

Mechanism Design and Policy Effect Evaluation of Digital Economy Empowering Rural Revitalization

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Abstract

Digital economy promotes the optimization of rural industrial structure and the innovation of governance methods by means of big data, Internet of Things and artificial intelligence, driving the level of agricultural modernization and the efficiency of rural social governance. By building a model of digital empowerment mechanism, this paper analyzes the application of digital economy in agricultural production, industrial integration and rural governance, considers the difference in the effect of policy combination in rural revitalization, and puts forward strategic opinions on policy implementation optimization. Digital economy actively promotes rural industrial upgrading and realizes social governance modernization, significantly improves the efficiency of agricultural production and farmers' income level, and strengthens the strength of rural sustainable development.

Keywords

Digital Economy, Rural Revitalization, Mechanism Design, Policy Effect, Industrial Upgrading

1. Introduction

With the rapid development of digital technology, the digital economy is gradually becoming a key force in promoting rural revitalization. With the use of big data, the Internet of Things, artificial intelligence and other technical means, the digital economy has shown great potential in improving agricultural production efficiency, promoting the integrated development of rural industries, and optimizing grassroots governance. How to use digital methods to help the transformation and upgrading of rural industries and promote the mutual integration of economic, social and environmental benefits has become a topic that needs to be overcome in the current rural revitalization strategy [1-3]. Exploring the mechanism planning and policy effect evaluation of digital economy empowering rural revitalization can provide a scientific basis and practical guidance for achieving coordinated urban and rural development.

2. Theoretical Basis of Digital Economy Empowering Rural Revitalization

2.1 Connotation and Characteristics of Digital Economy

The digital economy is a new economic model formed by the integration of digital technology and information resources, driven by core elements such as the Internet, the Internet of Things, big data, and artificial intelligence. Its essence is to use digital technology to enhance economic efficiency, optimize resource layout, and promote comprehensive transformation of social economy. In the wave of social and economic development, the traditional industrial structure has been changed by the digital economy, which has also promoted the evolution of innovation models and production methods. As a new driving force for economic progress, the digital economy plays an irreplaceable role in agricultural modernization, industrial upgrading and social governance. Big data can predict and analyze precision agriculture and agricultural management. The Internet of Things has raised the level of intelligence in the agricultural production chain [2,3]. In terms of crop pest monitoring and production efficiency improvement, artificial intelligence has obvious advantages [2,3].

2.2 Core requirements of the Rural Revitalization Strategy

The rural revitalization strategy is a key component of national modernization. Its core is to improve the level of agricultural modernization and rural governance efficiency, promote urban-rural integrated development and improve the quality of life of farmers. Agricultural modernization requires the promotion of digital upgrading of agricultural production technology and business models, and the promotion of intelligent and sustainable agricultural industry chains. The use of digital technology is conducive to breaking the urban-rural dual structure, realizing the close integration of rural economy and urban economy, and achieving modernization in rural governance. It requires digital platforms and intelligent technologies to play an effective role in grassroots management, improve grassroots governance efficiency and public service levels.

2.3 Mechanism Model of Digital Economy Empowerment

The mechanism model of digital economy empowering rural revitalization mainly includes three aspects: agricultural modernization, industrial integration and grassroots governance. Digital technology leads agriculture into modernization, builds smart agriculture, digital farms and agricultural product traceability architecture, comprehensively improves agricultural production efficiency and product quality, and adopts IoT sensors and intelligent monitoring systems to monitor agricultural environment and crop growth conditions in real time and improve the scientific level of agricultural management [4]. The role of digital platforms in industrial integration is reflected in promoting the development of rural e-commerce and the digitalization of cultural and tourism industries. Relying on e-commerce platforms, consumers can directly contact rural specialty agricultural products and open up market channels; adopting cultural and tourism digitalization measures, local characteristic culture and tourism resources are spread online to maximize economic benefits. Digital governance focuses on the development of grassroots management innovation, promotes the cloudification of government data and the creation of smart villages, realizes the improvement of governance efficiency and residents' convenience, and promotes the intelligent transformation and upgrading of rural social management.

