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Chapter: Digital Transformation, Artificial Intelligence, and Organizational Adaptation

Boosting county economic resilience through digital villages: the dual role of innovation capacity and fiscal investment

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Annotation. Amid rising global economic volatility and the advancing rural revitalization strategy, strengthening the resilience of county economies has become a key prerequisite for safeguarding overall national economic stability. Although previous studies have explored various determinants of economic resilience, empirical evidence remains insufficient with regard to the role and mechanisms of government-led digital policy interventions. To assess whether institutional digitalization serves as a channel through which digital village initiatives shape county-level resilience, this study utilizes the National Digital Village Pilot Program as an exogenous policy shock. Drawing on regional economic resilience theory and technology-biased innovation frameworks, we assemble county-level panel data that cover 2006–2023 and implement a difference-in-differences identification strategy to evaluate the policy's causal impact. Empirical evidence demonstrates that digital village programs generate significant and robust gains in county economic resilience, and these improvements are primarily driven by two underlying mechanisms: by improving county innovation capacity and increasing local fiscal investment. The findings provide important managerial and policy implications for enhancing regional economic stability and optimizing rural development strategies in the digital era, suggesting that strengthening inclusive digital infrastructure and establishing coordinated fiscal and digital mechanisms are essential for systematically building counties' capacity for risk resistance and recovery.

Keywords: Digital village construction; County economic resilience; Innovation capacity; Local fiscal investment

JEL classification: O33, R11, Q16

Introduction

As global economic structures undergo profound realignment, geopolitical frictions intensify, and nontraditional security threats, including climate-related risks, become increasingly salient, economic resilience has emerged as a core analytical construct in regional science, economic geography, and development economics. The term broadly refers to the capacity of an economic system to withstand and adapt to internal and external disturbances (Boschma, 2015; Martin, 2012). Economic resilience not only concerns a region's capability to resist disruption and rapidly recover after a downturn or crisis but also

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encompasses its dynamic capability to adapt to new environments, reconstruct growth trajectories, and achieve long-term sustainable development (Christopherson *et al.*, 2010; Martin, Sunley, 2015).

Within China's economic framework, counties function as the fundamental building blocks of the national economy and the key leverage points for advancing urban–rural integration. Consequently, the robustness of county-level economic resilience plays a decisive role in maintaining macroeconomic stability and ensuring the successful implementation of rural revitalization. Statistical data show that Chinese counties host more than half of the country's population and contribute nearly 40% of its gross domestic product (GDP). However, many county economies have long exhibited endogenous fragilities, such as a single industrial structure, a scarcity of innovation factors, limited market size, and high dependence on external markets. Consequently, when faced with macroeconomic downturns or disruptions in industrial and supply chains, counties generally demonstrate weaker resistance and slower recovery than large and medium-sized cities (Lapatinas *et al.*, 2022). Hence, moving beyond traditional growth-oriented thinking and cultivating new drivers that can systematically strengthen county-level economic resilience has become a major theoretical challenge and an urgent practical imperative.

Concurrently, accelerating digital innovations are redefining the architecture of the global economy. As noted by Acemoglu and Restrepo (2019), the digital economy currently serves as a critical driver of structural transformation and high-quality economic development. Digital transformation reduces information asymmetry, optimizes resource allocation efficiency, and fosters new business models and forms, creating unprecedented opportunities for regional economic development (Goldfarb, Tucker, 2019). Nevertheless, the effects of digital technologies are not inherently inclusive; instead, they may exacerbate regional development disparities and generate a "digital divide," particularly between urban and rural areas (Salemink *et al.*, 2017). In response to the aforementioned challenges, China has incorporated digital village development into its top-tier national strategy framework, framing it as a pivotal policy instrument that bridges the goals of "digital China" with those of the rural revitalization agenda. By implementing comprehensive policy measures, the initiative seeks to expand digital infrastructure, including 5G and internet of things (IoT) technologies, into rural regions, while simultaneously fostering the substantive integration of digital tools into agricultural production, rural governance, and everyday livelihood activities. Existing studies have begun to explore the socioeconomic effects of digital villages, finding that they significantly improve total factor productivity in agriculture, expand agricultural sales channels, increase farmers' nonagricultural income, and enhance the quality of rural public services. Beyond its formal designation as a national pilot policy, the Digital Village Program is implemented through a set of concrete on-the-ground measures. Specifically, pilot counties typically receive targeted support for the deployment of digital infrastructure such as broadband networks, 5G base stations, and Internet of Things (IoT) technologies in agricultural production. In addition, local governments actively promote the establishment of rural e-commerce service hubs and logistics systems to facilitate market access for agricultural products. Digital governance platforms are also introduced to improve public service delivery and real-time monitoring. These practical interventions provide the micro-level foundation through which the macro-level policy exerts its economic effects.

Despite substantial progress in the literature on economic resilience and digital village construction, a significant research gap remains with regard to how digital transformation systematically empowers regional economic resilience. Specifically, this gap manifests in three key dimensions. First, current research on the determinants of economic resilience primarily focuses on endogenous market-driven variables. Scholars have extensively examined factors, such as industrial structure (Brown, Greenbaum, 2017; Guo, Xu, 2019), innovation capacity (Bristow, Healy, 2018), and institutional quality (Rodríguez-Pose,

2013), which have deepened our understanding of resilience formation. However, the role of government as a "visible hand," particularly in proactively shaping and enhancing regional resilience through large-scale and strategic digital policy interventions, has received insufficient attention, and causal evidence remains scarce. Second, existing evaluations of the economic effects of digital villages have mostly focused on micro or single-dimensional outcome indicators, failing to capture their systemic effects on regional economic capability. Although prior research has examined how digitalization affects farmers' earnings and agricultural production (Cai, Wang, 2025; Ma *et al.*, 2025; Zhou *et al.*, 2023), the notion of economic resilience extends considerably beyond output expansion. It reflects an economy's structural flexibility and its capacity to evolve in the face of shocks. As a comprehensive policy package, digital village construction may exert effects that extend beyond output expansion to include improvements in the overall complexity and adaptability of county economies. Hence, existing research paradigms are limited in assessing the holistic value of such macro strategies and have yet to answer whether and how digitalization strengthens county-level economic resilience. Third, the underlying mechanisms and transmission pathways remain a black box. Clarifying these pathways is crucial for optimizing policy design and precision implementation, but empirical evidence on this front is still limited.

