

# *An Analysis of Rural Digital Economy Path*

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**Abstract:** In the face of profound changes in the global digital economy, the rural digital economy needs further transformation and development. Drawing from the current state of affairs, this paper embarks on a multifaceted examination of the digitalization of rural governance. It identifies existing problems and proposes countermeasures. By investigating the status quo, gauging demand, and exploring potential developmental pathways, the author aims to propose effective strategies that will drive the digital transformation of rural governance. The data suggests a promising future for the rural digital economy, indicating substantial potential and room for growth. Concurrently, through the application of Ordinary Least Squares (OLS) model experiments, three fundamental factors that influence the development of the rural digital economy have been identified: the construction of digital infrastructure in rural areas, the state of the rural digital economy itself, and the implementation of digital governance in these regions. Meanwhile, research has shown the need to strengthen policy support and build a market-oriented rural digital economy development system; Utilize technological advantages to develop differentiated rural digital economy models; and enhance the legal framework surrounding the rural digital economy industry, which has the potential to stimulate its growth and development.

**Keywords:** digital economy, rural revitalization, development dilemma, transformation path

## 1. Introduction

In the contemporary rural development landscape, the construction and advancement of the digital economy have emerged as a pivotal strategy. By harnessing cutting-edge technologies like big data, artificial intelligence, and mobile internet, the digital economy facilitates high-quality economic growth. The emergence of the digital economy breathes new life into modern agriculture and rural areas, fostering the development of innovative industries, frameworks, and models. It cultivates fresh driving forces for growth, propels improvements in the quality and efficiency of rural industries, enhances rural development dynamics, and promotes high-quality advancements in modern agriculture and rural areas across various sectors and at multiple levels. This profound integration of the digital economy with modern agriculture and rural development aligns harmoniously with the imperatives of the rural revitalization strategy. Based on the rural economy, many scholars have used mathematical methods to analyze and predict the development trend according to the realistic influencing factors. For example, Chen Xiaozhong's research is in line with the research direction of this paper. He used the help of CiteSpace and Tableau data visualization tools to research the status, development and hot spots of 307 Chinese research literature included on CNKI with the theme of

digital countryside, and carried out digital countryside and rural governance [1]. At the same time, Cao Xizi also used OLS linear regression model to study the data of 1880 county digital rural development in China in 2018 to study the problem of county digital rural development in China [2]. But both are not overall involves the specific management methods and management means, so this paper will be on the basis of the problems from the countermeasures, from the hypothesis to empirical, from the status quo, demand, countermeasures three aspects of digital rural governance, from the concept, structure optimization, power transformation, governance innovation four aspects to advance rural governance along the digital trajectory and propose a framework for the digital economy's development pathway. Through the investigations and evaluations conducted in this study, the influencing factors of rural digital development and the improvement programs for society, government and individuals can be obtained.

## **2. The Development of Rural Digital Economy**

### **2.1. Significantly Increasing Rural Broadband Volume**

In April 2022, China's Ministry of Industry and Information Technology, along with five other ministries and commissions, jointly unveiled the 'Key Points for Digital Rural Development in 2022'. This proposal targeted the expansion of 5G network coverage to encompass key towns and select administrative villages by year-end. As of December 2021, the population stood at 1.032 billion, marking an increase of 42.96 million from the previous year. The overall internet penetration rate ascended to 73.0 percent. Rural internet users accounted for 284 million of this total, leading to a penetration rate of 57.6 percent in rural areas — an upturn of 1.7 percentage points since December 2020. This data indicates a 0.2 percentage point reduction in the internet penetration disparity between urban and rural areas, compared to the previous year [3].

### **2.2. Growth Rate of Internet Users in Rural Areas**

In recent years, initiatives like the 'Information Benefiting the People' project have significantly improved the environment for rural digital economy development. From 2016 to 2020, the number of internet users in rural China swelled from 195 million to 255 million, injecting a potent vitality into the Chinese consumer market. This robust growth in rural internet usership provides a solid foundation for the burgeoning rural digital economy [3]. As the digital economy evolves, the rural revitalization strategy is poised to merge with the developmental ecosystem of the internet, big data, artificial intelligence, and the tangible economy.

### **2.3. Increasing Rural Internet Retail Sales**

As per the data from the National Bureau of Statistics of the People's Republic of China, the country's online retail sales in the first half of the year soared to 6.11 trillion yuan. This represents a 23.2 percent increase compared to the same period last year, reflecting an average biennial growth rate of 15.0 percent. According to a person in charge of the Ministry of Commerce, rural e-commerce has developed rapidly, with rural online retail sales reaching 954.93 billion yuan in the first half of the year, up 21.6 percent year on year [4]. The overall rural online retail sales still show a sharp rise in the trend, Figure 1 shows the huge development potential of the rural digital economy and development potential.