3. Policy Framework for Digital Economy to Empower Rural Revitalization

3.1 Policy Orientation Analysis

The first task of empowering rural revitalization with the digital economy is to clarify the policy direction. A number of policy documents have been issued, such as the Rural Revitalization Strategic Plan and the Outline for Digital Economy Development, which illustrate the key influence of digital transformation in agricultural modernization and rural governance. These policies guide the use of big data, the Internet of Things, artificial intelligence and other related technologies to enhance rural productivity and social governance efficiency. Through the construction of a complete digital infrastructure, it accelerates the coordinated progress of urban-rural integration, steadily narrows the digital gap between urban and rural areas, and lays a solid foundation for rural revitalization.

Local governments have issued digital rural revitalization policies that fit regional characteristics based on local realities. Some regions have promoted the digital management of agricultural product supply chains by creating smart agricultural demonstration areas and raising farmers' income levels, and other regions have taken the initiative to explore the digital path of cultural and tourism integration, such as using AR and VR technologies to create digital cultural and tourism products to boost the pace of rural tourism economic development. The implementation of these policies has accumulated valuable experience for exploring the digital economy to empower rural revitalization [5].

3.2 Mechanism Design Ideas

The effectiveness of the policy framework requires the help of scientific mechanism design, and the combination of policy tools is crucial. In terms of fiscal subsidies, the government can use special funds to support the construction of digital agricultural infrastructure, reduce the cost level of farmers' digital transformation, rely on digital skills training, and enhance farmers' operation level of using smart agricultural equipment and digital platforms. In terms of infrastructure construction, it promotes the construction of rural network coverage and cloud service platforms to ensure that the development of rural digital economy has technical support.

To achieve rural digitalization, the policy coordination mechanism is a key link. Local and central governments need to jointly promote and promote the implementation of policies at the grassroots level [6]. The government, enterprises, and agricultural cooperatives can establish a long-term cooperation mechanism to jointly develop and promote smart agricultural technology and digital governance platforms. Adopt a cooperative mechanism to form a model of multi-subject construction and sharing, and increase the comprehensive effectiveness of policy implementation.

3.3 Policy Innovation Path

To promote the digital economy to empower rural revitalization, we need to further explore policy innovation paths. Building a rural digital industry chain is a key measure to promote the sustainable development of the rural economy. Within the scope of digital agriculture, we should build an integrated digital chain from production to processing to sales to increase the added value of agriculture. Relying on smart farms and digital marketing platforms, we can promote the implementation of digital management in all links of the agricultural industry chain and achieve smooth information access and efficient connection.

The multi-party participation mechanism can significantly enhance the flexibility and inclusiveness of policy implementation. During the implementation of rural revitalization measures, the government, enterprises and social forces should work together to gather policy synergy. The government should control the planning direction and implement policy support. Enterprises should rely on the advantages of market-oriented operations and technological innovation, and social forces should rely on volunteer services and public welfare activities to promote the inclusive development of the digital economy. Multi-party cooperation can promote the formation of a long-term mechanism and realize the comprehensive deployment and efficient implementation of the rural revitalization strategy.

4. Empirical Analysis of Digital Economy in Promoting Rural Industrial Upgrading

4.1 Case Analysis: Digital Economy Promotes Agricultural Transformation

With the rapid development of digital economy, agricultural modernization has become a key entry point for promoting

rural revitalization. Taking the construction of smart agricultural platform in a certain place as an example, the comprehensive application of Internet of Things, big data and intelligent equipment is adopted to realize digital supervision and precise control of the whole stage of agricultural production. In the planting stage, the soil moisture, temperature and pest and disease conditions are monitored in real time with the help of sensors to realize real-time control of crop growth environment. In the stage of production management, precise fertilization, irrigation and disease early warning are implemented with the help of data integration platform, which effectively reduces the cost of manual intervention and enhances the scientificity and precision of agricultural production.