To fill the gaps identified in the existing literature, the current study leverages the rollout of the National Digital Village Pilot Program in 2020 as an exogenous policy shock. Drawing on a balanced panel of county data that cover 2006–2023, this work applies a difference-in-differences (DID) identification framework to accomplish two major objectives. First, it seeks to obtain a credible causal estimate of the impact of digital village initiatives on county-level economic resilience. Second, it tests two central mechanisms, namely, enhancements in local innovation capacity and expansions in fiscal investment, through which the policy exerts its influence on resilience.

This study makes three main contributions. First, it extends the regional economic resilience framework by explicitly incorporating government-led digital policy interventions, thereby broadening the analytical focus from endogenous market forces to policy-driven structural transformation. In doing so, the study responds to the call for greater attention to the institutional and policy dimensions of regional development trajectories (Martin, Sunley, 2015; Rodríguez-Pose, 2013). Second, it proposes a "policy-driven digital empowerment" perspective, highlighting that digitalization is not merely a byproduct of economic development, but can also function as a strategic policy instrument for strengthening resilience. Third, by empirically identifying the dual channels of innovation capacity and fiscal investment, this study provides a clearer analytical foundation for understanding how digital policies translate into macroeconomic resilience.

The remainder of this paper is structured as follows. Section 1 presents the theoretical analysis and develops the research hypotheses. Section 2 introduces the methodology, data, and variable design. Section 3 reports the empirical findings, including baseline results, robustness tests, and mechanism analysis. Section 4 discusses the main findings. The final section concludes with implications, limitations, and avenues for future research.

1. Theoretical Analysis and Research Hypotheses

1.1 Theoretical Analysis

1.1.1 Conceptual Evolution and Multidimensional Connotation of Economic Resilience

Originating from ecology and psychology, the concept of economic resilience was later introduced into economic geography and regional analysis to describe the ways in which regional economies respond and adapt to external shocks (Martin, 2012). Instead of representing a fixed characteristic, resilience is

understood as an evolving process that unfolds across the phases preceding, during, and following a shock. Much of the early literature conceptualized resilience through an engineering perspective, emphasizing the speed and efficiency with which a system restores its pre-shock state. However, this narrow interpretation cannot account for the structural reconfiguration and new developmental trajectories that regional economies may undertake in the aftermath of disruptions.

Martin and Sunley (2015) conceptualized economic resilience as comprising four mutually connected components. The notion of resistance reflects how effectively a region can buffer against external shocks and mitigate their harmful consequences. Recovery reflects how rapidly and effectively a region can re-establish its prior growth path. Reorientation concerns a region's capability to reshape its economic structure through shifts in industrial composition and technological upgrading. Finally, renewal refers to the capacity to cultivate new development pathways and sustain longer-term growth. This multidimensional framework emphasizes that a truly resilient economy must not only "endure and recover" but also "transform and evolve," achieving structural upgrading through the crisis process. This framework provides a comprehensive perspective for understanding county-level economic resilience.

With regard to the operationalization of economic resilience, prior research has generally adopted two methodological routes. The first approach relies on individual headline indicators, such as GDP growth or unemployment, to gauge how a locality's performance diverges from that of broader regional or national benchmarks (Martin, 2012). The second approach builds multidimensional composite indices that are designed to reflect the multifaceted and systemic attributes of resilience in an integrated manner (Tian *et al.*, 2023).

1.1.2 Determinants of Economic Resilience

After clarifying the connotation of economic resilience, academic attention has shifted toward exploring its underlying determinants. Decades of research have identified several key factors that can be broadly categorized into four dimensions.

(1) Industrial and economic structures. The early "diversification hypothesis" posited that a more diversified industrial structure, similar to a portfolio of investments, can disperse risks, and thus, enhance economic stability (Frenken *et al.*, 2007). Subsequent studies have further explored the effects of industrial relatedness and structural diversity (Guo, Xu, 2019).

(2) Innovation factors. During the knowledge economy era, innovation is regarded as the core driver that enables regions to achieve dynamic adaptation and path creation. Regions with strong innovation capacity and dense knowledge networks are more capable of reorganizing existing resources and capabilities to adapt to new technological paradigms and market demands (Bristow, Healy, 2018; Chang *et al.*, 2023; Zhu, Dong, 2024).

(3) Institutions, governance, and social capital. Economic resilience is deeply embedded not only into economic structures but also into social and institutional contexts. High-quality formal and informal institutions can significantly reduce transaction costs, foster collective action, and provide buffering and coordination mechanisms during crises (Rodríguez-Pose, 2013; Xiao *et al.*, 2025). Efficient and proactive local governments play indispensable roles in formulating forward-looking industrial policies, providing key public goods, and stabilizing market expectations.

(4) Financial development. A sound financial system serves as the "shock absorber" of the economy. Developed financial markets can provide liquidity support to distressed firms, assist them in overcoming

short-term disruptions, and offer financing channels for recovery and transformation, enhancing overall regional economic resilience (An, Luo, 2024).

1.2 Economic Consequences of Rural Digitalization

A surge of empirical research in recent years has begun to clarify how rural digital transformation shapes economic outcomes, with findings focused on three primary areas.

(1) Empowerment of microeconomic actors. Numerous studies have shown that internet access and improved digital skills significantly increase farmers' opportunities for non-agricultural employment and raise total household income (Tian, Zhang, 2022; Yi, 2021). The rise of rural e-commerce has broken traditional geographical constraints, expanded agricultural sales channels, and stimulated a surge of rural entrepreneurship, revitalizing rural economies (Lin *et al.*, 2024).

