model

According to previous studies, most use the Z-value of the Moran index to determine whether there is a spatial connection between regions. Therefore, this study first tested the Moran index of digital economy and rural revitalization, and the results are shown in Table 6: The results show that the Moran index of rural revitalization and digital economy both passed the significance level test of 1%, proving that both have a spatial correlation and are positive spatial correlation.

Table 6. The Moran’s I index of Rural Revitalization and Digital Economy

Year	Rural Revitalization		Digital Economy	
	Moran’s I	Z-value	Moran’s I	Z-value
2018	0.2172***	3.6238	0.3272***	3.7326
2019	0.2763***	3.8952	0.2831***	3.0127
2020	0.2037***	3.3126	0.3721***	3.8264
2021	0.2427***	3.4108	0.1374***	2.6936
2022	0.2865***	3.5931	0.2061***	3.0432

In order to more accurately judge the relationship between digital economy and rural revitalization, the paper introduces a spatial panel model. According to the research of Elhorst [15], LM test, LR test and Hausman test were carried out to select the spatial model, and finally the spatial Durbin model with individual fixed effect was selected for research, and the following equation (2) was established:

$$Y_{it} = \beta_0 + \rho WY_{it} + \beta_1 DE_{it} + \beta_2 W DE_{it} + \beta_i + \varepsilon_{it} \tag{2}$$

Where, ρ is the spatial autoregressive coefficient, W is the spatial weight matrix, β is the coefficient to be estimated, and β_i represents the individual fixed effect of region i that does not change with time.

The SAR and SDE models were tested by Stata15.0, and Table 7 was obtained. According to the results, under the geographical distance weight matrix, economic

distance matrix and adjacency matrix, digital economy has significantly promoted the local rural revitalization in space, and has positive spatial spillover effect on the rural revitalization in surrounding areas.

Table 7. The results of the SDE and SAR models

Spatial model	Spatial auto-regressive model with individual fixed effect			Spatial Durbin model with individual fixed effect		
	Economic matrix	Geographical distance	Adjacency matrix	Economic matrix	Geographical distance	Adjacency matrix
Variables	Y	Y	Y	Y	Y	Y
DE	0.1276** (0.0643)	0.2139*** (0.0398)	0.2702*** (0.0812)	0.1923** (0.0439)	0.1862* (0.0218)	0.1739** (0.0801)
W*DE				0.1863*** (0.0821)	0.1791** (0.0572)	0.1937*** (0.0472)
W*Y	0.3267*** (0.0583)	0.3176*** (0.0352)	0.3301*** (0.0418)	0.3582*** (0.0321)	0.3803*** (0.0379)	0.3728*** (0.0493)
Direct effect	0.2123** (0.0472)	0.2207*** (0.0654)	0.2451*** (0.0361)	0.1289*** (0.0815)	0.1470*** (0.0625)	0.1703*** (0.1021)
Indirect effect	0.2265*** (0.0561)	0.1942*** (0.0567)	0.2319*** (0.0468)	0.2682*** (0.0572)	0.2384*** (0.0681)	0.2037*** (0.0936)
Total effect	0.4308*** (0.1028)	0.4103*** (0.0612)	0.4723*** (0.0532)	0.3807*** (0.0603)	0.3769*** (0.0598)	0.3816*** (0.0893)
Control relevant variables	YES	YES	YES	YES	YES	YES
N	111	111	111	111	111	111
R2	0.3261	0.3518	0.3343	0.3947	0.3865	0.3784

5 Conclusions

Following extensive investigation and empirical analysis, the following conclusions are reached in this paper: The level of the internet economy significantly contributes to Guangxi's rural revitalization. On the one hand, Guangxi's rural development has fresh prospects thanks to the growth of the digital economy. Modernization of agriculture has been encouraged and agricultural production efficiency has been successfully increased through the widespread use of information technology. Conversely, the digital economy supports the growth of farmers' incomes, enhances the quality of life for rural dwellers, and optimizes the rural industrial structure. But it's also important to note that Guangxi's rural digital economy is still struggling with issues like inadequate infrastructure and a talent deficit. Therefore, efforts can be made from the following aspects in the future: first, optimize the digital infrastructure, improve the rural industrial development environment, innovate the rural circulation service system, and develop smart agricultural parks; Second, improve the utilization rate of digital technology,

promote industrial digitalization, use digital technology to build up and down connected rural industrial clusters, promote the development of economic agglomeration, and support the high-quality development of rural e-commerce, so as to drive the in-depth development of "agricultural tourism" industry; Third, strengthen the digital skills training of farmers, cultivate digital talents, actively expand the channels of return of talents, provide financial, policy and technical support for qualified returning entrepreneurial talents, and strengthen the education of talents at all levels, so as to give full play to the important role of digital talents in rural revitalization.

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