The evaluation shows the effect. The application of this smart agricultural platform has greatly improved the agricultural production efficiency and the market competitiveness of agricultural products. The efficiency of production links has increased by more than 20%, the unit output quality of agricultural products has been significantly improved, the market competitiveness of agricultural products has increased significantly, the brand effect has been further extended, and the sales price has increased by 15%. With comparative research, the application of smart agricultural platform has significantly reduced production costs and management difficulties, promoted the successful transition of traditional agriculture to modern smart agriculture, and demonstrated significant demonstration and reference value.

4.2 Rural e-Commerce Drives Rural Economic Development

The digital economy has given new vitality to the development of rural e-commerce, especially in the stage of agricultural product sales. Through live broadcasting and community marketing, agricultural products can be circulated from rural areas to cities. In the scope of typical cases, a live broadcasting base and a rural e-commerce platform were built in a certain place, paving the way for direct sales of agricultural products. During the platform construction and implementation, community operation and traffic guidance mechanisms were introduced to guide farmers and consumers to form direct communication, compress the commodity circulation chain, and save many intermediate links. In the live broadcasting link, local farmers were invited to be anchors to increase the authenticity and closeness of the products and enhance the level of consumer trust.

By using case comparison and research, when the traditional sales model is adopted, agricultural products are mainly sold through wholesale markets or intermediaries, with high circulation costs and slow market response. In the model used by e-commerce, they are sold directly to consumers through live broadcasts, and orders and revenues have increased dramatically. In a case in a certain place, the sales of agricultural products e-commerce increased by more than 30%, driving the per capita income of local farmers to rise by 15%. Rural e-commerce has not only broadened the sales channels of agricultural products, but also substantially promoted the optimization and upgrading of the rural economic structure.

4.3 Digital Transformation of Cultural Tourism Industry

In the development of rural cultural tourism industry, the important role of digital economy cannot be ignored, especially with the help of digital platforms and new media means, making rural tourism more diverse and immersive. Taking the construction of digital cultural tourism complexes in characteristic villages as an example, relying on AR experience, online booking and digital guidance, tourists can grasp the characteristics of scenic spots and specific arrangements of activities in advance. In the peak tourist season, relying on smart tourism platforms to achieve real-time monitoring and guidance of tourist flow, effectively resolve the pressure of people flow, improve service quality, and increase tourist satisfaction.

In the specific practice, a characteristic village in a certain place has built a digital cultural and tourism platform, integrating the natural landscape features with historical and cultural resources, and initiated online interactive experience activities, such as arranging virtual tours and cultural theme lectures. During the tourism activities, AR technology is used to explain the attractions and present stories, enhancing the tourists' travel experience and cultural identity. After realizing the digital transformation, the village's tourist reception volume increased by 40%, and the comprehensive tourism income increased by 25%. The in-depth application of digital technology in the cultural and tourism industry has not only added tourism styles, but also increased the economic results and brand appeal of rural tourism.

5. Digital Governance Innovation and Rural Social Construction

5.1 Practical Exploration of Digital Village Affairs Management

Digital village affairs management is a key link in helping rural social governance move towards modernization. In terms of village-level governance, the smart government affairs platform plays a key role in promoting it. By building an e-government system, villagers can handle household registration, medical insurance business, and agricultural subsidy-related matters online, achieving efficient and convenient government services. The construction of a livelihood service platform has further expanded digital application scenarios, including employment information disclosure, and villagers can use mobile phones or smart terminals to obtain the latest information and policy interpretations, which has improved the level of openness and transparency of village affairs.

The smart government affairs platform uses data analysis to optimize the allocation of public resources, help improve the level of village-level management, rely on big data to analyze villagers' opinions, help accurately identify issues of

concern to the masses, and build targeted service plans. The smart platform has also promoted the innovation of the working methods of village cadres, reduced the pressure of paper file management, and achieved office efficiency growth.

