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Exploring the Sustainable Path of Rural Governance: An Empirical Study on Digital Technology Empowering the "Fengqiao Experience" Model in the New Era

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ABSTRACT: Understanding digital technology and digital inclusive finance in rural governance is key to exploring the sustainable development path of rural governance in China. This study constructs a multidimensional index evaluation system for the "Fengqiao Experience" rural governance model in the new era, measures the model's rural governance level in 30 provinces in China (2011–2022), and empirically assesses digital technology's impact on rural governance and its mechanism. The results are as follows: (1) During the sample survey period, the rural governance level of digital technology and "Fengqiao Experience" in 30 provinces in China has improved year by year. (2) Benchmark returns to reality and digital technology significantly promotes the improvement of rural governance levels, which remains valid after using GLS, replacing core explanatory variables, excluding the impact of the epidemic, and excluding municipalities directly under the central government. (3) Digital inclusive finance plays an intermediary role in the digital technology process, enabling rural governance. (4) Digital technology's impact on rural governance has significant spatial spillover characteristics. Such technology helps improve the level of rural governance both locally and in surrounding areas. This study contributes to the understanding of the mechanism, effect, and regional differences of digital technology-enabled rural governance.

Keywords: Digital technology; Rural governance; Fengqiao Experience; Governance entities; Governance approaches

1. Introduction

Exploring sustainable development pathways for rural governance constitutes a pivotal component of China's Rural Revitalization Strategy, as well as a project fundamental to advancing the modernization of China's national governance system. The 2024 Chinese Government Work Report emphasizes the need to "effectively safeguard and enhance people's livelihoods, while strengthening and innovating social governance" [1]. Innovation is the linchpin for modernizing the rural governance system. By fostering innovations in the rural governance framework, we aim to extend public services to the grassroots level, better catering to the population's diverse and personalized needs, fully unleashing the potential of rural governance, and, thereby, establishing a solid groundwork for the comprehensive revitalization of rural areas [2].

China's rural governance—exemplified by "Fengqiao Experience"—boasts profound connotations and extensive implications. "Fengqiao Experience" originated from the grassroots social governance practices in Fengqiao Town, Zhuji City, Zhejiang Province, during the socialist education campaigns conducted in the early 1960s. It achieved a commendable social governance outcome characterized by "reduced arrests and enhanced public security" by mobilizing and relying on the masses and adhering to the principle of resolving conflicts locally without escalating them. In November 1963, Comrade Mao Zedong promoted the "Fengqiao Experience" nationwide. The evolution of the "Fengqiao Experience" has spanned four stages as follows: First stage, in the 1960s, against the backdrop of the socialist education movement in rural areas, Fengqiao Town, Zhuji, Zhejiang Province, achieving the goal of "resolving conflicts locally without escalation". In the second stage, during the initial phase of the reform and opening-up, confronted with the grave social security issues, cadres and the masses in Fengqiao placed significant emphasis on social security and stability. They continually enhanced the grassroots public security force and promptly addressed

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various public security disputes through community-based prevention and governance, thereby achieving a harmonious balance between economic development and social stability. In the early 21st century, the third stage faced with a prominent dualistic structure between urban and rural areas, as well as a widening wealth gap, safety incidents, environmental pollution, and relocation across regions, Zhejiang Province adopted measures to reform the village-level financial system by emphasizing improvements in the investment and financing environment. Moreover, it enhanced the provision of public services and strived to create a peaceful and harmonious countryside. Fourth stage, since the 18th National Congress of the Communist Party of China, guided by the ideology of socialism with Chinese characteristics, Fengqiao Experience has ushered in a new era of comprehensive innovative development, creating a new model of rural governance called "Fengqiao Experience" that integrates the leadership of the Party, government responsibility, social coordination, and mass participation, and adheres to the organic unity of autonomy, moral governance, and the rule of law. The report of the 20th National Congress of the Communist Party of China proposed to further develop the "Fengqiao Experience" at the grassroots level in the new era, strengthen the mechanism for resolving internal contradictions among the people under the new situation, nip social contradictions in the bud, and mark the maturity of the rural governance model of the "Fengqiao Experience" in the new era.

From the perspective of the connotation of the "Fengqiao Experience" model in the new era, the leadership of the Party serves as the first principle of rural governance, drawing from the "Fengqiao Experience" in the new era. By deeply embedding themselves in rural areas, Party organizations can effectively propel the modernization of rural technology, invigorate rural social vitality, and establish a rural governance network that seamlessly integrates with the government [3]. By integrating resources from various parties, a concerted governance effort is forged, facilitating the preferential allocation of policies, funds, and technology towards the grassroots, thereby achieving precise allocation of governance resources. By deeply integrating Party organizational coverage with governance units, conflicts and disputes can be promptly identified and addressed. Second, the involvement of multiple stakeholders in rural governance exemplifies the quintessential characteristic of the "Fengqiao Experience" in the new era. In the course of rural governance, collaboration among local governments, the populace, civil society organizations, and other local stakeholders, such as rural elites, returning entrepreneurs, and cooperatives, can effectively mitigate numerous social and economic challenges confronting rural areas [4], thereby contributing to the enhancement of rural governance standards [5]. Diversified co-governance ensures the sustainability of rural governance models by establishing a harmonious and inclusive governance mechanism characterized by diverse participation, coupled with effective communication, negotiation, and benefit distribution mechanisms [6]. Once again, autonomy serves as the primary means of achieving rural governance in the new era, embodying the "Fengqiao Experience". A heightened level of democratic autonomy in village governance fosters a greater sense of security among farmers concerning their land rights, which subsequently influences rural governance [7]. The institutionalized channels for participation in rural autonomy exert a positive impact on the efficacy of grassroots governance. The institutionalized forms of rural autonomy, exemplified by the village representative conference and village collective organizations [8], serve as pivotal hubs connecting national policies with villagers' aspirations, integrating resources, and executing specific affairs. This, in turn, enhances the efficiency of rural public administration and yields positive outcomes in village-level elections [9]. Furthermore, moral governance approaches rooted in village regulations and customs, as well as the trust bonds among acquaintances, constitute the enduring essence of rural governance in the new era, as exemplified by the "Fengqiao Experience". By revitalizing traditional rural governance resources such as clans and local worthies, these approaches provide an endogenous impetus for governance modernization. Additionally, by preserving the trust bonds within the acquaintance society, the cost of governance is reduced [10]. The social trust network rooted in rural acquaintance networks continues to exert a profound influence on rural governance in China. Research indicates that the greater the trust among villagers towards their acquaintances, the more effective the provision of rural public services in that area [11]. Ultimately, the rule of law serves as a crucial safeguard for rural governance in the context of the "Fengqiao Experience" in the new era. Huang's research in 2024 reveals that laws, regulations, planning documents, and legal ownership collectively form the institutional foundation of rural governance, offering systematic protection to villagers and effectively mitigating the survival pressures stemming from spatial constraints and economic uncertainties, by crafting local regulations tailored to specific local conditions, we can precisely address institutional deficiencies and safeguard the legitimate rights and interests of rural residents [12].

It cannot be overlooked that the empowerment of digital technology has emerged as a novel feature of rural governance within the context of the "Fengqiao Experience" in the new era. By reducing the costs associated with rural governance and alleviating the mismatch of public service resources in rural communities [13], digital technology has facilitated intelligent, precise, and collaborative rural governance through the integration of diverse resources and the

dismantling of information silos. Levesque (2024) found that digital technology enhances the operational efficiency of rural organizations and bolsters their capacity to address risks and challenges [14]. Meanwhile, Young's research in 2019 revealed that digital rural development fosters broader participation by villagers in economic and political activities, thereby expanding the scope of rural governance [15]. The governance framework of the "Fengqiao Experience" in the new era leverages a comprehensive rural grassroots governance platform to establish a multi-level government linkage and multi-department collaboration mechanism for rural governance. This approach disrupts hierarchical organizational authority and information asymmetry, thereby ensuring a smooth information flow [16]. Through a digital grid platform, rural residents, local elites, villages, and social organizations are interconnected to form a regional governance network, thereby creating a diversified participatory rural governance paradigm and achieving "people-centered" rural governance [17]. Wang (2024) found that the deep integration of digital technology with environmental governance can help government departments in addressing the dilemma of incompatible efficiency and fairness in environmental governance. Wu pointed out that digital inclusive finance enhances the resilience of the rural economy and accelerates the rural economic governance process [18]. Furthermore, inclusive finance plays a crucial role in empowering rural governance with digital technology. Digital inclusive finance enhances the resilience of the rural economy and promotes the process of rural economic governance [19]. Jiang's (2024) research suggests that digital inclusive finance strengthens the equalization of public services and has a positive impact on rural revitalization [20]. Han's (2024) research found that as digital inclusive finance advances in rural areas, it plays an increasingly significant role in the development of developed rural areas and drives changes in rural governance policies [21].

In recent years, the establishment of a comprehensive indicator system for rural governance has emerged as a key area of focus for both academic and practical circles. Saputra et al. (2024) formulated a rural governance system comprising five elements: localism and rural development, rural reconstruction, globalization, governance, and village administration [22]. Sun et al. (2024), drawing on the spatial governance concept of "material-organization-ownership", developed a comprehensive framework for rural development grounded in material, organizational, and ownership governance [23]. Anthony Bebbington et al. (2005) established a rural governance research framework centered around three core elements: asset capacity, rural political and economic development, and sources of capacity building, this framework was built upon analyses of asset distribution, the process of state formation, the relationship between the state and enterprises, and the interplay among various forms of local social capital [24]. Liu et al. (2024) introduced a rural spatial governance framework oriented towards ecological environments, with space, capital, and rural entities serving as its key components [25]. Cui et al. (2024), utilized social network analysis, to construct a multi-agent governance system for land integration from the perspective of power-interest-trust relationships. The indicators used in this system include network density, centrality, small-world characteristics, cohesive subgroups, and centers [26]. These studies not only reflect the complexity of rural governance, but also the limitations of research on rural governance, primarily due to the failure to systematically discuss participants and governance methods within a unified framework. For example, although the model of SAPUTRA et al. (2024) covers governance entities represented by village governments and governance processes in the context of globalization, it does not delve into the collaboration mechanisms between different entities.The "object organization ownership" framework proposed by Sun et al. (2024) emphasizes spatial governance, but neglects the promotion of digital and legal governance methods for resconstructing governance space.

This study is grounded in the theoretical essence and practical wisdom embedded in the "Fengqiao Experience" rural governance model in contemporary China. It establishes a rural governance indicator system, encompassing governance entities and dimensions, to quantify the Chinese practice of the "Fengqiao Experience" rural governance in the new era, thereby offering a quintessential Chinese experience for rural governance worldwide. Furthermore, drawing upon the social realities of China's digital countryside, this study systematically examines the positive impact of digital technology on the "Fengqiao Experience" rural governance model in the new era, highlighting the facilitating role of digital inclusive finance in this process. This examination broadens the theoretical scope and practical pathways of digital rural governance. Lastly, this article considers spatial effects, exploring the spatial spillover effects of digital technology on the "Fengqiao Experience" rural governance model in the new era, thereby further enriching the spatial dimension of digital rural governance.

2. Research Question

2.1. Digital Technology's Impact on the "Fengqiao Experience" Rural Governance Model in the New Era

From the perspective of participating entities, digital technology enables diverse entities, including Party organizations, governments, the populace, and social organizations to coordinate their involvement in rural governance [27]. By establishing a digital governance platform featuring Party committee leadership, government facilitation, populace participation, and enterprise operations, these governance entities can engage extensively in various activities, including democratic elections, dispute mediation, public security collaboration, education, and training. This approach facilitates the efficient and professional handling of social issues, achieving collaborative construction, participation, and mutual benefits among multiple parties. An institutionalized rural governance model is established through initiatives such as "Internet + Party Building" and "Internet + Social Organizations + People", thereby granting a voice to Party organizations, governments, the populace, and social organizations [28]. This enhances the participation and professionalism levels of governance entities in rural governance, fostering transparency and democratization in rural governance.