(2) Agricultural efficiency is substantially enhanced. The adoption of digital tools within agricultural production processes significantly elevates total factor productivity (Quan *et al.*, 2024; Wang *et al.*, 2024).

(3) The spread of digital technologies is redefining urban–rural interactions. Enhanced information connectivity promotes reciprocal flows of labor, capital, and other factors; mitigates income inequality; and accelerates progress toward urban–rural integration (Lu *et al.*, 2025; Salemink *et al.*, 2025).

1.3 Direct Impact of Digital Village Construction on County Economic Resilience

At the county level, economic resilience captures how effectively local economies can buffer external disturbances, recover essential functions, and reconfigure themselves in response to volatile markets or unforeseen shocks. It primarily reflects their capacity for risk absorption and adaptive adjustment (Hu *et al.*, 2022). In recent years, digital village construction has become a key national development strategy, not only as a crucial measure for promoting rural revitalization, but also as a core driver for enhancing county-level economic resilience. Existing research generally agrees that digital village construction directly strengthens the stability and sustainability of county economies through three major pathways: improving infrastructure, facilitating economic transformation, and enhancing governance capacity.

First, digital village initiatives strengthen counties' capacity to withstand risks through the upgrading of digital infrastructure. As information and communications technology, IoT systems, and big data tools become more pervasive, long-standing information asymmetries and spatial inefficiencies are substantially mitigated, which, in turn, enhances agricultural operational efficiency and strengthens the distribution of critical production resources (Zhao, Zhao, 2024). Smart farming technologies facilitate precision operations and proactive risk control, reducing potential losses from natural hazards. Moreover, improved digital infrastructure accelerates information transmission, alleviates market information asymmetry, and enables agricultural products to adjust more responsively to demand shifts, collectively increasing resilience to market volatility. Empirical studies have further indicated that stronger digital infrastructure is closely associated with greater regional shock absorption capability (Chen *et al.*, 2025).

Second, the progression of digital village programs promotes broader economic diversification and drives innovation-led upgrading at the county level as the digital economy expands. Emerging digital sectors, such as digital agriculture, rural e-commerce, and smart tourism, raise the value creation of traditional agricultural activities and open up diverse employment and income opportunities for rural populations. The proliferation of e-commerce platforms has connected agricultural producers to national and global markets, reducing dependency on traditional intermediaries. Such economic diversification strengthens endogenous growth potential and mitigates risks associated with reliance on single industries. By

facilitating the digital and intelligent upgrading of agricultural value chains, digital village construction fundamentally enhances counties' recovery capacity, enabling faster rebound from crises.

Finally, digital village development strengthens institutional foundations for maintaining economic stability by advancing digital governance capability. The deployment of advanced data analytics, cloud-based computing architectures, and artificial intelligence-enabled applications equips governments with tools to enhance decision accuracy, transparency, and timeliness. During public health emergencies or economic crises, real-time data monitoring helps local authorities identify risk points and implement targeted interventions to mitigate recessions. Enhanced digital governance also improves information sharing and interaction between governments and citizens, fostering public trust and creating a more stable and predictable business environment (Zeng, Liu, 2025).

In summary, digital village construction not only represents a technological innovation but also a systemic transformation process that reshapes infrastructure, drives industrial upgrading, and optimizes governance models, comprehensively enhancing counties' adaptability and risk resistance.

Hypothesis 1 (H1): Digital village construction enhances county economic resilience.

1.4 Digital Village Construction, County Innovation Capacity, and Economic Resilience

Previous studies have consistently highlighted the pivotal role of innovation in underpinning the endogenous formation of regional economic resilience (Martin, Sunley, 2015). Strong innovation capacity not only enables economies to withstand external shocks but also "to build back better" through creative adaptation and structural transformation. At the county level, innovation capacity acts as a "protective moat" that allows local economies to adjust industrial structures flexibly and leverage technological advantages to strengthen risk resistance. Digital village construction enhances county economic resilience primarily by fostering innovation capacity through two key mechanisms.

First, digital village construction facilitates the flow and recombination of innovation factors, providing new momentum for local innovation. In accordance with technology-biased innovation theory (Acemoglu *et al.*, 2002), the downward diffusion of advanced information technologies reshapes traditional factor input structures and breaks geographical boundaries. Digital platforms operate as innovation networks, and thus, they promote cross-regional flows and integration of information, technology, capital, and talent (Han *et al.*, 2024). This dynamic reallocation stimulates new business models and industrial patterns. Through big data analytics, county enterprises can better capture market demand and engage in product innovation. Such efficient configuration of innovation resources fundamentally enhances the structural adaptability of county economies, enabling rapid adjustment to external changes.

Second, digital village construction provides institutional guarantees for innovation activities by establishing multilevel digital governance platforms. An efficient digital governance system dismantles traditional administrative barriers, fostering a collaborative innovation ecosystem that includes governments, enterprises, research institutions, and communities (Maulana, Decman, 2023). This collaboration, which is supported by data sharing and process optimization, considerably improves the dynamic allocation of innovation resources. Governments can leverage digital platforms to deliver policy support and financial aid rapidly to innovative enterprises, reducing innovation risks. Such high-efficiency resource orchestration enables counties to respond swiftly and effectively to external shocks through innovation.

Hypothesis 2 (H2): Digital village construction enhances county innovation capacity, strengthening county economic resilience.

1.5 Digital Village Construction, Government Fiscal Investment, and County Economic Resilience

Government fiscal investment plays a critical role in shaping and reinforcing local economic resilience. Appropriate fiscal spending provides stable financial support for regional development, particularly in responding to external shocks. The fiscal intervention capacity of governments largely determines the speed and adaptability of economic recovery. As a new form of infrastructure investment, digital village construction empowers fiscal policy through digital technologies, significantly improving the precision and efficiency of fiscal resource allocation and thereby indirectly enhancing county-level resilience.