5.2 Challenges of Digital Economy in Grassroots Governance

Although digital economy has positive significance for rural social governance, it also faces many challenges, especially in the scope of grassroots governance. The contradiction of digital divide is more prominent. When facing smart terminals and digital platforms, aging villagers often face technical operation difficulties, resulting in the inability to fully enjoy the convenience brought by digitalization. The contradiction between informatization and aging is very obvious in some remote villages, which limits the popularization of digital governance and hinders its effectiveness.

Data security and privacy protection issues are also constantly highlighted. In the stage of smart government affairs and village affairs management, the personal information of many villagers is stored and transmitted after digitization, facing the potential risk of information leakage and improper misappropriation. If the platform security protection is insufficient and the management does not meet the requirements, it may cause the villagers' privacy to be damaged and the social trust to be reduced. Considering information security and data privacy maintenance, we can prevent the social potential risks brought by technology abuse.

5.3 Optimization Path

In order to more effectively promote digital village governance and rural social construction, efforts should be made to carry out digital skills training, especially for grassroots cadres and elderly villagers. Digital skills training camps should be held regularly to improve the proficiency of village cadres in the operation of smart government platforms, and simplified operation guides and special guidance should be provided for elderly villagers to gradually eliminate digital barriers and enhance the information literacy of grassroots cadres, which will help to more effectively guide villagers to use smart platforms and increase the coverage of policy publicity and people's livelihood services.

For data security supervision related matters, a strict privacy protection mechanism should be established, the data encryption and identity authentication efficiency of the platform should be enhanced, and hierarchical management measures for village affairs data and personal information should be implemented to ensure the security and compliance of key data. A third-party security audit mechanism should be introduced to conduct regular reviews and vulnerability repairs of digital platforms. By improving the digital literacy level of villagers, their awareness of information security can be enhanced, and proactive prevention of privacy leakage risks can be encouraged to build a solid security barrier for digital governance.

6. Evaluation of the Policy Effect of Digital Economy Empowering Rural Revitalization

6.1 Construction of Evaluation Framework

If the policy effect of digital economy empowering rural revitalization is evaluated, a scientific and reasonable evaluation framework needs to be established to comprehensively examine the four dimensions of economic benefits, social benefits, environmental benefits and governance effectiveness. In terms of economic benefits, the main consideration is the effect of digital technology in achieving agricultural production and income increase and improving the market competitiveness of agricultural products. In terms of social benefits, the effect of digital governance and rural e-commerce on improving the living standards of villagers is examined. In terms of environmental benefits, the application effect of digital technology in ecological agriculture and environmental protection is considered. From the perspective of governance effectiveness, the effectiveness of the smart government platform in improving the efficiency of village affairs management and villagers' satisfaction is evaluated.

In order to achieve the scientific and objective characteristics of the evaluation results, diversified data collection methods should be adopted, including statistical data, questionnaire collection and field interviews. Relying on statistical data, the specific contribution of the digital economy to rural economic and social development can be quantified; questionnaire surveys can directly obtain the subjective assessment of the effects of digital policies by villagers and grassroots cadres; field interviews can make in-depth analysis of the actual problems and improvement space in digital transformation. By comprehensively applying these methods, the policy effect can be comprehensively considered, and scientific evidence support can be provided for policy optimization.

6.2 Analysis of the Effectiveness of Policy Implementation

In the field of digital agriculture, with the use of smart agricultural platforms, agricultural production efficiency has been significantly improved, and the output value per unit area has increased by more than 20% compared with the traditional planting model. Farmers' income has shown a stable upward trend. Due to the application of digital technology, the cost of agricultural inputs has been reduced, and the utilization efficiency of resources has been improved. In the construction of rural e-commerce platforms, relying on live broadcasting and community marketing methods, the sales channels of agricultural products have been broadened, the boundaries of market coverage have been expanded, and the transaction volume and income have shown a continuous upward trend. With the help of e-commerce platform empowerment, the sales volume of characteristic agricultural products in a certain area has increased threefold, which has promoted the rise of the local economy.