From the perspective of governance methods, digital technology empowers rural "self-governance", "rule by virtue", and "rule of law", driving innovation in the "Fengqiao Experience" governance model in the new era. Concerning autonomy, the rural governance big data system enables villagers to stay informed about village committee elections, rural public utility projects, and other matters in real time, thereby stimulating enthusiasm for participating in village affairs [29]. Furthermore, the interactive section of the rural governance big data system provides villagers with avenues to voice their demands and opinions, thereby reinforcing their primary role in rural governance. Regarding virtue-based governance, a digital points system is implemented to convert the concept of rural virtue-based governance into quantifiable and actionable points indicators, which document and evaluate villagers' daily behavior and participation in public affairs, thereby standardizing villagers' behavior and enhancing their awareness of virtue-based governance. Advanced culture is disseminated in rural areas, and villagers' sense of cultural belonging and identity is enhanced by publishing moral model deeds, promoting socialist core values, and implementing cultural public welfare projects via platforms such as smart village affairs and WeChat public accounts. Concerning the rule of law, artificial intelligence and blockchain technology are leveraged to standardize the collection, review, and storage of evidence throughout the litigation process. Disclosing judicial documents and trial processes through intelligent courts enhances judicial transparency, effectively curbing the abuse of judicial power and promoting fairness and justice under the rule of law.

Based on the above analysis, this study proposes Hypothesis 1 as follows: Digital technology plays a significant role in optimising rural governance.

2.2. Digital Inclusive Finance's Intermediary Effect on the "Fengqiao Experience" Rural Governance Model in the New Era of Digital Technology Empowerment

From the perspective of governance entities, digital inclusive finance empowers rural governance by enhancing financial literacy, facilitating digital transformation, and mitigating rural financing constraints. First, extending digital inclusive finance in rural areas contributes to optimizing the model of rural Party building [30]. Services such as financial knowledge promotion are provided to villagers by establishing "Party Building + Finance" activity rooms within village Party branches. By facilitating the study and exchange of opportunities for rural Party members and cadres at financial institutions, we can enhance their ability to use digital financial tools for facilitating rural governance. Second, digital inclusive finance facilitates the digital transformation of township governments [31]. By enhancing investments in digital infrastructure development in rural regions, we can ensure comprehensive coverage of digital infrastructure in these areas and improve the administrative service efficiency of grassroots organizations. Third, digital inclusive finance has improved mass participation in village affairs [32]. By leveraging big data, cloud computing, and other technologies to match the diverse financing needs of farmers precisely, timely financing support has been provided for developing low-income rural populations and small and micro-enterprises. This has not only elevated the enthusiasm of rural residents to engage in rural public affairs but also infused vitality into rural governance. Ultimately, digital inclusive finance enhances the effectiveness of social organizations in supporting rural governance. By establishing a diversified dispute resolution platform for the financial industry, we can develop a new one-stop model to resolve financial disputes, encompassing litigation evidence preservation, various forms of mediation, judicial confirmation, and online litigation, thereby effectively enhancing the quality and efficiency of resolving financial conflicts and disputes. Introducing a series of community financial products with low thresholds and high flexibility, such as

microfinance, provides convenient and fast financial services, as well as financial security for rural professional cooperatives and family farms, and helps social organizations fully realize their potential.

From the perspective of governance approaches, digital inclusive finance empowers rural governance by systematically documenting the financial information of rural residents, fostering the development of excellent traditional culture, and cultivating a favorable legal environment. First, digitally inclusive financing enhances rural governance capabilities. During its promotion in rural areas, village cadres and township grid managers extensively collate credit information from farmers, which deepens their understanding of villagers' financial status and creditworthiness, thereby improving the governance capacity of grassroots organizations, such as village committees. Furthermore, the proliferation of digital inclusive finance contributes to the development of rural virtue-based governance. By attracting capital inflows, developing digital inclusive finance provides robust support for preserving a strong culture, which draws more talent to study, inherit, and innovate upon traditional rural culture, thus aiding the construction of virtue-based rural governance. Finally, the promotion of digital inclusive finance in rural areas helps foster a sound legal environment. By formulating regulatory frameworks for digital inclusive finance, establishing and refining a credit evaluation mechanism related to agriculture, and incorporating law-abiding behavior into credit assessments, it guides villagers to honor contracts in good faith and operate legally, thereby advancing both the rule of law and civilization in rural areas.

Based on the above analysis, this study proposes Hypothesis 2 as follows: Digital inclusive finance exerts an intermediary effect on digital technology-enabled rural governance.

2.3. Spatial Spillover Effect of the "Fengqiao Experience" Rural Governance Model Empowered by Digital Technology in the New Era

First, digital technology can break the restrictions of traditional administrative regions and geographical boundaries on rural governance's scope [33]; consequently, the experience, technology, and resources of the "Fengqiao Experience" in rural governance in the new era can be shared across a wider region. Relying on blockchain, artificial intelligence, and information and communication technology, governance-related data are standardized and traceable, thus realizing the cross-regional sharing and cooperation of data resources, information, and knowledge [34]; enhancing the ability to cope with social governance risks; and providing efficient and high-quality public services for society. For example, to resolve social contradictions and disputes, the online mediation of cross-border contradictions and disputes is conducted through remote video communication equipment. By virtue of mechanism linkage, contradiction, joint investigation, and information sharing, it provides a platform for parties in conflict and mediators in different regions to resolve problems and promote the timely and rapid resolution of social contradictions across regions.

Second, cross-regional joint prevention and governance stand out as a defining characteristic of the "Fengqiao Experience" in the new era, constituting a pivotal task in modernizing national governance capacity and systems [35]. The application of digital technology in rural governance has given rise to new models, such as online mediation for conflicts and disputes and remote consultations, rendering cross-regional rural governance the new norm. According to public value management theory, information technology and digital governance tools facilitate cross-regional network governance. Rural communities, governments at all levels, and functional departments utilise their respective resource advantages and capabilities to establish cross-regional governance mechanisms, thereby forming a collaborative governance landscape that span regions, hierarchies, and sectors. On the one hand, special rural governance projects organized by government departments utilize a big data governance platform to facilitate vertical integration between government departments and grassroots organizations. These projects ensure the smooth dissemination of policies, services, and information to rural residents by establishing a multilevel digital government service system encompassing provinces, cities, counties, townships, and villages. On the other hand, governments at all levels and village communities have cooperated closely, thereby transcending traditional administrative and geographical boundaries. By adopting an integrated service model that combines "online registration and offline assistance", they have overcome territorial restrictions in service delivery, enabling cross-provincial services and significantly enhancing rural residents' satisfaction with public services.

Third, empowered by digital technology, rural governance demonstrates a notable regional demonstration effect. Through induction, comparison, and integration, the experiences and deficiencies of rural development in this region were analyzed, offering insights and empirical support for enhancing the rural governance levels.

Based on the aforementioned analysis, Hypothesis 3 is proposed as follows: The influence of digital technology on rural governance exhibits a spatial spillover effect, which indicating that digital technology not only markedly

elevates the rural governance level in the region but also significantly and effectively boosts the rural governance level in neighboring areas.

The mechanism chart is as follows, as shown in Figure 1:

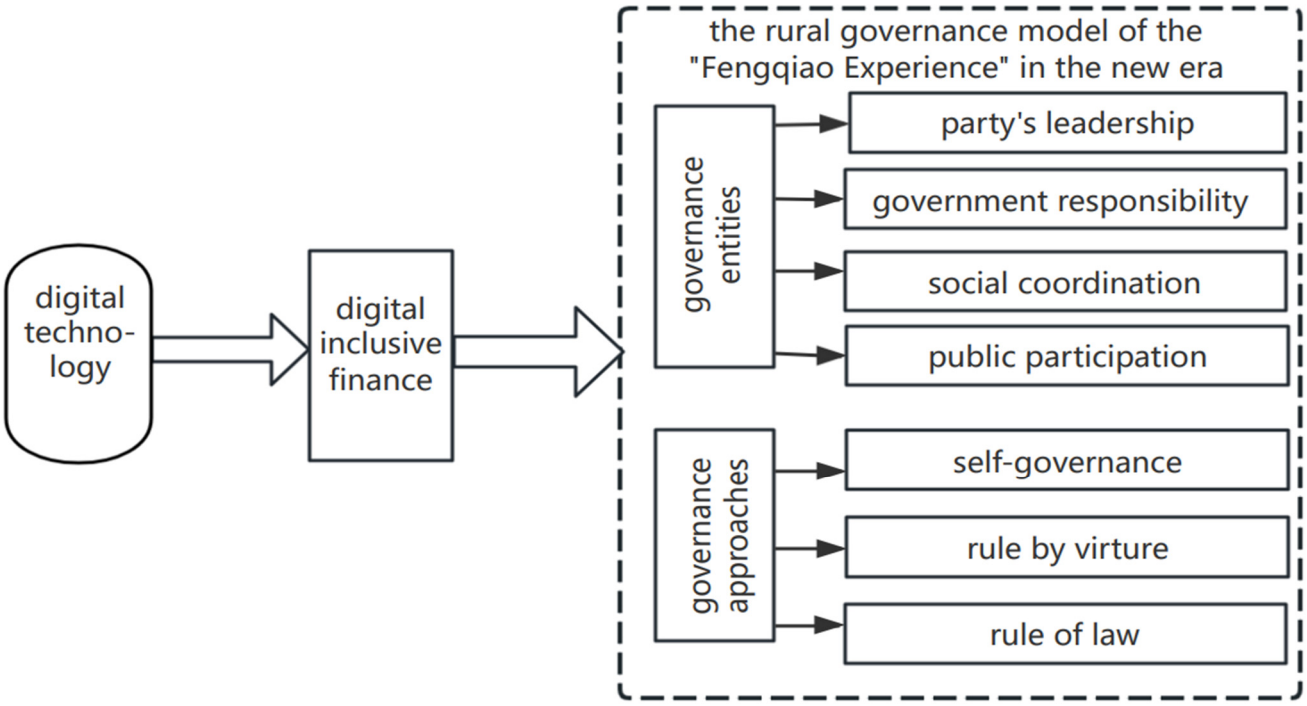

Figure 1. Technical roadmap.

3. Methodology

3.1. Data Source

This study employed panel data spanning the period from 2011 to 2022, encompassing 30 provinces, autonomous regions, and municipalities in China. The data pertaining to rural governance, digital technology, digital inclusive finance, and control variables were derived from various sources, including the website of the National Bureau of Statistics, Peking University's Digital Inclusive Finance Index (2011–2020), EPS China Rural Affairs Database, as well as publications such as the China Statistical Yearbook (2011–2022), China Agricultural Statistical Yearbook, China Civil Affairs Statistical Yearbook, China Procuratorial Yearbook, China Law Yearbook, and China Disabled Persons' Undertakings Statistical Yearbook. Missing values were imputed using interpolation.