First, digital village construction enhances the precision of fiscal resource allocation, optimizing government spending strategies. With big data analytics and intelligent decision systems, governments can obtain real-time and accurate structural information on county economies, enabling the identification of potential vulnerabilities and risk areas (Zhou, 2023). This information advantage leads to more scientific budgeting and targeted resource allocation. Fiscal funds can thus be directed toward agricultural sectors requiring technological upgrades or rural industries facing market risks, minimizing resource waste and maximizing economic benefits. Such precision-oriented fiscal allocation substantially strengthens counties' adaptive capacity and resistance to shocks.

Second, digital village construction improves fiscal efficiency by reducing agency and monitoring costs. The implementation of digital governance systems streamlines administrative layers, minimizes dissipation in fiscal fund transmission, and eliminates unnecessary intermediaries (Wenchao, Dan, 2024). This technological enhancement ensures that agricultural and rural funds flow efficiently and transparently to their intended uses while reducing monitoring difficulties. With digitalized monitoring systems in place, authorities can continuously track how funds are allocated, thereby ensuring that resources are devoted to priority sectors—including digital infrastructure, smart farming, and rural e-commerce ecosystems. From a broader theoretical perspective, the effectiveness of fiscal investment in digital village construction can be further understood within the framework of state capacity and public goods provision. Existing studies emphasize that the ability of governments to provide high-quality public goods is a fundamental determinant of regional economic performance and stability (Cheng, Gawande, Qi, 2022). In this context, digital infrastructure—such as broadband networks, IoT systems, and digital governance platforms—can be conceptualized as a new form of public good characterized by strong externalities, high initial costs, and long-term developmental impacts.

Digital village construction enhances not only the scale of fiscal investment but also the capacity of local governments to allocate and utilize these resources effectively. Through digital technologies, fiscal spending becomes more targeted, transparent, and efficient, thereby strengthening the government's ability to transform financial inputs into resilience-enhancing outcomes. Accordingly, if digital village construction improves the capacity of local governments to provide digital public goods through more effective fiscal investment, it is reasonable to expect that county-level economic resilience will also be enhanced.

Hypothesis 3 (H3): Digital village construction increases government fiscal investment, strengthening county economic resilience.

2. Methodology

2.1 Model Construction

2.1.1 Baseline Regression Model

To examine the extent to which the National Digital Village Pilot Policy affects county-level economic resilience and strengthens it through digital village development, the analysis employs a widely used empirical approach and exploits the official release of the National Digital Village Pilot Area list as an externally imposed policy intervention. The announcement, endorsed collectively by key central authorities such as the Cyberspace Administration of China, the Ministry of Agriculture and Rural Affairs, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Science and Technology, the State Administration for Market Regulation, and the State Council Office for Poverty Alleviation, constitutes a credible quasi-natural experiment (Roberts, Whited, 2013). Consequently, the analysis employs the DID specification presented below:

$$Resilience_{it} = \alpha_0 + \alpha_1 Treated_i \times Post_t + \sum_{i=2}^{7} Controls_{it} + CountyFE + YearFE + \varepsilon_{it} \quad (1)$$

In this specification, subscripts i and t refer to the county and year, respectively. The dependent variable, resilience, measures the intensity of county-level economic resilience. The treatment indicator, Treated, equals 1 for counties designated as National Digital Village Pilot Areas and 0 otherwise. The variable Post takes the value of 1 in the post-policy period beginning in 2020 and 0 for prior years. The Vector Controls captures a set of county characteristics, including economic development, financial depth, industrial composition, educational attainment, consumption levels, and residents' savings.

CountyFE and *YearFE* correspond to county- and year-specific fixed effects, which account for unobservable county characteristics that remain constant over time and nationwide macroeconomic shocks in each year. As the fixed effects already incorporate the information contained in Treated and Post, these variables are not separately included in Model (1).

2.1.2 Mechanism Testing Model

Although mediation-effect frameworks are commonly used to explore policy transmission pathways, estimates obtained solely from mediation models may suffer from bias. To address this concern, and following the methodological guidance of Jiang (2022), we construct supplementary models that allow for a direct examination of how the National Digital Village Pilot Policy operates on county-level economic resilience:

$$Mechanism_{it} = \alpha_0 + \alpha_1 Treated_i \times Post_t + \sum_{i=2}^{7} Controls_{it} + CountyFE + YearFE + \varepsilon_{it} \quad (2)$$

where *Mechanism* represents the mechanism variable. This study identifies two potential transmission channels through which the National Digital Village Pilot Policy may influence county-level economic resilience: (1) county innovation capacity and (2) local fiscal investment.

2.2 Variable Selection and Measurement

2.2.1 Dependent Variable

The current study employs a county-level economic resilience index constructed using the entropy weight method as the dependent variable. The literature commonly classifies economic resilience measurements into three methodological strands. An initial group of studies relies on 1D metrics, such as regional GDP or unemployment rate, to approximate resilience in a simplified manner. The second

category characterizes resilience by observing variations in core explanatory variables before and after external shocks. For example, some studies have compared regional GDP growth rates with the national average growth rate to capture the degree of economic resilience. The third category constructs a multidimensional composite indicator system. In part of the literature, resilience metrics are formulated along the lines of resistance, recovery, adaptability, and transformation. Other studies have instead relied on observable economic indicators, including labor market performance, export volume, household consumption, and industrial activities, to construct their measures. Although concise and convenient, the single-indicator approach is insufficient for comprehensively capturing the multifaceted nature of economic resilience. Building on the framework proposed by Martin (2012) and considering data availability and measurement rigor at the county scale, we construct an integrated resilience metric that incorporates sixteen indicators grouped into four dimensions to portray counties' comprehensive resilience performance (*Table 1*).