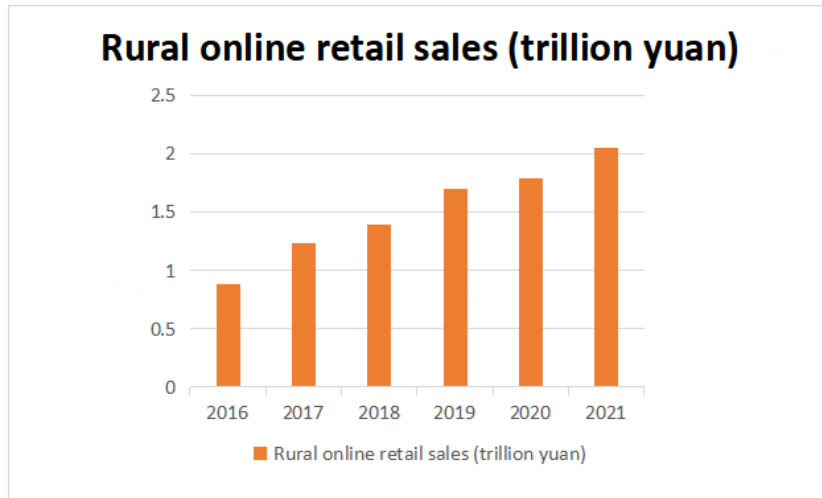


Figure 1: Rural online retail sales.

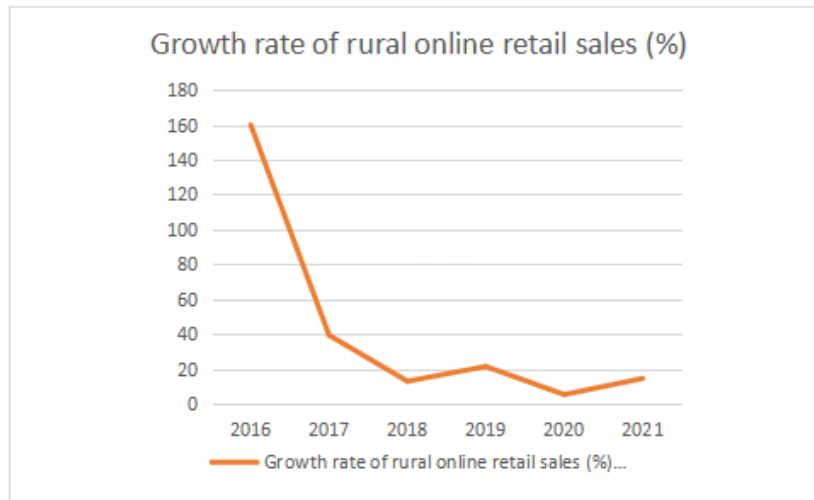


Figure 2: Growth rate of rural online retail sales.

### 3. Empirical Study Based on Quantile Regression

The OLS regression model is used for linear regression parameter estimation. The objective is to identify values that minimize the sum of squared differences between the actual and the model's estimated values. Based on the OLS model, this paper explores the important factors influencing the development of digital countryside.

#### 3.1. Metering Method

Quantile regression is mainly about how the samples at a certain quantile of the conditional distribution are affected by the variables. In contrast to the mean regression of OLS, quantile regression uses a weighted average of absolute residuals as the objective function of minimization, and the sensitivity of quantiles to outliers is much less than the mean. The main idea is as follows: if the total Q quantile of the conditional distribution  $y | x$   $y_q(x)$  is a linear function of X, that is:

$$y_q(x_i) = x_i' \beta_q + \varepsilon_i \quad (1)$$

Therefore, for any quantile  $q$ , its regression objective function is:

$$V(\beta_q; q) = q \sum_{y_i > x'_i \beta_q} |y_i - x'_i \beta_q| + (1 - q) \sum_{y_i < x'_i \beta_q} |y_i - x'_i \beta_q| \quad (2)$$

For any  $p$  quantile estimate, the quantile regression coefficient can be obtained by minimizing the objective function [5]:

$$\hat{\beta}_q = \operatorname{argmin} \left[ q \sum_{y_i > x'_i \beta_q} |y_i - x'_i \beta_q| + (1 - q) \sum_{y_i < x'_i \beta_q} |y_i - x'_i \beta_q| \right] \quad (3)$$