3.2. Benchmark Regression Model

Dunleavy proposed that digital governance constitutes a unified entity of social transformation encompassing organizations, politics, and culture [36]. With the impetus provided by digital technology, the rural governance model has undergone further optimization, the mechanism for resolving social contradictions and disputes has matured, and rural social governance capabilities have exhibited comprehensive enhancement. Based on the theory of digital governance, this study assessed the impact mechanism and effects of digital technology on effective rural governance and established the following benchmark regression model:

$$ggo_{it} = \alpha_0 + \alpha_1 dig_{it} + \alpha_c z_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (1)$$

In Formula (1), ggo_{it} represents the rural governance level of the i area in period t; dig_{it} represents the digital technology level of the i region in t; z_{it} represents a series of control variables affecting ggo_{it}, including social organization, financial support for agriculture, marketization degree, agricultural mechanization level, fertilizer use per hectare, years of education of rural residents, and rural collective economic development index; and μ_i and

v_t distributions represent individual and time fixed effects, respectively. By controlling for multidimensional fixed effects to avoid interference from omitted variables, ε_{it} is the random disturbance term.

3.3. Mediating Effect

To explore digital inclusive finance's intermediary effect on rural governance driven by digital technology, based on the benchmark regression model, the linear regression equation of digital technology dig_{it} on digital inclusive finance dif_{it} is constructed as follows:

$$dif_{it} = \beta_0 + \beta_1 dig_{it} + \beta_c z_{it} + \mu_i + \nu_t + \varepsilon_{it} \tag{2}$$

$$ggo_{it} = \gamma_0 + \gamma_1 dif_{it} + \gamma_c z_{it} + \mu_i + \nu_t + \varepsilon_{it} \tag{3}$$

Formula (2) represents the test of digital technology dig_{it} on digital inclusive finance dif_{it} and Formula (3) represents the impact of the mechanism variable digital inclusive finance dif_{it} on rural governance ggo_{it}; whether the mediating effect exists is judged by observing the significance of regression coefficients β_1, β_c, γ_1, γ_2 and γ_c.

3.4. Spatial Effect Model

With socioeconomic development, the application of digital technology in rural governance has given rise to new models, such as contradiction, dispute mediation, and remote consultation, and cross-regional village governance has become the new norm. Digital technology innovation has significant spatial spillover effects. The cross-regional networking construction of rural digital governance big data platforms not only addresses cross-regional social problems but also drives digital governance technology's transformation in the surrounding areas and promotes the improvement of rural governance levels in these areas. Therefore, investigating the spatial correlation and spatial spillover effects of rural governance is of practical significance for further exploring the mechanism and impact of rural governance.

First, the global Moran index was employed to examine whether spatial correlation exists at the overall rural governance level. The index was computed as follows:

$$I = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij} \times (ggo_i - \overline{ggo})(ggo_j - \overline{ggo})}{\sum_{i=1}^{n}\sum_{j=1}^{n} (ggo_i - \overline{ggo})^2} = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij} \times (ggo_i - \overline{ggo})(ggo_j - \overline{ggo})}{S^2 \sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}} \tag{4}$$

ggo_i and ggo_j represent the rural governance index of region i and region j, respectively; n represents the 30 provinces and municipalities studied (excluding Tibet, Hong Kong, Macao, and Taiwan owing to the lack of data); W_{ij} is a different geographic weight matrix. I represents the global Moran index, and when $I \in [-1,1]$, $I > 0$, rural governance indicates a positive spatial correlation. The greater the I value, the stronger the spatial correlation of rural governance in each province; $I < 0$ indicates a negative correlation in the space of rural governance, and the smaller the I value, the greater the difference in the space of rural governance.

Considering the possible spatial spillover effect between rural governance in various regions, a spatial econometrics model was constructed to examine the spatial spillover effect of rural governance. The model is as follows:

$$ggo_{it} = \eta_0 + \rho_1 W ggo_{it} + \eta_1 dig_{it} + \theta_1 W dig_{it} + \eta_2 z_{it} + \theta_c W z_{it} + u_i + \lambda_t + \varepsilon_{it} \tag{5}$$

In the equation, ggo_{it} represents the dependent variable, denoting the rural governance level of province i in year t, W stands for the spatial weight matrix, and ρ_1 is the dependent variable's spatial autocorrelation coefficient. Additionally, θ_1 and θ_c signify the spatial interaction coefficients of the core explanatory variable and control variable, respectively.

3.5. Variable Definitions

3.5.1. Explained Variables

Drawing upon the "Fengqiao Experience" in the new era, to effectively assess the rural governance level in China and establish a multidimensional evaluation index system for rural governance, we selected two primary indicators—namely, rural governance subjects and governance approaches—along with seven secondary indicators, including "Party's leadership", "governmental responsibility", "social coordination", "public participation", "self-governance", "rule by virtue", and "rule of law". These indicators were utilized to construct a comprehensive multidimensional evaluation framework. The entropy method was employed to determine the weights of various tertiary indicators of rural governance across 30 provinces and municipalities in China from 2011 to 2022, as well as the overall rural governance index. This approach helps minimize the measurement errors stemming from subjective assessments. The overall rural governance index is denoted as ggo, with the specifics of the indicators outlined in Table 1.

Table 1. Composite index of the rural governance model of the "Fengqiao Experience" in the new era.

Target Layer	Primary Indicators	Secondary Indicators	Tertiary Indicators	Unit	Attribute	Weight
Rural governance measurement index system *ggo*	Governance entities	Party leadership	Proportion of Party members	%	Positive	0.0419
			Number of village organizations where the same person holds the secretary and director	Each	Positive	0.0360
		Governance responsibility	Number of township waste transfer stations	Each	Positive	0.0377
			New green space area	Hectare	Positive	0.0454
			Township sewage treatment capacity	10,000 cubic meters	Positive	0.0533
			Local fiscal expenditure/total population of each province	%	Positive	0.0202
			administrative fees/revenue	%	Negative	0.0367
		Social coordination	Number of social groups in agriculture and rural development	Each	Positive	0.0319
			Number of employees in rural private enterprises	Ten thousand people	Positive	0.0331
		Public participation	Voting participation in village committee elections	%	Positive	0.0836
			Number of meetings of villagers' representatives	Number of times	Positive	0.0238
	Governance approaches	Self-governance	Number of village clinics	each	Positive	0.0717
			Per capita expenditure on agriculture, forestry, and water	RMB 100 mn	Positive	0.0726
			Per capita local fiscal expenditure on urban and rural community affairs	RMB 100 mn	Positive	0.0464
		Rule by virtue	Number of rural cultural stations	Each	Positive	0.0724
			Number of village disabled persons' associations	Each	Positive	0.0230
			Number of rural pension institutions	Each	Positive	0.0476
			Rural performances by art performance groups	Number of times	Positive	0.0271
		Rule of law	Number of lawyers per province/rural population	/	Positive	0.0358

	Government investment in ecological construction and protection	RMB 100 mn	Positive	0.0325
	Number of crimes per province/total population per province	/	Negative	0.0325

From the perspective of governance entities, the Party's leadership serves as the fundamental principle in adhering to and developing the "Fengqiao Experience" in the new era. By examining the exemplary role of Party members and leadership of Party organizations in rural affairs, we selected "proportion of Party members" and "number of village organizations where the secretary and director are held by the same person" as the tertiary indicators for "Party's leadership". Government accountability is a robust safeguard for the effective functioning of our rural governance model, the "Fengqiao Experience" in the new era. Considering government environmental governance and administrative efficiency, we selected "number of township transfer stations", "new green space area", "township sewage treatment capacity", and "local fiscal expenditure/total population of each province" as the tertiary indicators for "administrative fees/revenue" to gauge the government's management of rural society. Social collaboration constitutes an integral part of our rural governance model, measuring the involvement of major social organizations in rural affairs. We utilized "number of social groups in agriculture and rural development" and "number of employees in rural private enterprises" as the tertiary indicators for "social coordination" to assess the collaborative participation level of social forces in rural governance. Mass participation forms the cornerstone of our model and is an indispensable force for social stability. We employed "voting participation in village committee elections" and "number of meetings of villagers' representatives" to measure the extent of public participation in rural social governance.

From the perspective of governance approaches, self-governance stands as the primary manifestation of our model. For formulating village economic development plans and advancing public utility projects, indicators such as the number of village-run health clinics, per capita expenditure on agriculture, forestry, and water affairs, and per capita expenditure on local fiscal affairs related to urban and rural communities are selected to gauge the level of rural "self-governance". Virtue-based governance is a vital component of our rural governance model. Regarding cultural promotion, assistance for individuals with disabilities, pension services, and the promotion of arts and literature in rural areas, metrics such as "number of rural cultural stations", "number of village people with disabilities' associations", "number of rural pension institutions", and "rural performances by performance groups" were selected as tertiary indicators to assess the level of "rule by virtue" in rural communities. The rule of law is a fundamental principle of rural governance. Concerning legal service quality and the effectiveness of legal system development, indicators such as "number of lawyers per province/rural population", "government investment in ecological construction and protection", and "number of criminals divided/total population per province" were selected as tertiary indicators to evaluate the level of "rule of law" in villages.

3.5.2. Explanatory Variables

Digital technology streamlines government governance processes and enhances public participation in social governance, thus emerging as a novel governance approach aimed at delivering high-quality public services. Inherently linked to specific institutional environments, digital technology has evolved in tandem with changes within these environments. This study assessed the level of digital technology development by examining the number of digital economy patent applications across provinces. The volume of digital patents not only underscores technological innovation and R&D investment but also reflects the digital governance's effectiveness and market competitiveness. As the portfolio of digital patent technologies expands, an increasing number of patents are being filed and implemented in rural governance, offering robust technical support and fostering innovation in our rural governance model. For instance, leveraging big data and cloud computing technologies enables the real-time analysis and processing of diverse data in rural governance, providing a scientific foundation for optimal resource allocation and enhancing the efficiency of rural governance.

3.5.3. Control Variables

To analyze digital technology's impact on rural governance more comprehensively, other variables that potentially affect rural governance were controlled for. The marketization degree, agricultural mechanization level, disposable

income of rural residents, rural ecological environment, educational level of rural residents, rural collective economy, and population structure were selected as control variables for the analysis, as follows:

Degree of marketization (mar). Rural marketization is a phenomenon that cannot be neglected in rural governance. Through the market competition mechanism, the government screened the best social services, innovated the path to rural governance, and improved rural governance efficiency. Simultaneously, marketization may precipitate potential problems such as disputes over the allocation of rural public resources and contradictions between government governance and villagers' autonomy. The marketization index constructed by Fan Gang [37] reflects marketization's impact on rural governance.

Agricultural mechanization level (mec). The large-scale application of machinery in agriculture significantly reduces labor time and enhances agricultural labor productivity. The advancement of agricultural mechanization substantially influences the adjustment of agricultural structures, amelioration of rural living environments, and the upgrading of farmers' quality of life. The total power of agricultural machinery was selected as an indicator to gauge the agricultural mechanization level.

Per capita disposable income of rural residents (rev). Rural governance's effectiveness must be measured by the impact of equity distribution among different stakeholders on the increase in rural residents' income and the use of disposable income of rural residents to reflect the impact of villagers' income on the level of rural governance.

Fertilizer usage per hectare (fer). Improvement in the rural ecological environment exerts a positive impact, enhancing rural talent cohesion and capital attraction. The use of chemical fertilizers—divided by the area of cultivated land—reflects the rural ecological environment's role in rural governance.

Years of education of rural residents (edu). Education is crucial for advancing the modernization of rural governance capabilities, preserving rural traditional culture, and harnessing rural talent capital. The proportion of individuals in rural areas with a high school diploma or higher education is employed as a metric to gauge the influence of rural residents' educational attainment on rural governance [38].