Table 1. Construction of the County Economic Resilience Indicator System

Primary Dimension	Secondary Dimension	Indicator	Attribute
Resistance and Absorption Capacity	Risk Absorption	Per capita grain output (tons)	+
		Per capita balance of household savings at year-end (CNY)	+
	Risk Resistance	Number of employees at year-end (10,000 persons)	+
		Share of exports in GDP (%)	–
Recovery and Reorganization Capacity	Economic Growth	Per capita GDP (CNY)	+
		Per capita disposable income of rural residents (CNY)	+
	Economic Stability	Fiscal self-sufficiency ratio	+
		Per capita total fixed asset investment (CNY 10,000)	+
Adjustment and Adaptation Capacity	Organizational Adaptation	Per capita fiscal expenditure (CNY 10,000)	+
		Per capita total retail sales of consumer goods (CNY 10,000)	+
	Factor Allocation	Number of hospital and health-center beds per 10,000 persons	+
		Industrial SO_2 emissions per unit of GDP (tons)	–
Innovation and Transformation Capacity	Technological Progress	Number of broadband access users per 10,000 persons	+
		Number of mobile phone users per 10,000 persons	+
		Value added of the tertiary industry (CNY 10,000)	+
	Innovation Potential	Number of secondary vocational school students per 10,000 persons	+

Note: "+" sign marks indicators that rise with stronger resilience, whereas a "-" sign designates indicators for which higher values imply lower resilience.

Source: created by authors.

To minimize bias arising from subjective weight selection, the analysis utilizes the entropy weighting approach to derive the index based on county panel data from 2006 to 2023. First, all indicators are standardized according to their positive or negative attributes to eliminate dimensional differences. The standardization formulas are as follows:

$$y_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} \quad (3)$$

In this framework, y_{ij} denotes the normalized value of indicator x_{ij} for county i; while max(x_{ij}) and min(x_{ij}) represent the upper and lower bounds of indicator j across all n counties, respectively. Following normalization, we compute the share of each indicator for each county (P_{ij}), derive the information entropy for each indicator (I_{ij}), and obtain the corresponding entropy-based weights (W_j). The overall county economic resilience index is then constructed by aggregating the standardized indicators using these weights.

$$P_{ij} = \frac{y_{ij}}{\sum_i y_{ij}} \tag{4}$$

$$I_{ij} = -\frac{\sum_i P_{ij} \ln P_{ij}}{\ln N}, W_j = \frac{1-I}{\sum_j (1-I)} \tag{5}$$

$$Resilience_t = \sum_j W_j \times y_{ij} \tag{6}$$

2.2.2 Independent Variable

The principal independent variable indicates a county's participation in the National Digital Village Pilot Initiative. Using the official pilot list provided in the multiagency notice, we utilize this designation to construct a quasi-natural experiment under the DID framework. The treatment effect is estimated via the interaction term "Treated × Post," with "Treated" defined as "1" for counties included in the pilot program and "0" for nonparticipants. The variable "Post" marks the post-policy period, with a value of "1" from 2020 onward and "0" in the pre-reform years. Therefore, the coefficient on the interaction isolates the causal effect of the digital village pilot program on county economic resilience.

2.2.3 Control Variables

To mitigate confounding influences and sharpen the identification of the policy effect, the regressions include six county-level covariates that have been widely adopted in related studies. Local demand conditions are characterized by the ratio of total retail sales of consumer goods to county GDP, while household financial status is captured by the natural logarithm of residents' savings deposits. The stock of human capital is proxied by the share of students enrolled in ordinary middle schools in the county population. On the production side, the industrial structure is reflected in the contribution of the secondary sector to county GDP. The depth of financial intermediation is measured by the year-end loan balances of financial institutions relative to county GDP. Overall economic development is represented by the logarithm of county GDP. Together, these variables provide a compact description of counties' socioeconomic environments and help attenuate bias arising from unobserved heterogeneity, improving the credibility of the estimated policy effects.

2.3 Sample and Data

This study utilizes a county-level panel dataset spanning 2006 to 2023 to evaluate how the National Digital Village Pilot Policy influences county economic resilience. Observations with substantial missing information were removed to maintain data quality. The dataset used in the analysis is assembled primarily

from the CSMAR county economy module and the China County and China Rural Statistical Yearbooks. Measures of innovation capacity are supplemented with data retrieved from the National Intellectual Property Administration's online database. Missing values in certain series are addressed through linear interpolation. Definitions and documentation for all principal variables appear in *Table 2*.

Table 2. Definition and Description of Variables

Variable Category	Symbol	Description
County Economic Resilience	*Resilience*	Constructed based on a multidimensional indicator system and calculated using the entropy weight method
Digital Village Construction	*DID*	Dummy variable equal to 1 if the county is designated as a National Digital Village Pilot Area in the given year, and 0 otherwise
Economic Development Level	*Gdp*	Natural logarithm of county-level gross domestic product (GDP)
Financial Development Level	*Find*	Ratio of year-end balance of loans from financial institutions to county GDP
Industrial Structure	*Industry*	Ratio of county industrial output value to county GDP
Education Level	*Edu*	Ratio of students enrolled in ordinary middle schools to total county population
Consumption Level	*Consume*	Ratio of total retail sales of consumer goods to county GDP
Household Savings Scale	*Deposit*	Natural logarithm of the balance of urban and rural residents' savings deposits

Source: created by authors.

2.4 Descriptive Statistical Analysis

According to the descriptive statistics presented in *Table 3*, the mean value of county economic resilience (*Resilience*) is 0.5053, with a standard deviation of 0.0192. Within the sample period, only 0.9% of the observations are affected by the policy treatment (*DID*), indicating that most counties have not yet implemented the pilot program. The mean value of financial development level (*Finde*) is 0.0680, with a standard deviation of 0.0449, a minimum of 0, a maximum of 0.2801, and a median of 0.0571. These statistics suggest substantial heterogeneity in financial development across counties—some counties exhibit relatively high loan-to-GDP ratios, while in most counties the level of financial development remains low. The mean value of the industrial structure (*Industry*) is 0.4177, with a standard deviation of 0.1498, a minimum of 0.0830, a maximum of 0.7867, and a median of 0.4222. This indicates that, on average, the industrial output value accounts for approximately 40% of county GDP, though there exists considerable variation among counties—some are highly industrialized, whereas others remain at relatively low levels of industrial development. The remaining variables fall within reasonable ranges and demonstrate expected statistical distributions; therefore, detailed elaboration is omitted here.