### 3.2. Data Sources and Model Settings

This paper selects 2018 county digital rural data to examine the impact of various factors on urban size. In consideration of data availability and consistency, the County Economic Digital Rural Index (2018), published by the New Rural Development Institute of Peking University and the Ali Institute, was chosen as the basis for analysis. The report takes the county as the basic unit, gathers the national macro-statistics data, the industry data and the internet big data, and forms 1880 county samples. In this paper, the metrological model is set in the form of semi-logarithm, as follows [2]:

$$\operatorname{Indv}_i = \beta_0 + \beta_1 \operatorname{Indi}_i + \beta_2 \operatorname{Ined}_i + \beta_3 \operatorname{Ingd}_i + \beta_4 \operatorname{Inld}_i + \varepsilon_i [5] \quad (4)$$

Where  $i$  denotes the  $i$ <sup>th</sup> city and  $\varepsilon$  denotes the residual term;  $\operatorname{dii}$  stands for digital infrastructure development;  $\operatorname{edi}$  stands for Economic Digital Development;  $\operatorname{gdi}$  stands for governance digital development;  $\operatorname{ldi}$  stands for life digital development; and  $\operatorname{dvi}$  stands for digital rural development.

### 3.3. Empirical Results

Using the quantile regression model can not only reflect the development of the digital village in all aspects, but also predict the development trend in the future. The regression results of 10%, 25%, 50%, 75%, 90% loci and OLS results for comparison are given.

Firstly, the paper examines the influence of rural digital infrastructure construction on the rural economy through comprehensive analysis. The OLS regression coefficient was 0.269, but different quantile regression results were different, for example, in 10%, 25%, 50%, 75%, 90% quantile regression, the coefficients were 0.270, 0.269, 0.269, 0.270 and 0.270 respectively. The data demonstrates that the ongoing enhancement of rural digital infrastructure construction plays a significant role in elevating the consumption level and structure among rural residents. On one hand, e-commerce, as a prominent exemplar of novel business forms and models, alongside digital payment technology and digital circulation, significantly contribute to facilitating the daily economic activities of rural residents. On the other hand, the enhancement of rural digital infrastructure has accelerated the pace of information dissemination and exchange, and alleviated the problem of information asymmetry in the consumer market, open and transparent commodity information is also conducive to rural residents to choose quality and low-cost products. Moreover, the dissemination of information will update the consumption concept of rural residents, make them pay more attention to the pursuit of the spiritual level, thus causing the increase in entertainment, culture, medical and other aspects of consumer spending, fostering the enhancement of the consumption structure among rural residents.

The second is the digitisation of the rural economy. The OLS regression coefficient was 0.400, but the results of different quantile regression were different. The coefficients of 10%, 25%, 50%, 75%, 90% were 0.399, 0.400, 0.400, 0.400, 0.399, respectively. These data show that as the core of the digital economy development, rural economy digitization has a significant impact on digital rural development. At the same time, as the core of the development of digital economy, the economy has

a greater impact on the medium-term development of digital rural areas. However, during the early and mature stages of the digital economy, the impact of economic factors on the development of digital rural areas is comparatively less significant, primarily due to varying degrees of industrial development. In contrast, the middle stage places greater emphasis on areas such as social governance and public services.

Finally, the digitization of rural governance. the OLS regression coefficient is 0.139, but the regression results vary across quartiles, with significant coefficients of 0.139, 0.139, 0.140, 0.139, and 0.139 in the 10%, 25%, 50%, 75%, and 90% quartile regressions, respectively, with different quartile cases, the digitization of rural governance on rural digital economy. From this, it can be seen that the digitization of rural governance has a relatively stable impact on the development of the digital economy. Although its significance is not as significant as the construction of rural digital infrastructure and rural digitization, looking at the development of digital rural areas, it is a factor that cannot be ignored [6].

## **4. Research on the Governance and Development Path of Rural Digital Economy**

### **4.1. Strengthening Policy Support and Building a Market-oriented System**

Firstly, with local governments as the core, build an integrated service platform with financial support, technical support, and financial subsidies to provide one-stop service for rural enterprises and farmers; build a team of talents for the village digital economy; build an information team; and build a talent training mechanism supported by scientific and technological innovation. Specifically, “going out” and “inviting in” methods can be developed to encourage agricultural enterprises to strengthen cooperation with universities, hire cutting-edge experts in the field to conduct training courses, or regularly organize relevant talents to conduct on-site inspections of agricultural enterprises and planting bases, continuously enrich theory and practice, and improve the foundation of rural digital economy. Finally, establish and improve the rural digital economy supply chain system, propose unnecessary intermediate links, and strengthen the connections between enterprises in various links of the industrial chain. Focus on developing smart agriculture and digital agriculture, improve agricultural efficiency and increase farmers’ income [7].