Rural collective economic development (col). Developing a rural collective economy plays a significant role in promoting rural governance. The income from the rural collective economy can be utilized to improve rural infrastructure, provide public services, and enhance rural governance. Developing a rural collective economy promotes democratic management, enhances the cohesion and centripetal force of villagers to participate in rural affairs, fosters a conducive governance atmosphere, helps reduce social contradictions and ensure rural social harmony and stability, and promotes improvement in the rural governance system. Referring to the rural collective development index constructed by Chen et al., it reflects the mechanisms of collective economic development in rural governance [39].

Population structure (str). The change in population structure has a significant impact on the supply of the rural labor force, consumption mode, demand for social services, and cultural inheritance. The rural population outflow has caused significant problems, such as aging and left-behind children, which are associated with rural economic development and social stability. The proportion of the population aged 60 years and older was employed to measure the population structure and reflect the aging level.

3.5.4. Mediating Variables

Digital inclusive finance (dif): Digital inclusive finance enables rural residents to obtain financial services more easily. With its wide coverage and strong penetration, digital inclusive finance enables financial services to benefit the broadest rural areas, provides multidimensional social information for rural governance decision-making through intelligent financial services, and effectively helps improve the efficiency of rural social governance. Referring to Fu and Yi, the provincial-level "digital inclusive financial index" released by the Digital Inclusive Financial Center of Peking University was selected to measure the development level of digital inclusive finance [40].

4. Measurement and Empirical Analysis

4.1. Measurement of Digital Technology Development Level

The ArcGIS 10.8 software was used to visually represent the level of digital technology development across 30 provinces in China from 2011 to 2022, as depicted in Figure 2. Between 2011 and 2022, China witnessed a steady annual enhancement in the development of digital technology. Concerning provincial development levels, China's digital technology advancement exhibited a distinct pattern: East > Central > West > Northeast. Guangdong, Jiangsu, Zhejiang, Beijing, and Shanghai occupy the top five spots in terms of digital technology development nationwide. Notably, Guangdong leads the pack, with 277,096 digital technology patents in 2022. However, regarding the highest

number of digital technology patents in a single year, Qinghai holds the record with 35 patents in 2011. Meanwhile, pronounced regional disparities prevail in China's digital technology development. Currently, the eastern region significantly outpaces the central, northeastern, and western regions. This is attributed to the east region's comprehensive support for data-technology-related industries, substantial technology accumulation, governmental policy backing, and an open business environment, positioning it at the forefront of national digital technology development.

Figure 2. Development trend of provincial digital technology from 2011 to 2022. Data source: National Geographic Information Public Service Platform, Tianditut.gov.cn(Date: 20 May 2025). The review number for the map of provinces, cities, and counties in China in the "Tianditu" version is GS (2024) 0650.

4.2. Measurement of the Composite Index of the "Fengqiao Experience" Rural Governance Model in the New Era

From 2011 to 2022, our rural governance model's composite index has increased year by year; the development level of the main sub-system of rural governance has steadily risen from 0.1537 in 2011 to 0.2411 in 2022. In recent years, our rural governance model has demonstrated a vigorous development trend of diversified co-governance, forming a social governance pattern that involves the participation of Party organizations, government, society, market, and other stakeholders. As a result, the efficiency of grassroots social governance has been significantly improved. Party leadership has played a central role in leading rural governance, creating a fair and honest environment, and constantly improving the organizational strength and cohesion of grassroots Party organizations by strengthening their construction at the county, township, and village levels, selecting the best candidates, and enhancing the effectiveness of the secretaries of village Party organizations. The government has played a crucial role in leading rural governance, providing a solid material foundation by continuously increasing investment in rural infrastructure construction and promoting the equalization of basic public services in rural areas through improvements in the level of public services, such as education, medical care, and culture, in rural areas. Mass participation plays an important role in leading rural governance and broadening investment channels by attracting social elites and entrepreneurs to invest in rural construction projects. Intellectual support for rural governance is provided by encouraging Xinxiang sages and rural elites to participate in the management of rural public affairs. Social organizations are playing an increasingly important role in leading rural governance, utilizing their professional expertise in areas such as nurseries, pensions, sports, psychological counseling, and other aspects to provide diversified professional services to rural areas. For example, trusteeship social

organizations help reduce the pressure on rural residents to raise their children by conducting general education activities for rural left-behind children during the summer. Through mutual counselling organizations, psychological intervention is conducted for rural residents in distress to help re-establish a positive and healthy outlook on life.

The subsystem of rural governance modes has witnessed the most rapid development, surging from 0.2844 in 2011 to 0.5 in 2022, as shown in Figure 3. In recent years, China's rural governance has been continually optimized under the principles of integrating autonomy, the rule of virtue, and the rule of law, thereby providing a strong impetus for the harmonious, stable, and prosperous development of rural areas. Enhancing the villagers' autonomy system, strengthening their autonomous organizations, and implementing democratic elections, consultations, decision-making processes, management, and supervision have ensured the transparency and openness of the decision-making process. Various channels have been leveraged to mobilize villagers' enthusiasm for participating in rural governance, encouraging them to engage in formulating and enforcing village rules and regulations. Rural elites and capable individuals are empowered to lead by example, inspiring villagers to participate in rural constructions actively. By intensifying legal publicity and education, villagers' awareness and understanding of the rule of law have been improved, ensuring that rural governance is grounded in law. By strengthening law enforcement in rural governance and establishing a comprehensive rural public legal service system, convenient legal services can be provided to villagers. By severely cracking down on rural gangs, tyrants, and ruffians, the harmony and stability of rural societies have been maintained. By tapping into traditional Chinese culture, villagers have been guided to establish correct moral values, and village rules and regulations have been improved. The exemplary and leading role of new rural elites in rural governance has been leveraged. By constructing a governance system that integrates autonomy, the rule of virtue, and the rule of law, innovations in rural governance have been promoted, driving the comprehensive progress and harmonious development of rural society.

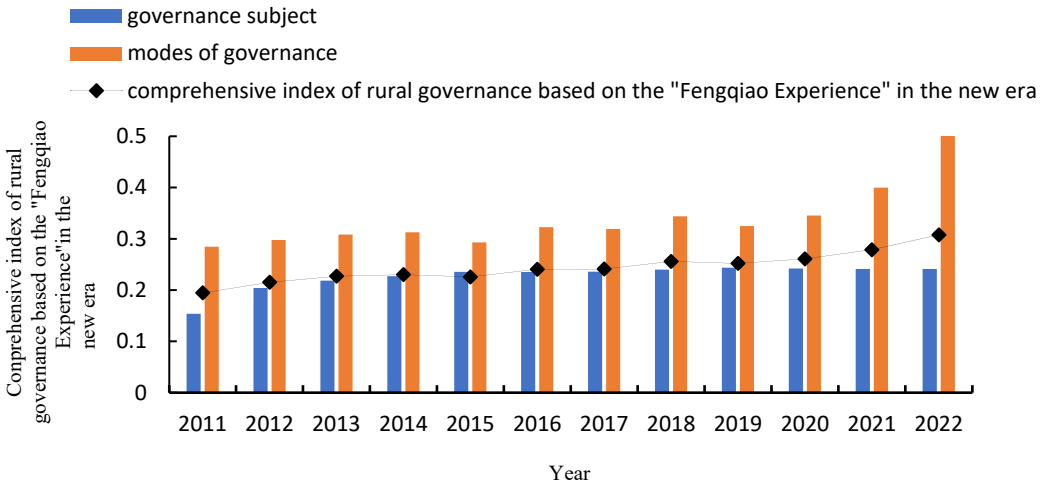

Figure 3. Time series evolution characteristics of the composite index of the "Fengqiao Experience" rural governance model in the new era.

To further investigate the regional differences and fluctuations in our model, based on the comprehensive index and index variance of rural governance across 30 provinces, regions, and cities in China, a bar graph and a broken line graph of the cross-section evolution trend and fluctuation variance are drawn, as depicted in Figure 4.

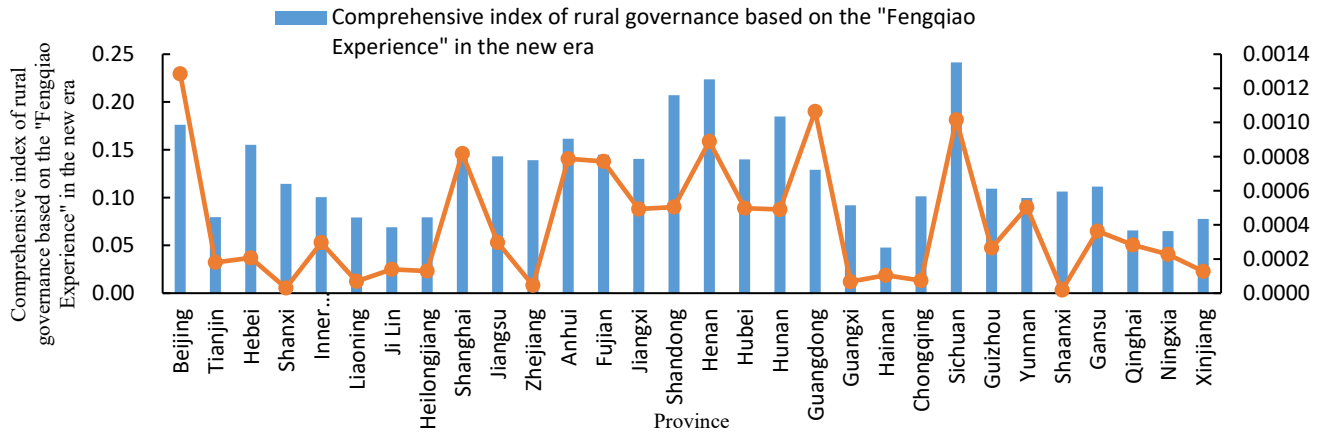

Figure 4. Cross-sectional evolution trend and fluctuation variance of a comprehensive rural governance index.

As evident from Figure 4, our rural governance model varies across the 30 provinces, autonomous regions, and municipalities. During the sample observation period, Sichuan, Henan, and Shandong ranked first with the highest composite index at 0.241, 0.223, and 0.207, respectively. Conversely, Hainan, Ningxia, and Qinghai ranked at the bottom, with the lowest comprehensive development indices of 0.047, 0.064, and 0.065, respectively.

Notably, the areas with a high composite development level highly overlap with traditional agricultural areas in China and areas with deep Confucian traditional culture infection—such as Henan, Shandong, Jiangsu, and other provinces in traditional agricultural areas with relatively dense populations—and are deeply affected by Confucian culture, especially the "hometown of Confucius and Mencius" in Shandong. Areas with a low composite index, such as Qinghai, Xinjiang, Ningxia, and other provinces, are predominantly in ethnic areas; the degree of exposure to traditional Confucian culture is relatively low, and they have their own unique ethnic cultural customs. The areas with large variances, such as Shanghai, Guangdong, Beijing, and other places, are primarily at the forefront of economic development and special administrative zones, with diverse industrial structures, fierce cultural collision, more active organizational and institutional innovation, continuous reform and innovation in governance methods, and participation of governance subjects; moreover, the rural governance level has changed considerably. In areas where the variance has changed less, such as Shanxi, Shaanxi, and other places, the industrial structure is relatively stable and has been influenced by traditional culture for a long time. The governance mode is predominantly stable, and the rural governance level has changed less.

5. Results and Analysis

5.1. Spatial Correlation Test

According to the analysis of the previous mechanism, digital technology's impact on rural governance exerts a spatial spillover effect. Using the global Moran index and a spatial econometrics model, the spatial correlation between digital technology and rural governance and as well as digital technology's spatial effect on adjacent rural governance is analyzed, which is of practical significance for the coordinated development of rural governance between regions.