Table 3 Descriptive Statistics

Variables	N	Mean	S.D.	Min	Median	Max
Resilience	18559	0.5053	0.0192	0.1258	0.5055	0.5275
DID	18559	0.0090	0.0944	0.0000	0.0000	1.0000
Gdp	18559	23.0814	1.0855	20.0988	23.0648	25.6205
Find	18559	0.0680	0.0449	0.0000	0.0571	0.2801
Industry	18559	0.4177	0.1498	0.0830	0.4179	0.7867
Edu	18559	0.0509	0.0164	0.0162	0.0488	0.1140
Deposit	18559	22.7157	1.1743	19.3249	22.7081	25.4228
Consume	18559	0.3271	0.1351	0.0424	0.3171	0.8982

Source: own calculations.

3. Results Analysis

3.1 Baseline Regression Analysis

For the baseline assessment, the analysis uses a layered regression framework to quantify how digital village initiatives influence county economic resilience. The model progressively introduces control variables to examine whether the major findings remain stable under different specifications. The corresponding estimation results are presented in *Table 4*. The estimated coefficients of the interaction term for the core independent variable remain significantly positive at the 1% confidence level across all model specifications. The results suggest that compared with counties that are not participating in the program, those designated as digital village pilots exhibit a notable enhancement in economic resilience after the policy's rollout.

Table 4. The Impact of Digital Village Construction on County Economic Resilience

	(1)	(2)	(3)
	resilience	*resilience*	*resilience*
DID	0.0011*** (4.2392)	0.0011*** (4.3168)	0.0011*** (4.3124)
Gdp		0.0010*** (4.4760)	0.0011*** (5.0996)
Find		0.0047*** (3.5570)	0.0052*** (3.7643)
Industry		-0.0003 (-0.4962)	0.0002 (0.4357)
Edu			0.0220*** (7.6517)
Deposit			-0.0004*** (-3.3886)
Consume			0.0020*** (5.2757)
Constant	0.5053*** (2.09e+05)	0.4831*** (100.3995)	0.4884*** (92.0739)
Time fixed effects	YES	YES	YES
County fixed effects	YES	YES	YES
N	18559	18559	18559
R2	0.989	0.989	0.989
Adj. R2	0.988	0.988	0.988

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The t-values shown in parentheses are based on two-tailed tests, with standard errors clustered at the county level. This presentation format is applied consistently across all subsequent tables unless specified otherwise.

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Column (3) of *Table 4* reports the most comprehensive specification, incorporating all control variables and county and year fixed effects. Under this model, the estimated coefficient for the key interaction term is 0.0011 and remains significant at the 1% level, indicating a strong and stable positive impact of digital village construction on county economic resilience. This evidence offers solid empirical support for H1.

Moreover, the control variables exhibit relationships with economic resilience that are consistent with theoretical expectations. Notably, the economic development level demonstrates a positive association

with county resilience at the 1% significance level, implying that more economically advanced counties possess a stronger capacity to absorb and adjust to shocks triggered by economic volatility.

3.2 Robustness Tests

3.2.1 Dynamic Effect Test

A parallel-trend analysis is carried out to evaluate the robustness of the baseline estimates. This step is essential, as the DID approach presupposes that treated and untreated counties share similar pre-intervention dynamics. Following standard practice in the literature (Roberts, Whited, 2013), Model (7) is augmented with interaction terms between the treatment indicator (Treated) and a full set of year dummies covering the entire sample period. To mitigate multicollinearity, the year immediately prior to policy implementation is designated as the reference period, and its interaction with Treated is excluded from the specification. The resulting model is expressed as follows:

$$Resilience_{it} = \alpha_0 + \alpha_1 \sum_{k\geq -8, k\neq -1}^{k=3} Treated D_{it}^{k} + \sum_{i=2}^{7} Controls_{it} + CountyFE + YearFE + \varepsilon_{it} \quad (7)$$

where the dummy variable Dit indicates whether county i is in the k-th year after the implementation of digital village construction in year t. Specifically, when the year t corresponds to k years after the county was included in the pilot list, D_{it}=1; otherwise, it equals 0. The coefficient Treated captures the differential effect between pilot and non-pilot counties across different periods relative to the baseline year.

Table 5. Dynamic Effect Test

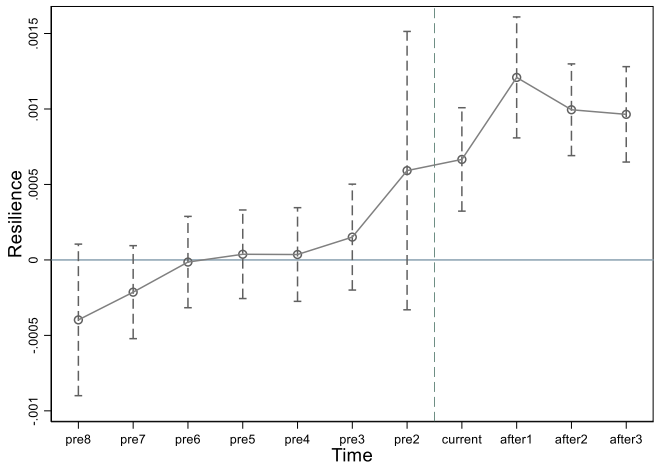
	(1)
	resilience
pre8	-0.0004 (-1.3021)
pre7	-0.0002 (-1.1407)
pre6	-0.0000 (-0.0769)
pre5	0.0000 (0.2100)
pre4	0.0000 (0.1897)
pre3	0.0002 (0.7089)
pre2	0.0006 (1.0560)
current	0.0007*** (3.1989)
after1	0.0012*** (4.9661)
after2	0.0010*** (5.3879)
after3	0.0010*** (5.0221)
Gdp	0.0011*** (5.0932)

Table 5 (*continuation)*. Dynamic Effect Test

Find	0.0052*** (3.7834)
Industry	0.0002 (0.4343)
Edu	0.0221*** (7.6728)
Deposit	-0.0004*** (-3.3965)
Consume	0.0020*** (5.2821)
Constant	0.4884*** (92.1014)
Time fixed effects	YES
County fixed effects	YES
N	18559
R2	0.989
Adj. R2	0.988

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The t-values in parentheses are based on two-tailed tests. Standard errors are clustered at the county level. Unless otherwise specified, the same notation applies to all subsequent tables.