From the perspective of the application of smart governance platforms, the efficiency of village-level government administration has increased significantly, the service process has been significantly simplified, and the handling time of villagers' affairs has been shortened by more than 50%. With the use of cloud-based government affairs and intelligent data management, the precision and real-time nature of rural governance have been greatly improved, and the satisfaction of villagers has been significantly improved. A comparative analysis of the policy implementation effects in different regions shows that the role of the digital economy in promoting rural revitalization is significantly different, mainly due to the combined effects of factors such as the level of digital infrastructure, policy implementation strength and villagers' acceptance.

6.3 Policy Optimization Suggestions

When the digital economy empowers rural revitalization policies, in view of the gap in policy implementation effects in various regions, an optimization plan that fits the local reality can be adopted. For villages with poor digital foundations and low digital literacy of villagers, the scale of investment in infrastructure construction should be increased, and the implementation of skills training should be strengthened to strengthen villagers' cognition and application skills of digital technology. In the scope of agricultural digitalization policies, the technology promotion plan should be further refined, and customized technical support should be given to enable farmers to effectively master digital planting and management skills.

At the rural e-commerce policy level, we should strengthen market connection and brand promotion to prevent changes in market demand from causing unsalable agricultural products. In the process of building a smart governance platform, we should focus on data security and privacy protection, further improve platform operation and maintenance, and achieve long-term stable and effective operation of digital village affairs management. It is recommended to set up a policy implementation tracking system to track policy effectiveness in real time and promptly adjust the content of policy measures to ensure that the digital economy empowers rural revitalization efficiently and lastingly.

7. Conclusion

Empowering rural revitalization through digital economy has become a path to promote rural economic and social development. Relying on digital technologies such as big data, the Internet of Things, and artificial intelligence, it promotes the transformation of agriculture to modernization, promotes industrial integration and grassroots governance innovation, and achieves the improvement of agricultural production efficiency and the optimization of rural economic structure. In the process of practical promotion, it still faces difficulties such as digital divide, data security, and policy implementation differences. By building a scientific and appropriate policy framework and comprehensively evaluating the policy effectiveness of digital economy in rural revitalization, it can provide theoretical support and practical basis for policy optimization. It is necessary to intensify digital infrastructure construction, improve the digital literacy level of villagers, promote the implementation of policies according to local conditions, and help urban-rural integration and rural comprehensive revitalization.

References

- [1] Li Peng, Fu Xiaorui, Chen Yuchun, et al Digital economy fu can effect on employment of rural revitalization of forestry workers study. *Journal of forestry economy*, 2024 46-48 (5): 64-78.
- [2] Zhang Hongchun, Yang Tao, Ying Yuliang. Digital infrastructure construction of countryside revitalizing effect. *Journal of finance and economy*, 2024, (6): 60-73.
- [3] Yan Xin, Ma Qianhong. The Path and Policy Inspiration of Digital Economy Empowering the Transformation and Upgrading of Rural Industries from the Perspective of Rural Revitalization. *Agricultural Economics*, 2024, (08):10-12.
- [4] Gao Mengfei, Zhang Nanan. Digital economy in liaoning province fu to rural revitalization of the mechanism and the influence of space effect. *Journal of economic times*, 2024, 21 (7): 15-19.
- [5] Li Peng, Fu Xiaorui, Guo Xinling, et al. The Influence Mechanism and Spatial Effect of Digital Economy Empowering Rural Industrial Revitalization. *China Agricultural Information*, 2024, 36(05): 112-126.
- [6] Peng Hui, Zhang zhao. Digital economy can assign rural industries: effect of test and mechanism analysis. *Journal of rural financial research*, 2023, (5): 44-56.