Table 2 presents the global Moran's index of digital technology and rural governance levels in 30 provinces, autonomous regions, and municipalities in China from 2011 to 2022. The index exhibited a significantly positive trend during the inspection period, with an overall upward volatility trend. The Moran's index of digital technology was 0.265 in 2011, 0.299 in 2016, and 0.3823 in 2022, indicating a strong positive spatial correlation between the level of digital technology in China's provinces. The Moran's index of rural governance was significantly positive during the survey period and exhibited an overall upward trend in volatility. In 2011, the overall Moran's I index of rural governance was 0.373. In 2016, that of digital technology was 0.412, which increased to 0.462 in 2022, indicating that there is a strong spatial positive correlation between the level of good governance in rural areas at the national and provincial levels. The spatial agglomeration characteristics are evident, which is consistent with the construction of a spatial econometric model type of conditions.

Table 2. Moran's index of digital technology and rural governance in 30 provinces, autonomous regions, and cities in China from 2011 to 2022.

	Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Digital technology	Moran's I	0.265	0.254	0.270	0.292	0.309	0.299
	Z value	3.224	3.133	3.261	3.592	3.337	3.711
	P value	0.000	0.000	0.000	0.000	0.000	0.000
	Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
	Moran's I	0.293	0.372	0.384	0.371	0.378	0.382
	Z value	3.588	3.556	3.378	3.283	3.392	3.403
	P value	0.000	0.000	0.000	0.000	0.000	0.000
Rural governance	**Year**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
	Moran's I	0.373	0.381	0.328	0.347	0.412	0.412
	Z value	3.628	3.371	3.482	3.748	3.972	3.746
	P value	0.000	0.000	0.000	0.000	0.000	0.000
	Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
	Moran's I	0.423	0.432	0.438	0.447	0.456	0.462
	Z value	3.847	3.736	4.183	4.273	4.347	4.827
	P value	0.000	0.000	0.000	0.000	0.000	0.000

To further analyze the spatial autocorrelation characteristics of rural governance, a Moran index scatter plot of rural governance in 2015, 2018, and 2020 (Figure 5) was drawn.

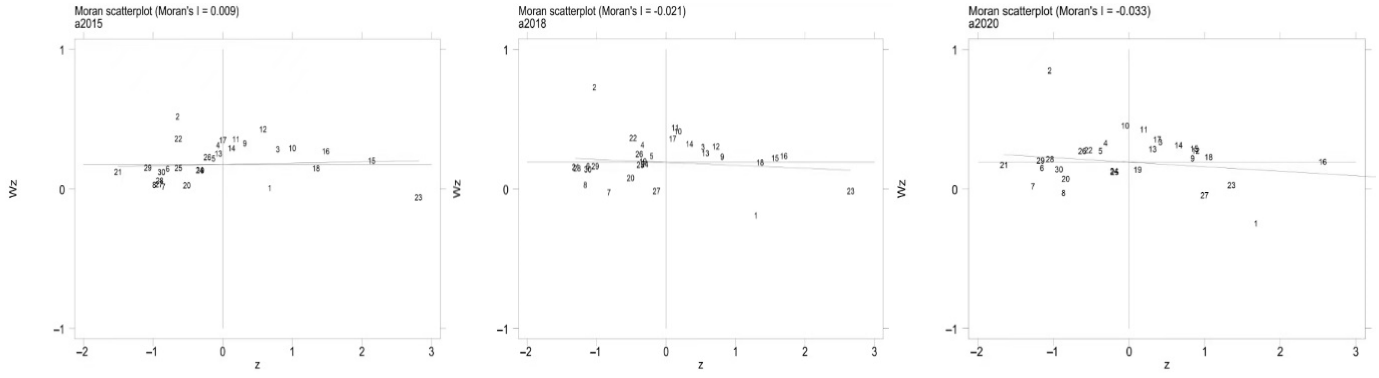

Figure 5. Scatter chart of rural governance in 30 provinces, regions, and cities in China in 2015, 2018, and 2020.

As shown in the scatter plot of rural governance in Figure 5, the scatter in most provinces is concentrated in the first and second quadrants, with relatively fewer provinces in the third and fourth quadrants. Among them, Shandong, Henan, and Zhejiang are relatively stable in the first quadrant (HH), which constitutes a highly empowered area of rural governance. Shandong promotes the high-quality development of rural governance by adhering to the modern village governance mechanism of "branch command and main division of labor". Henan Province has improved the efficiency of rural public management and achieved the rural collective economy's healthy and stable development by establishing a digital rural comprehensive service center and a rural collective assets supervision and management platform. Zhejiang Province continues to deepen rural construction and accelerate the improvement of rural living environment and diversified development of rural industries. Tianjin, Yunnan, Ningxia, and Guizhou are stable in the second quadrant (LH), indicating that the level of rural governance development in these provinces is lower than that in neighboring provinces. Qinghai, Jilin, Heilongjiang, and Xinjiang are relatively stable and concentrated in the third quadrant (LL), and the rural governance level in these areas is low due to the limitations of natural geographical conditions and economic development level. Hunan, Hubei, and Sichuan are relatively stable in the fourth quadrant (HL), and these provinces have formed some high-level rural governance areas. For example, Yunxi County, Hubei Province, has effectively improved the rural governance level by innovating the rural governance mode, strengthening normative guidance, and emphasizing the demonstration and leading role of Party building. However, due to the regional economy's uneven development, high-level areas of rural governance have failed to effectively promote the development of rural governance in the surrounding areas, forming a spatial imbalance.

5.2. Selection and Verification of Spatial Econometric Models

The above analysis indicates that rural governance has a spatial effect, and spatial metrology methods are suitable for analysis. Furthermore, through the LM and Hausman tests, the specific form of the spatial metrology model is further determined, and Table 3 presents the results. The values of lmlag, robustlmlag，lmerr and robustlmerr all pass the significance test of 1%, according to the Lagrange multiplier method, both SEM and LM models can be used. The Hausman test result is 73.28, which is significant at the 1% level, indicating that the fixed effect model is more reasonable.

Table 3. Test results of LM and Hausman.

Test	Statistic
LM-lag test	12.353 ***
Robust-LM-lag test	19.362 ***
LM-err test	6.777 ***
Robust-LM-err test	12.381 ***
Hausman	73.28 ***

Note: *** indicate significance at the level of 1% respectively.

To determine whether the spatial Dubin model cannot be transformed into a spatial error model or spatial lag model through Wald and likelihood ratio LR tests, as shown in Table 4. All test results passed the 1% significance level test, indicating that the spatial Dubin model can't be transformed into a spatial error or a spatial lag model. Therefore, the spatial Dubin model was selected as the optimal model.

Table 4. Fitting results of spatial model.

	Spatial Fixed Effect	Time Fixed Effect	Double Fixed Effect
sigma2	0.01	0.03	0.01
R2	0.98	0.92	0.99
log-likelihood	426.21	173.62	535.87
wald-spatial-lag	91.37 ***	102.27 ***	42.26 ***
wald-spatial-error	37.48 ***	124.43 ***	38.46 ***
LR-spatial-lag	72.36 ***	103.72 ***	36.65 ***
LR-spatial-error	46.78 ***	109.76 ***	32.86 ***

Note: *** indicate significance at the level of 1% respectively.

Finally, according to the statistics of each effect of the spatial Dubin model, the optimal model is selected. According to the results in Table 4, the sigma2 value of the spatial Dubin double fixed effect is 0.01, the log-likelihood value is 537.87, and the R2 value is 0.99, which is the optimal fitting result among the three models. Therefore, the spatial Dubin double fixed effect model can better capture the spatial effects of digital technology on rural governance.

5.3. Analysis of Spatial Durbin Model Results

Model (1) presents digital technology's impact on rural governance without adding the control variables. The regression coefficient for digital technology is 0.357, significant at the 1% level, indicating that digital technology has a significant positive impact on rural governance. Thus, Hypothesis 1 is verified. According to digital governance theory, digital technology has reshaped the relationship between government and society, establishing a platform for collaborative governance among individuals, governments, and organizations. It enhances collaborative governance capabilities, invigorates market entities, simplifies administrative procedures through interactive information processing, and serves as a hub for comprehensive digital governance at the grassroots level. This hub provides a powerful impetus for the comprehensive upgrading of rural grassroots governance. By predicting and perceiving data it supports scientific decision-making in rural governance, significantly boosts the efficiency of public services, and introduces a novel model that transcends time, space, and regional boundaries to resolve social conflicts and disputes.

The spatial autoregressive coefficient ρ in the model is positive and significant at the 1% level, indicating that the improvement of rural governance in the local area drives the improvement of rural governance in the surrounding areas. This suggests that rural governance has a positive spatial correlation, and the advanced governance model in the local

area has become an object of emulation for rural areas in the surrounding areas, providing a replicable governance template and practical samples for the surrounding areas. Through industrial cooperation and cultural mutual learning, a governance network for regional coordinated development is constructed, ultimately promoting the modernization of overall rural governance, the results are shown in Table 5.

Table 5. Benchmark regression analysis.

	(1)	**(2)**
Digital technology	0.357 ***	0.425 ***
	(0.127)	(0.146)
W × Digital technology	0.231 ***	0.324 ***
	(0.004)	(0.006)
ρ		2.138 ***
		(0.042)
σ^2		0.0001 ***
Marketization level		0.015
		(0.010)
Agricultural mechanization level		0.015 ***
		(0.001)
Rural residents' disposable income		0.025 *
		(0.011)
Rural ecological environment		0.250 **
		(0.115)
Educational level of rural residents		−0.006
		(0.004)
Rural collective economy		1.611 ***
		(0.345)
Population structure		0.002 **
		(0.001)
Province	Yes	Yes
Year	Yes	Yes
Observations	360	360
R-squared	0.866	0.895

Note: The robust standard errors in parentheses are significant at the 1%, 5%, and 10% levels for ***, **, and *, respectively, the parentheses indicate the robust standard error.

From the perspective of the control variables, the regression coefficient for the agricultural mechanisation level is 0.015, significant at the 1% level. The improvement in agricultural mechanization level enhances agricultural production efficiency, which is of great significance for optimizing the agricultural industrial structure and promoting an improvement in the rural governance level. The regression coefficient of rural residents' disposable income is 0.025, significant at the 10% level. With an increase in the disposable income of rural residents, villagers have more funds to invest in improving rural infrastructure and the ecological environment, as well as enhancing the rural living environment, and farmers' sense of social responsibility and enthusiasm to participate in rural governance. The regression coefficient for the rural ecological environment is 0.250, significant at the 5% level, indicating that excessive use of chemical fertilizers causes environmental pollution, increases the difficulty and cost of governance, and is not conducive to improving the rural governance level. The regression coefficient for the rural collective economy is 1.611, significant at the 1% level. By introducing a modern enterprise management system, such as the establishment of the Council and board of supervisors, the new rural collective economy has enhanced the collective economy's management level and scientific decision-making and effectively improved rural governance's democratization level through the broad participation of the masses in the decision-making and management of collective economic organizations. The regression coefficient of population structure is 0.002, significant at the 5% level. The number of older adults over 60 years of age in rural China is high. Overall, 120 million people aged 60 years and older live in rural areas, accounting for 23.81% of the total rural population. The work and lives of older adults in rural areas support the stable development and improvement of rural governance levels.

5.4. Spatial Effect Decomposition

From the perspective of the spatial economic geographic weight matrix, the total-effect regression coefficient of digital technology on rural governance is 0.623, significant at the 1% level. The regression coefficient for digital technology's direct effect is 0.381, significant at the 1% level, indicating that digital technology has a positive impact on the improvement of rural governance levels in this region. Simultaneously, the regression coefficient of digital technology for the indirect effect is 0.242, also significant at the 1% level, indicating that digital technology plays a positive role in promoting the improvement of rural governance in surrounding areas, the results are shown in Table 6.