Figure 1 illustrates the dynamic effects of digital village development on county economic resilience. The interaction coefficients for Treated and the pre-policy year dummies are all statistically indistinguishable from zero at the 1% level, suggesting that treated and control counties followed comparable trends prior to the policy rollout. From the first post-implementation year onward, however, the trajectories diverge: counties participating in the pilot program show a clear and significant improvement in economic resilience relative to those not included. The positive effect remains significant in subsequent years, indicating that the benefits of digital village construction are persistent rather than short-lived and do not show evidence of attenuation over time.



Source: created by authors.

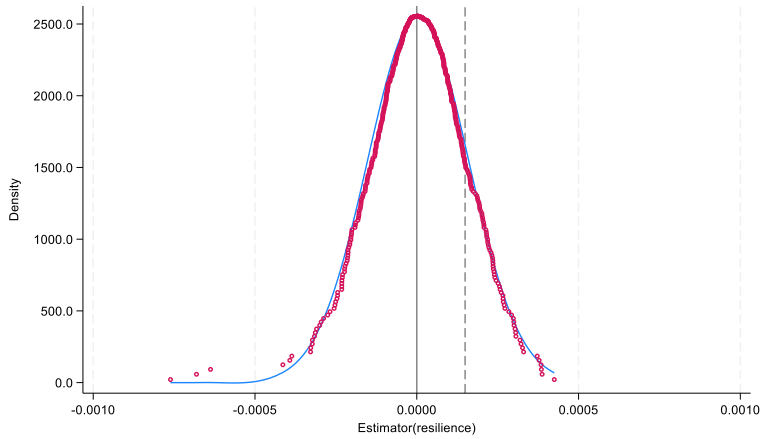
Figure 1. **Dynamic Effect Test of Digital Village Construction on County Economic Resilience**

3.2.2 Placebo Test

To strengthen the credibility of the baseline estimates, a placebo test is performed. In principle, any divergence in economic resilience between pilot and non-pilot counties should be attributable to the National Digital Village Pilot Policy rather than to random or spurious factors. However, prior research has suggested that the estimated results from the DID model may suffer from serial correlation, which could bias standard errors and lead to an excessive rejection of the null hypothesis (Baker *et al.,* 2022).

To address this concern, a nonparametric permutation test was employed following established practices (Liu, Lu, 2015; Ferrara *et al.,* 2012). Specifically, the treatment effect of digital village construction was randomly reassigned across counties to generate a pseudo-DID variable. After randomly reshuffling the treatment indicator, Model 1 was repeatedly estimated 500 times. The resulting coefficient estimates from these placebo regressions were stored, and Figure 2 depicts the distribution of these simulated effects.

Figure 2 demonstrates that the placebo coefficients are tightly centered near zero and display a distribution that is roughly normal in shape. This finding implies that the coefficients obtained from the randomized samples are statistically indistinguishable from zero, suggesting that unobservable county-level characteristics are unlikely to drive the main results. Therefore, the baseline estimates cannot be explained by random variation, reinforcing the robustness and reliability of the study's core results.



Source: created by authors.

Figure 2. **Distribution of Estimated Coefficients under Randomized Treatment**

3.2.3 Excluding the Interference of Other Policies

Across the years under investigation, county economic resilience may also have been shaped by policy initiatives unrelated to the Digital Village Construction Policy. Among the overlapping policy initiatives, the "Broadband China" Pilot Project stands out for its focus on expanding digital infrastructure, potentially influencing resilience outcomes. To mitigate this source of bias, we introduce a control variable capturing county involvement in the program, coded as 1 for years in which the county was selected as a pilot and 0 otherwise. The pilot county list is obtained from MIIT's official website.

Second, policies promoting e-commerce development in rural areas, such as the Comprehensive Demonstration Program for E-Commerce in Rural Areas, may have enhanced rural economic performance and, consequently, strengthened county economic resilience. To account for this effect, a corresponding dummy variable is constructed: if a county was covered by the demonstration program in a given year, the

variable equals 1; otherwise, it equals 0. The list of demonstration counties is obtained from the official website of the Ministry of Commerce (MOFCOM).

To ensure a cleaner estimation of the policy's net effect, the empirical model also accounts for two concurrent initiatives—the Broadband China pilot and the E-Commerce into Rural Areas Demonstration Policy. The corresponding estimates are presented in *Table 6*. Once the influence of these parallel policies is taken into consideration, the coefficient associated with the Digital Village Development Policy remains significantly positive and aligns with the baseline findings, reaffirming the robustness of the study's main conclusions.

Table 6. Regression Results after Controlling for Other Policy Interference

	(1)	(2)
	resilience	*resilience*
DID	0.0012*** (4.5182)	0.0011*** (4.5650)
BroadBand	0.0013*** (6.5666)	
e-commerce		-0.0018*** (-11.4103)
Gdp	0.0011*** (5.2734)	0.0012*** (5.9856)
Find	0.0054*** (4.0252)	0.0046*** (3.6532)
Industry	0.0002 (0.4370)	-0.0001 (-0.2375)
Edu	0.0241*** (8.5691)	0.0203*** (7.2755)
Deposit	-0.0004*** (-3.5497)	-0.0003*** (-2.8636)
Consume	0.0019*** (4.9953)	0.0020*** (5.5081)
Constant	0.4880*** (94.2756)	0.4826*** (91.3840)
Time fixed effects	YES	YES
County fixed effects	YES	YES
N	18559	18559
R2	0.990	0.990
Adj. R2	0.989	0.989

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The t-values in parentheses are based on two-tailed tests. Standard errors are clustered at the county level. Unless otherwise specified, the same notation applies to all subsequent tables.