### **4.2. Giving Full Play to Technological Advantages and Developing a Differentiated Rural Digital Economy Model**

With a focus on the present challenges faced by rural areas, agriculture, and farmers in China, the country needs to strive to establish a distinctive model for the rural digital economy, leveraging the unique characteristics of cost-effective agriculture. Due to the vast and diverse rural areas in China, various regions need to develop rural digital economy development models that are suitable for local development needs based on their geographical environment, resource endowment, and industrial development status, in order to avoid homogeneous development issues. At the same time, different rural areas may encounter different challenges in the process of digital development. Therefore, it is recommended that local governments carry out special optimization projects and projects to address these difficulties, overcome the difficulties of transformation and development, and continuously explore new models of rural digital economy [8].

### **4.3. Improving the Legal System of Rural Digital Economy and Enhancing the Governance Capacity of Rural Digital Industry**

At present, the digital economy is in a high-speed development stage, and the traditional laws and regulations seriously lag behind the technical development needs. Therefore, it is imperative to

perfect the relevant laws and regulations in view of the digital economy risks that have appeared or may appear. In particular, it is urgent to speed up the legislation concerning the sensitive data industry, such as the collection of big data information, clarify the property rights of digital information, prevent the abuse of information, establish the corresponding data protection mechanism, improve the security of information data in the process of circulation, and ensure that information data has an efficient and reasonable configuration [9]. Simultaneously, it is crucial to prioritize the safeguarding of intellectual property rights related to digital technology. It is essential to establish clarity regarding ownership, responsibilities, and authority in data storage and utilization processes. Additionally, the establishment of appropriate profit distribution mechanisms is necessary to ensure the interests of all participants in the rural digital economy. Furthermore, there will be an emphasis on strengthening law enforcement and upholding the principle of governance based on the rule of law. Efforts will be made to continuously enhance the regulatory framework for the digital economy and expedite the high-quality integration of the rural digital economy with the agricultural industry [10].

## 5. Conclusion

This paper employs the OLS linear regression model to conduct a comprehensive analysis of the factors influencing rural economic development. It aims to analyze and predict the holistic, extensive, and multi-level development of modern agriculture, rural demographics, and rural economies. The data reveals the immense potential and ample room for development in rural digital economies. Meanwhile, through the application of OLS model experiments, three influential aspects impacting the development of rural digital economies were identified: rural digital infrastructure construction, digital rural economies, and digital rural governance. Meanwhile, research has shown the need to strengthen policy support and build a market-oriented rural digital economy development system; utilize technological advantages to develop differentiated rural digital economy models; and improve the law. In this field, the income gap of farmers is one of the important factors, but this article ignores the impact of this factor. Future research will further refine the research subjects and influencing factors, such as considering the age and income disparities of rural netizens. In addition, multiple linear regression models will be used to modify the model.

## References

- [1] Chen Xiaozhong. *An analysis of the current situation and development trend of digital rural research in our country* [J]. *Rural Economics and technology*, 33(02): 10-13. 2022.
- [2] Cao Xizi. *A study on digital rural development and its influencing factors in China* [J]. *China Business Review*, (23): 90-92. 2022.
- [3] China Internet Network Information Center (CNNIC). *The scale of Internet users in rural areas of our country has reached 284 million* [J]. *South China Agriculture*, 16(05): 60. 2022.
- [4] Ministry of Commerce: *in the first half of the 2021, China's rural Internet retail sales reached 954.93 billion yuan* [J]. *Southern China Agriculture*, 15(22): 20. 2021.
- [5] Longbin Qiu, Na Liu, et. al. *Research on Integration of Yangtze River Delta Based on OLS Regression Model* *Proceedings of 2nd International Conference on Education Technology, Economic Management and Social Sciences (ETEMSS 2021)* Ministry of Commerce: *in the first half of the 2021, China's rural Internet retail sales reached 954.93 billion yuan*(1), 38-47. 2021.
- [6] Zhang Wei, Wen Yaxin. *A study on the countermeasures of digital economy for rural revitalization in the new era* [J]. *CHINA JOURNAL OF COMMERCE*, (05): 33-35. 2023.
- [7] Cao Meiyong, Tan Qiyun, Wang Lixin. *Research on the influence of rural digital development on the revitalization of rural industries under the background of common prosperity — Take Guangxi as an example* [J]. *Agricultural Economy*, (02): 5. 2023.
- [8] Zhang Hong, Du Kevin, Jin Bingyan, Liu Qilei. *Study on the influencing factors of high-quality rural development under the digital rural Strategy* [J]. *Statistics and Decision-making*, 37 (08): 98-102. 2021.
- [9] Ren Min. *Research on the status quo and path of digital rural development based on "Internet +"* [J]. *Light Industry Technology*, 37 (07): 124-125 + 134. 2021.

- [10] Li Kaiqing. *Research on digital Rural Development Pathways under the background of Rural Revitalization* [J]. *Hebei Enterprise*, (01): 47-49. 2023.