Table 6. Spatial spillover effect analysis

	Direct Effect	Indirect Effect	Total Effect
Digital technology	0.381 **	0.242 ***	0.623 ***
	(0.171)	(0.020)	(0.031)
Observations	360	360	360
R-squared	0.86	0.86	0.86

Note: The robust standard errors in parentheses are significant at the 1% and 5% levels for ***, **, and respectively, the parentheses indicate the robust standard error.

Digital technology has the characteristics of high permeability,realizes cross-regional, cross-temporal, and spatial collaborative rural governance. It constructs a new model of digital rural governance through the regional digital governance platform of city, county, and township linkage; and comprehensively improves the rural governance level. In sum, Hypothesis 3 is supported.

5.5. Endogeneity Test

To address the endogeneity issues present in benchmark regression models, particularly the existence of reverse causality, where a higher level of rural governance suggests an efficient digital technology application environment and relatively comprehensive digital infrastructure in the area, thereby enhancing digital technology advancement. To mitigate endogeneity bias, firstly, we followed the methodology of Arellano and Bond (1991), employing the first- and second-order lagged terms of the explanatory variables as instrumental variables for GMM estimation. The outcomes are presented in the first and second columns of Table 7 [41].

Table 7. Endogenous test.

	Explanatory Variable Lags behind by One Period	Explanatory Variable Lags behind by Two Period	Instrumental Variables Two-Stage Least Squares Test
Digital technology	0.436 ***	0.457 ***	0.582 ***
	(0.115)	(0.122)	(0.161)
Control variable	Yes	Yes	Yes
Time dummy variable	Yes	Yes	Yes
Provincial dummy variable	Yes	Yes	Yes
Observations	360	360	360
R^2	0.872	0.846	0.835

Note: The robust standard errors in parentheses are significant at the 1% levels for *** respectively, the parentheses indicate the robust standard error.

Secondly, utilizing the number of Internet broadband access ports as an instrumental variable to conduct an endogeneity test on the model. Through a correlation coefficient test, it was revealed that the correlation coefficient between the number of Internet broadband access ports and digital technology stands at 0.4572, significant at the 1% level, indicating a strong correlation between the two. The results of the endogeneity test are displayed in the third column of the table. The findings indicate that, even after accounting for endogeneity issues, digital technology continues to make a significant contribution to the enhancement of rural good governance.

5.6. Robustness Check

To enhance the stability of the empirical results, five methods were used to test robustness. Table 8 presents the results. First, referring to the GLS test method using the replacement model, the results reveal that digital technology has a positive impact on rural governance, and digital technology's regression coefficient is 0.499, significant at the 1% level. The control variables have a significant positive impact on rural governance at different significant levels. Second, using the method of replacing the core explanatory variable, the number of digital economy patents in each province is replaced by the Internet penetration rate, and digital technology's regression coefficient is 0.334, significant at the 1% level.

Table 8. Robustness test.

	GLS	Replace Core Explanatory Variable	Excluding the COVID-19 Pandemic's Impact	Excluding Municipalities	The Dependent Variable Lags behind by One Period
Digital technology	0.499 ***	0.334 ***	0.352 ***	0.526 ***	0.451 ***
	(0.027)	(0.023)	(0.114)	(0.119)	(0.103)
Control variable	Yes	Yes	Yes	Yes	Yes
Time dummy variable	Yes	Yes	Yes	Yes	Yes
Provincial dummy variable	Yes	Yes	Yes	Yes	Yes
Observations	330	360	300	324	330
R^2	0.881	0.983	0.852	0.862	0.874

Note: The robust standard errors in parentheses are significant at the 1% levels for *** respectively, the parentheses indicate the robust standard error.

Third, to exclude the COVID-19 pandemic's influence, the two years (2020 and 2021) that were significantly impacted are excluded, and the samples are re-regressed. The coefficient of digital technical variables is 0.352, significant at the 1% level. Additionally, considering the differential impact of policy preferences brought about by administrative grade factors on rural governance in the region, the sample method excluding municipalities directly under the central government is employed for regression. The digital technology's regression coefficient is 0.526, significant at the 1% level. Finally, robustness tests were conducted using lagged dependent variables, and the results showed that digital technology has a positive impact on rural good governance, with a regression coefficient of 0.451 and a significance level of 1%.

5.7. Mediating Effect

To further confirm whether digital inclusive finance is the mechanism whereby digital technology enables rural governance, this study assesses its intermediary effects on rural governance. Table 9 presents the test results of digital technology's impact on rural governance.

Table 9. Intermediary effect analysis.

	Digital Inclusive Finance	Rural Governance Model of "Fengqiao Experience" in the New Era
Digital technology	1.094 ***	0.425 ***
	(0.274)	(0.108)
Control variable	Yes	Yes
Time dummy variable	Yes	Yes
Provincial dummy variable	Yes	Yes
Observations	360	360
R^2	0.880	0.803

Note: The robust standard errors in parentheses are significant at the 1% levels for *** respectively, the parentheses indicate the robust standard error.

Table 9 indicates that digital technology's regression coefficient to digital inclusive finance is 1.0944; it is significantly positive at the 1% level, indicating that digital technology's development can significantly improve the

level of digital inclusive finance. Digital technology has effectively reduced the cost of financial services, reshaped the mode of financial services, and improved the efficiency of these services. The development of digital technology is conducive to enhancing the innovative added value of financial products, assisting financial institutions to optimize the layout of offline physical outlets, effectively improving payment efficiency, promoting the development of inclusive finance, restraining financial fraud by enhancing bank competition and information diffusion, and improving financial security.

5.8. Heterogeneity Analysis

5.8.1. Analysis of Heterogeneity Based on the Rural Population's Size in Each Province

According to human capital theory, the rural population's size significantly influences rural industrial development, social patterns, and the rural governance level [42]. Varying rural population sizes result in vastly different scenarios in rural social governance. In regions with smaller rural populations, villages are often situated far apart, thereby increasing costs for establishing a digital infrastructure. Furthermore, diverse social customs and governance situations in villages significantly affect the degree of digital technology adoption. Conversely, in regions with larger rural populations, agglomeration effects are more likely to emerge, facilitating the use of big data governance platforms to effectively analyze and precisely address various aspects of rural residents' lives. Therefore, analyzing heterogeneity within rural populations is of utmost importance.

To examine whether digital technology's impact on rural governance is affected by the rural population's scale, taking its number in each province as the standard of heterogeneity analysis, its scale in 30 provinces, autonomous regions, and cities in 11 years was sorted from high to low and divided into five groups—namely, the T1, T2, T3, T4, and T5 regions. Among them, T1 covers Henan, Shandong, Sichuan, Guangdong, and Hebei provinces; T2 covers six provinces of Anhui, Gansu, Yunnan, Guangxi, Hubei, and Jiangxi; T3 covers six provinces of Guizhou, Zhejiang, Shaanxi, Shanxi, Fujian, and Gansu; T4 covers six provinces, regions, and cities in Liaoning, Heilongjiang, Xinjiang, Chongqing, Jilin, and Inner Mongolia; and T5 covers six provinces, regions, and cities, namely, Hainan, Ningxia, Beijing, Qinghai, Shanghai, and Tianjin. The five regions were regressed individually, and the results are presented in Table 10.

Table 10. Analysis of heterogeneity based on rural population in each province.

	T1	T2	T3	T4	T5
Digital technology	2.218 ***	1.009 ***	0.166 ***	0.167 ***	0.140 ***
	(0.779)	(0.273)	(0.201)	(0.141)	(0.124)
Control variable	Yes	Yes	Yes	Yes	Yes
Time dummy variable	Yes	Yes	Yes	Yes	Yes
Provincial dummy variable	Yes	Yes	Yes	Yes	Yes
Observations	72	72	72	72	72
R-squared	0.956	0.968	0.953	0.974	0.982

Note: The robust standard errors in parentheses are significant at the 1% levels for *** respectively, the parentheses indicate the robust standard error.

Among the five groups of regions, the estimated coefficients for the T1, T2, T3, T4, and T5 regions were significantly positive at different levels, indicating that the larger the rural population, the stronger the positive impact of digital technology on rural governance [43,44]. Among them, digital technology exerts the most significant impact on T1, with a coefficient of 2.218, significant at the 1% level, whereas digital technology's impact on T5 is the weakest, with a coefficient of 0.1527, significant at the 1% level. On the one hand, a larger rural population implies that digital technology has bigger audiences, which amplifies its regional radiation effect on rural governance. On the other hand, the increase in rural population has also increased the difficulty and frequency of social governance. Complex social governance cases offer massive data resources for optimizing digital systems and further promote the optimization and upgrading of digital rural governance systems.

5.8.2. Analysis of Heterogeneity Based on the Support of Local Government Financial Science and Technology Activities

Local government support for scientific and technological activities has a significant influence on digital rural governance. Local fiscal expenditures on science and technology actively promote the development of digital rural infrastructure, integration and innovation of digital governance systems, and attraction of digital governance talent. The democracy and transparency of rural governance have been enhanced by leveraging big data technology to achieve the

real-time collection, analysis, and application of rural governance data, effectively facilitating the innovation of the rural governance model of the "Fengqiao Experience" in the new era. Guided by local fiscal expenditures on science and technology, the government can introduce more policies and measures, such as tax incentives and financial support, thereby attracting widespread participation from all sectors of society in digital rural construction and fostering a positive scenario of diversified co-governance among governments, enterprises, and society.

To assess whether local fiscal science and technology expenditure affects the impact of digital technology on rural governance, considering the amount of local fiscal science and technology R&D expenditure as a measure, the expenditure for the same purpose in 30 provinces and regions over 11 years is averaged and ranked from the highest to the lowest. Based on this standard, the places of 30 provinces are ranked from high to low and divided into the following five groups: the U1, U2, U3, U4, and U5 regions. Among them, U1 covers six provinces, regions, and cities in Guangdong, Jiangsu, Shanghai, Zhejiang, Beijing, and Anhui; U2 covers six provinces, regions, and cities in Shandong, Hubei, Henan, Sichuan, Hunan, and Jiangxi; U3 covers six provinces, regions and cities of Tianjin, Fujian, Liaoning, Guizhou, Hebei, and Shaanxi; U4 covers Chongqing, Guangxi, Shanxi, Yunnan, Heilongjiang, and Xinjiang; and U5 covers six provinces, autonomous regions, and cities of Jilin, Inner Mongolia, Gansu, Ningxia, Hainan, and Qinghai. Table 11 presents the results.

Table 11. Analysis of heterogeneity based on local fiscal expenditure on science and technology.

	U1	U2	U3	U4	U5
Digital technology	1.311 ***	1.235 ***	1.354 ***	0.525 ***	0.234
	(0.455)	(0.369)	(0.367)	(0.148)	(0.174)
Control variable	Yes	Yes	Yes	Yes	Yes
Time dummy variable	Yes	Yes	Yes	Yes	Yes
Provincial dummy variable	Yes	Yes	Yes	Yes	Yes
Observations	72	72	72	72	72
R-squared	0.859	0.836	0.899	0.871	0.862

Note: The robust standard errors in parentheses are significant at the 1% levels for *** respectively, the parentheses indicate the robust standard error.

With the change in local fiscal expenditures on science and technology, the impact of digital technology on rural governance exhibits the characteristics of heterogeneous distribution. The estimation coefficients of U1, U2, U3, and U4 in regions with relatively high local fiscal science and technology expenditure are significantly positive at different levels, while that of U5 is not significant. Indicating that the more local fiscal technology expenditures, the stronger the positive impact of digital technology on improving rural governance levels [45]. This is because areas with higher local fiscal science and technology expenditure can better optimize and upgrade rural digital infrastructure construction and digital governance systems and better serve rural residents, while areas with lower local fiscal science and technology expenditure lack the necessary funds and corresponding technical support for the digital upgrading of rural governance, which limits the improvement of the rural governance level to a certain extent. It is worth noting that the impact coefficient of digital technology on rural governance in U1 region, where the level of fiscal technology expenditure is relatively high, is 1.311, which is lower than the impact coefficient of digital technology on rural governance in U3 region, where the level of fiscal technology expenditure is relatively high, which is 1.354. This reflects the regional differentiation of the "forced innovation" effect under the constraint of fiscal resources: medium-sized regions are forced to focus on core needs due to limited fiscal resources, forming a "precise input efficient output" model, such as lightweight technologies such as smart agriculture IoT adapted to local scenarios, and stimulating grassroots innovation through "rewards instead of subsidies" to build a bottom-up innovation ecology; Although high spending regions have abundant resources, they are prone to falling into the misconception of "greed for the big and seeking the whole", or blindly introducing high-end technologies such as blockchain, which leads to a lack of adaptability, or overly relying on external suppliers, resulting in technology idleness, making digital technology more prone to becoming a one-way management tool. Due to different financial resource endowments, there is a sharp contrast between the two regions in terms of adaptability, resource allocation efficiency, and main driving force of digital technology empowering rural governance.

5.8.3. Analysis of Heterogeneity Based on Regional Development Characteristics

China is a vast territory that encompasses significant variations in natural resources, economic foundations, social structures, and cultural traditions across its regions. These variations present unique challenges to rural governance in different areas. Rural governance has been deepened and refined in its birthplace, Zhejiang, and has also given rise to

typical models such as the "Fengqiao Experience" in pastoral regions, the maritime "Fengqiao Experience", and the frontier "Fengqiao Experience". These models have created rural governance solutions with regional characteristics by closely integrating the social environments and governance needs of diverse regions. Therefore, analyzing regional heterogeneity in rural governance can facilitate a more accurate understanding of its realities in different regions, providing a foundation for formulating differentiated rural governance strategies. China boasts a vast territory, encompassing significant variations in natural resources, economic foundations, social structures, and cultural traditions across different regions. Consequently, rural governance in these diverse areas faces a range of unique problems and challenges.

To test whether regional development heterogeneity affects the impact of digital technology on rural governance, such impact in each of the eastern, central, western, and northeastern regions is studied individually. The eastern region includes 11 provinces, regions, and cities in Beijing, Tianjin, Hubei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. The central region includes eight provinces, regions, and cities in Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. The western region includes 11 provinces, regions, and cities in Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang. The northeastern region encompasses the Heilongjiang, Jilin, and Liaoning provinces, regions, and cities. The four regions were regressed individually, and the results are presented in Table 12.

Table 12. Analysis of heterogeneity based on regional rural governance characteristics.

	Eastern Region	Western Region	Central Region	Northeast Region
Digital technology	1.713 ***	1.104 ***	1.229 ***	0.847 ***
	(0.571)	(0.244)	(0.197)	(0.302)
Control variable	Yes	Yes	Yes	Yes
Time dummy variable	Yes	Yes	Yes	Yes
Provincial dummy variable	Yes	Yes	Yes	Yes
Observations	132	96	132	36
R-squared	0.887	0.824	0.852	0.845

Note: The robust standard errors in parentheses are significant at the 1% levels for *** respectively, the parentheses indicate the robust standard error.

In the above four regional groups, digital technology has a positive impact on the development level of rural governance in the eastern, western, central, and northeastern regions. The digital technology's impact on the eastern region is the most significant, with a coefficient of 1.7136, followed by the impact on rural governance in the central region, with a coefficient of 1.2297, and in Northeast China, with a coefficient of 0.8472—all significant at the 1% level. Originating the "Fengqiao Experience", the eastern region boasts relatively sophisticated digital infrastructure, a pool of digital professionals, and rural governance experts, offering abundant intellectual support for rural governance and consistently pioneering innovations in the rural governance model of the "Fengqiao Experience" in the new era. In recent years, the central region has significantly intensified its investment in digital infrastructure, resulting in substantial improvements in network coverage and data transmission speeds. Under the influence of the eastern region's radiating and driving effects, the rural governance level in the central region has steadily risen. The western region, with its vast territory and diverse ethnic groups, has diverse rural governance landscapes across its provinces. Recently, the western region has substantially increased its investment in digital infrastructure, exploring pathways for digital rural development in remote and ethnic minority areas, thereby effectively boosting the enthusiasm of ethnic minority communities to engage in grassroots governance and markedly enhancing the rural governance level. Meanwhile, Northeast China has continually bolstered its support for information technology and social governance innovation while confronting considerable pressure from economic transformation. The adjustment of industrial structures and nurturing of emerging industries necessitate substantial time and investment, which, to some extent, has impacted the progress of rural governance development.

6. Conclusions and Discussion

6.1. Conclusions

Employing panel data on provincial administrative regions in China from 2011 to 2020, this study demonstrates digital technology's impact on the level of effective rural governance and analyzes digital inclusive finance's transmission effect. Simultaneously, social organizations, financial support for agriculture, marketization level,

collective economy, disposable income of rural residents, and rural ecology are included in the study as control variables. The spatial spillover effect of digital technology on good governance in rural areas is investigated. Finally, regional heterogeneity in digital technology's impact on effective rural governance is analyzed. The results reveal that, first, digital technology plays a significant role in promoting good rural governance, and with the increase in rural population and local fiscal expenditure on science and technology, digital technology's impact on effective rural governance is becoming increasingly significant. Second, digital inclusive finance exerts a significant transmission effect on improving effective rural governance. Third, the effective rural governance model, the "Fengqiao Experience" in the new era, exerts a spatial spillover effect. This model's implementation helps improve the level of effective rural governance both locally and in surrounding areas. Fourth, the impact of digital technology on effective rural governance exhibits the characteristics of spatial heterogeneity based on rural population size and local fiscal and technological expenditures, which play a more significant role in improving the level of effective rural governance in T1, T2, and T3 regions with relatively large rural populations. It plays a more significant role in improving the level of effective rural governance in U1, U2, and U3, where local fiscal expenditure on science and technology is relatively high. Fifth, controlling variables, such as social organization, financial support for agriculture, marketization level, collective economy, and rural ecological environment, significantly promoted the level of effective rural governance.

6.2. Discussion

6.2.1. Innovation of the Rural Governance Index System of the "Fengqiao Experience" Model in the New Era

Based on the Chinese governance practice of the rural governance model of the "Fengqiao Experience" in the new era, this study unifies the rural governance ability and governance system into an index system and constructs the main governance index system based on four dimensions—namely, Party leadership, government responsibility, social coordination, and public participation. This is a significant theoretical contribution to the literature, particularly in developing a governance index system based on the three dimensions of self-governance, rule by virtue, and rule of law, and in building a rural governance evaluation index system, drawing on the "Fengqiao Experience" in the new era.

Drawing on previous research, various perspectives have been employed to elucidate the impact of diversified governance subjects' participation in rural governance. Rural governance requires the coordination of multiple forces, including the government, the market, and society. Therefore, in the rural governance process, harmonizing governance approaches should be emphasized to foster a strong sense of folk inclusiveness and fully respect the inherent self-repair capabilities of rural areas [6]. Xin and Gallent highlighted that village cadres bolster communities' capacity for collaborative innovation and action, enabling villages to address economic development challenges more effectively through cooperation with private actors or nongovernmental organizations [3] Sheng and Ma discovered that public involvement in rural grassroots governance positively impacted the enhancement of rural environmental governance levels [46]. Likewise, Sun et al. empirically demonstrated that such participation aids in clarifying property rights boundaries in rural areas and fosters the development of rural tourism [47]. Luo highlighted that self-governance exerts strong autonomy and regulatory constraints within grassroots governance, effectively addressing prevalent issues. Virtue-based governance plays a pivotal role in empowering public governance [48]. Muswaka emphasized that promoting a virtue-based governance culture among local governments elevates officials' moral standards, bolsters citizens' trust and support for the government, and facilitates the achievement of good governance [49]. Hans suggested that the rule of law significantly enhances the government's sense of responsibility by strengthening financial management, reforming national institutions, and empowering citizens; additionally, it encourages citizens to oversee village governments and motivates them to work toward community welfare [50]. The rural governance model of "Fengqiao Experience" in the new era involves the collaborative involvement of Party organizations, governments, social organizations, and the general populace in social governance; it discards the monolithic and coercive authoritarianism of traditional rural governance in China, achieving governance objectives through synchronized efforts, interactions, and cooperation among diverse governance entities. This approach shifts the focus from merely maintaining social order and stability to comprehensively balancing the interests of all stakeholders, ultimately fostering a harmonious and effective governance landscape that accommodates the interests of multiple entities. Research suggests that regions with an advanced composite index of the rural governance model, such as those inspired by the "Fengqiao Experience" in the new era, closely overlap with traditional agricultural areas and regions deeply influenced by traditional Confucian culture, including Shandong, Jiangsu, and Henan provinces. This traditional Confucian culture has provided fertile ground for the nurturing and evolution of the "Fengqiao Experience". The principles of "benevolence", "harmony as the most precious", and "seeking common ground while reserving differences" advocated in Confucian

culture align intrinsically with the "cooperative governance" and "rule of virtue" promoted by the "Fengqiao Experience". Chinese traditional culture has always esteemed the virtue-based governance concept of "winning people by virtue", along with the legal pursuit of "avoiding litigation". These traditional values and ethics hold importance in resolving conflicts within rural communities and advancing the modernization of grassroots governance.

6.2.2. Digital Technology's Positive Impact on Rural Governance

Research indicates that digital technology has a positive influence on rural governance, a viewpoint corroborated by numerous theories. Wang [51] established an analytical framework for government environmental governance leveraging digital technology, encompassing perspectives on efficiency, fairness, and coupling. The analysis reveals that digital technology enhances the efficiency and fairness of local government environmental governance [18].Liu draw upon the complex adaptive system theory and the institutional theory—employed behavioral data spanning 18 months from 1,255,206 farmers across 119 villages to validate that digitally driven rural governance markedly boosts rural governance performance [25]. Consequently, efforts should be intensified to facilitate the conversion and application of digital technology patent outcomes, elevate the level of integrated and collaborative digital governance, and achieve comprehensive and multidimensional identification and resolution of rural risk hazards. Additionally, financial investment in science and technology should be augmented to improve rural digital infrastructure, expedite the development of broadband networks and mobile communication infrastructure in rural areas, and ensure high-speed and reliable network connectivity, thereby creating favorable foundational conditions for implementing digital technology in rural governance.

On the one hand, the digital rural governance platform equips diverse governance entities with a mechanism for collaborative participation in rural governance, thereby fostering a mature consensus through dialogue and negotiation among various social groups. This effectively addresses the inherent limitations of rural self-governance in managing highly complex public affairs and mitigates the shortcomings of monolithic and static bureaucratic governance. On the other hand, digital technology facilitates traditional moral culture's preservation and perpetuation in the rural governance context. This offers Xiangxian, that is, local elites, a novel online avenue for engaging in rural governance. Through network platforms, mobile applications, and other means, Xiangxian can participate remotely in discussions and decision-making processes, thereby gaining a deeper understanding of the villagers' needs and opinions. This allows traditional village agreements and folk customs to endure through digital means. Moreover, digital platforms, such as short video platforms and moral promotion websites, disseminate deeds of moral exemplars, fostering the dissemination and exchange of exemplary traditional morality. Additionally, the database digitally records and showcases rural cultural resources, including traditional culture, folk customs, and historical relics, thereby facilitating the inheritance and promotion of rural culture.

6.2.3. Digital Inclusive Finance's Mediating Effect

Utilizing it as an intermediary variable, this study reveals that digital inclusive finance plays a notable intermediary role in empowering rural governance through digital technology. It empowers rural governance by enhancing the financial literacy of rural governance entities and fostering a favorable financial environment in rural areas. It discovered that with the assistance of digital tools, urban and rural households can transcend geographical barriers, gain access to financial resources more conveniently, provide robust support for future investment plans, and consequently enhance their asset allocation efficiency and risk appetite [13]. Likewise, Lin and Peng demonstrated that digital inclusive finance promotes rural development. However, its impact is more pronounced in rural areas of developed regions, whereas its effect on rural governance in underdeveloped areas is less significant [21]. Contrary to Lin's findings, this study demonstrated that digital inclusive finance significantly enhances the rural governance level across the country. The discrepancy arises because the former overlooked the positive influence of the unique rural governance model, which incorporates participation from multiple governance entities and integrates "autonomy", "rule of virtue", and "rule of law", on empowering rural governance through digital inclusive finance.

This study reveals that developing digital inclusive finance in rural areas aligns with the rural governance practice of the "Fengqiao Experience" in the new era, exhibiting multiple convergences concerning implementation pathways and core objectives. First, the concepts of "universality" and "benefit" embedded in digital inclusive finance resonate with the "people-centered" approach of the rural governance model of the "Fengqiao Experience" in the new era. By leveraging digital technology, digital inclusive finance transcends the geographical and temporal limitations of traditional financial services, thereby enabling financial services to reach a broader spectrum of populations. It extends

financial products and services with broad coverage and low barriers to entry to remote villages, low-income households, widowed older adults, and other marginalized groups. Furthermore, tailoring financial products and services to local conditions fosters the modernization of agriculture, rural areas, and farmers in rural regions, facilitating rural residents to develop industries and increase their incomes through financial support, thus embodying the service principle of being "people-centered". Second, digital inclusive finance fosters a community in which diverse societal entities participate in rural development by channelling capital, talent, and services to rural areas. It leverages the financial capital flowing into rural regions to engage various social organizations and capital in rural governance. By sending financial professionals to rural areas and offering door-to-door services, rural residents can gain a better understanding of and access to financial services, thereby stimulating their enthusiasm for financial activities and investments and ultimately achieving a harmonious landscape of collective participation from multiple entities. Furthermore, the credit-scoring feature of digital inclusive finance platforms encourages rural residents to cultivate a positive financial ecosystem rooted in honesty and compliance, which contributes to fostering new trends in rural civilization and supporting the development of rural virtue-based governance. Finally, by enhancing the rural credit system, utilizing credit information systems and evaluation mechanisms, and combining integrity incentives with risk prevention and control measures, such as "honor rolls" and moral banks, digital inclusive finance guides rural residents to uphold honesty, pursue legal wealth accumulation, and promotes the integration of rural inclusive finance with the development of legal civilization.

6.2.4. Spatial Spillover Effect of Digital Technology-Enabled Rural Governance

The study reveals that digital technology exhibits a spatial spillover effect on rural governance, positively impacting local rural governance and enhancing the standards of rural governance in neighboring areas. Wang et al. discovered that digital technology-empowered rural governance demonstrates a spatial spillover effect, facilitating the provision of labor force, capital, technology, and other scarce resources essential for rural industrial development. This, in turn, helps transform rural populations, land use, industrial development, urban–rural relations, and optimize rural spatial patterns [52]. Furthermore, the spatial spillover effect of digital technology has enriched the connotation of the rural governance model, exemplified by the "Fengqiao Experience", in the new era. The traditional "Fengqiao Experience" upholds the governance principle of "resolving minor issues within the village, significant matters within the township, and never escalating conflicts", advocating for conflict resolution at the grassroots level and in the smallest administrative divisions. Digital technology has augmented the essence of our model by establishing a rural digital governance network that spans administrative regions and connects different hierarchical levels. This network facilitates cross-regional collaborative investigation and governance of social issues, thereby broadening the scope of rural governance as traditionally defined by the "Fengqiao Experience". Additionally, through digital governance platforms, the precision of addressing social issues has been enhanced. Building upon the traditional "Fengqiao Experience", this approach upgrades governance methodologies while adhering to its core principles of "collaborative governance", "prevention first", and "resolving conflicts at their inception".

6.2.5. A Comparative Discussion of the "Fengqiao Experience" Rural Governance Model in the New Era and Digital Rural Governance in Various Countries

The township autonomy model in the United States emphasizes the direct participation of citizens and the rule of law in administration. This spirit of autonomy provides a reference for other countries on how to protect the autonomy rights of villagers through the law and improve the transparency and fairness of governance [53]. However, due to its high degree of autonomy and short tenure of grassroots governance officials, it lacks certain policy stability. The "Village Building Movement" in Japan emphasizes the coordinated development of urban and rural areas. Through policy support and planning, as well as organizations such as agricultural cooperatives, "corporate" management of rural areas is carried out, which is conducive to the cultivation of rural characteristic industries. The highly centralized management system limits the subjectivity of villagers, and the reality of an aging population also restricts the further release of rural development vitality [54]. The government leads the "Information Village" plan in South Korea and establishes rural operation committees to develop digital public services and promote the construction of rural digital infrastructure. This model, which combines government leadership with public participation, provides a model for other countries to learn from. However, there is a problem of insufficient adaptability between the technological development path of digital rural areas in South Korea and the reality of rural areas [55]. The comprehensive development model in Germany emphasizes the improvement of laws and regulations and as well as the extensive participation of villagers. It

pays attention to the balance between economy, society, and ecology, and emphasizes the protection of cultural heritage in the process of rural governance [56]. This comprehensive and coordinated development concept is of great significance for achieving sustainable rural development. In France, the government raised funds to promote the construction of rural digital infrastructure, utilized internet technology to build an education network platform, and carried out digital technology training through rural digital family alliances, which helped to effectively improve the overall quality of rural residents.

The "Fengqiao Experience" rural governance model in China is unique in global rural governance due to its diverse co governance and the combination of "autonomy", "moral governance", and "rule of law. By building a diversified cooperation network led by Party building, government, market, society, and villagers, a comprehensive and multi-level rural governance system has been established. This not only ensures the sustainability of policy implementation in rural governance but also unleashes the vitality of grassroots democracy through diversified governance. The "Fengqiao Experience" in the new era uses digital technology as a catalyst for the integration of "three governance": at the autonomous level, using blockchain technology to build a village affairs public platform; At the level of moral governance, develop a digital evaluation system for "moral points"; At the level of the rule of law, the enforcement of rules is strengthened through tools such as "cloud courts" and "smart contracts". This deep coupling of "technology system culture" avoids the instrumentalization tendency of technology application, helps to enhance the flexibility of rural governance, and achieves sustainable development in rural governance. In addition, the unique advantage of the "Fengqiao Experience" in the new era lies in its endogenous growth mechanism: by cultivating entities such as "digital new farmers" and "rural makers", digital literacy is transformed into rural governance capabilities; By integrating urban and rural resources through digital platforms, a two-way flow pattern of "city leading township, township promoting city" is formed. This model not only enhances governance efficiency but also strengthens the sustainable endogenous driving force of rural development.

Undoubtedly, the potential of the "Fengqiao Experience" in the new era has not been fully unleashed. Attention should be paid to drawing on advanced experiences in rural governance, such as enhancing the legal awareness of digital rural governance entities, drawing on the governance model of the Japan Agricultural Cooperative, attempting to innovate rural governance models with an enterprise oriented development approach, drawing on the development ideas of France, emphasizing the use of rural social network relationships, leveraging the advantages of "rural elites" and "returning technical talents", researching and developing a "mentorship" mechanism for digital skills improvement, in order to enhance the overall digital literacy of rural residents comprehensively.

6.2.6. Further Discussion

Further analysis reveals that the extent to which digital technology influences rural governance depends on the size of the rural population. This empirical finding aligns with Liu, who posits that labor force size factors influence rural governance behavior [12]. The empirical results indicate that, in regions with a larger rural population and a moderate population size, the impact of digital technology on rural governance is more pronounced, while in regions with a smaller rural population and a larger population size, it is more moderate. In areas with smaller populations, digital technology has a significant impact on rural governance. The empirical evidence suggests that in sparsely populated areas, digital technology amplifies the model's effectiveness. This conclusion underscores that digital technology's extensive reach fosters the equitable development of public services, particularly in areas with smaller populations. Transcending geographical barriers, facilitating information interconnectivity, and optimizing resource allocation, digital technology provides a platform for diverse stakeholders to engage remotely in rural governance. The application of Internet technology and digital governance systems comprehensively enhances the efficiency of rural self-governance, standards of moral governance, and efficacy of the rule of law in sparsely populated areas. Future scholars should prioritise research on the relationship between population size and the effectiveness of digital rural governance.

In regions with higher fiscal expenditure levels on science and technology, digital technology exerts a more pronounced positive influence on our model. Based on this, future scholars may seek to concentrate their efforts on researching the efficiency of inputs and outputs related to financial funding for the development of digital villages.

Based on an analysis of the heterogeneity of regional rural governance, it is evident that digital technology exerts the most pronounced impact on the eastern region, followed by the central region, with the weakest influence observed in Northeast China. Rural governance exhibits a reconciling nature, as villages across different provinces vary in geographical location, natural environment, and rural cultural customs, resulting in diverse governance approaches and priorities. Scholars can delve deeper into the influence of geographical factors on digital rural governance by examining

more nuanced areas, such as how ethnic minority and non-ethnic minority concentrations, folk culture, religious beliefs, and national traits impact regional autonomy, the realm of virtue-based governance, and the level of legal governance, in addition to corresponding measures to enhance governance effectiveness.

6.2.7. Limitations and Suggestions for Future Research

The study utitized provincial panel data from 30 provinces from 2011 to 2022, but lacked micro level research from the perspective of prefecture-level or county-level, making it difficult to reveal in detail the micro differences in rural governance that reflect different regions. Future scholars can conduct research on digital technology empowering rural governance in the new era of "Fengqiao Experience" at the municipal or county level, exploring the regional characteristics of digital rural governance in the new era of "Fengqiao Experience" at the municipal level. Further exploration is needed to integrate digital technology with traditional governance wisdom, such as using AI to analyze the governance logic in rural regulations and agreements, or reconstructing rural cultural spaces through metaverse technology. In addition, special attention should be paid to the shaping of traditional customs and traditions through digital technology, as well as the research on the impact mechanism of the younger generation on rural governance.

Author Contributions

Conceptualization, X.C.; Data curation, X.C.; Formal analysis, X.C.; Methodology, M.Y.; Supervision, M.Y.; Software, X.C.; Writing, original draft, X.C.; Writing, review, and editing, X.C., J.C. and Q.S. All authors have read and agreed to the published version of the manuscript.

Ethics Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Data were obtained from the website of the National Bureau of Statistics, Peking University's Digital Inclusive Finance Index (spanning from 2011 to 2020), and the EPS China Rural Affairs Database, as well as publications such as the China Statistical Yearbook (2011–2022), China Agricultural Statistical Yearbook, China Civil Affairs Statistical Yearbook, China Procuratorial Yearbook, China Law Yearbook, and China Disabled Persons' Undertakings Statistical Yearbook.

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Declaration of Competing Interest

The authors declare no conflicts of interest.

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