Source: created by authors.

3.3 Mechanism Analysis

The preceding findings substantiate a clear resilience-enhancing effect of digital village policies at the county level. Innovation outcomes and fiscal input are central to resilience formation; hence, a deeper exploration of the mechanisms that link digital village initiatives to these drivers is warranted.

To empirically examine these transmission channels, this study uses the annual numbers of invention patent applications and grants to capture county-level innovation capacity. Fiscal investment is measured

by the ratio of general public budget expenditure to GDP, with its logarithmic form used as a supplementary proxy. The estimation results for the mechanism analysis are reported in *Tables 7 and 8*.

A potential concern is that the mechanism variables may be endogenous. Specifically, stronger economic resilience may itself stimulate innovation output or fiscal expenditure, leading to reverse causality. To address this issue, we re-estimate the models using one-period lagged mechanism variables (L1.patent and L1.fiscal investment). The results remain qualitatively similar, indicating that the identified mechanisms are robust and not simply driven by simultaneity bias.

As indicated in *Table 7*, digital village development yields estimated coefficients of 0.355 for patent applications and 0.376 for patent grants, with both effects significant at the 1% level. These results provide evidence that the digital village construction policy meaningfully enhances counties' innovation capacity, reinforcing their overall economic resilience.

Table 7. Mechanism Analysis Results: County Innovation Capacity

	(1)	(2)	(3)	(4)
	Invention Patent Applications	Invention Patent Grants	L1.Invention Patent Applications	L1.Invention Patent Grants
DID	0.355*** (3.560)	0.376*** (3.324)	0.358*** (2.621)	0.536*** (3.607)
Gdp	0.099 (1.337)	0.063 (0.914)	0.198** (2.430)	0.181** (2.343)
Find	2.021*** (5.088)	1.732*** (4.416)	2.042*** (5.270)	1.994*** (5.159)
Industry	0.706*** (3.266)	0.647*** (3.557)	0.470** (1.986)	0.646*** (3.170)
Edu	-0.978 (-1.074)	1.190 (1.429)	-1.095 (-1.101)	0.418 (0.441)
Deposit	0.118*** (3.063)	0.053* (1.817)	0.043 (1.033)	0.019 (0.575)
Consume	0.236** (1.997)	0.027 (0.242)	0.397*** (3.082)	0.397*** (3.082)
Constant	-2.374 (-1.329)	-1.189 (-0.710)	-2.987 (-1.472)	-2.987 (-1.472)
Time fixed effects	YES	YES	YES	YES
County fixed effects	YES	YES	YES	YES
N	16622	16622	12883	12883
R2	0.857	0.823	0.860	0.840
Adj. R2	0.841	0.803	0.840	0.817

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The t-values in parentheses are based on two-tailed tests. Standard errors are clustered at the county level. Unless otherwise specified, the same notation applies to all subsequent tables.

Source: created by authors.

Similarly, *Table 8* reports that digital village construction exerts a significant positive effect on local fiscal investment at least at the 5% significance level. This finding suggests that the policy not only increases the intensity of local fiscal spending, but also improves the capacity of local governments to allocate resources toward digital infrastructure and public services, thereby enhancing the provision of digital public goods.

Importantly, the changes in these mechanism variables are not merely intermediate outcomes, but represent key channels through which digital village construction translates into improvements in economic resilience. Enhanced innovation capacity strengthens counties' ability to adapt to external shocks through technological upgrading and structural transformation, while increased fiscal investment—particularly in digital infrastructure and public services—improves the provision of digital public goods and reinforces local adaptive capacity. Therefore, the observed effects on innovation and fiscal investment provide substantive evidence on how digital village policies are transmitted into resilience-enhancing outcomes.

Overall, these results validate H2 and H3, confirming that digital village construction enhances economic resilience through the innovation-driven and fiscal-support mechanisms.

Table 8. Mechanism Analysis Results: Local Fiscal Investment

	(1)	(2)	(3)	(4)
	Local Fiscal Investment	Local Fiscal Investment	L1.Local Fiscal Investment	L1.Local Fiscal Investment
DID	0.007*** (2.916)	0.195** (2.485)	0.007* (1.817)	0.179* (1.929)
Gdp	-0.012*** (-7.089)	0.658*** (13.375)	-0.004** (-2.053)	0.835*** (13.920)
Find	0.086*** (7.178)	1.507*** (5.160)	0.095*** (6.640)	1.557*** (4.618)
Industry	0.011** (2.075)	0.444*** (3.428)	0.001 (0.095)	0.017 (0.111)
Edu	-0.003 (-0.141)	0.619 (0.864)	0.017 (0.604)	1.769** (2.042)
Deposit	0.004*** (3.185)	0.145*** (4.522)	0.003*** (3.431)	0.124*** (4.365)
Consume	-0.004 (-1.228)	-0.026 (-0.277)	-0.009*** (-2.709)	0.004 (0.037)
Constant	0.234*** (5.247)	0.864 (0.700)	0.063 (1.259)	-2.781* (-1.906)
Time fixed effects	YES	YES	YES	YES
County fixed effects	YES	YES	YES	YES
N	18308	18302	14140	14136
R2	0.668	0.823	0.691	0.841
Adj. R2	0.633	0.805	0.649	0.820

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The t-values in parentheses are based on two-tailed tests. Standard errors are clustered at the county level. Unless otherwise specified, the same notation applies to all subsequent tables.

Source: created by authors.

4. Discussion

Building on rigorous empirical analysis, the current study provides evidence that digital village initiatives strengthen county-level economic resilience and identifies the mechanisms that drive this enhancement.

These findings offer new analytical insights into the role of digital technologies in advancing rural development. In response to the question raised in the introduction regarding how to enhance county economic resilience, the findings not only provide concrete answers but also deepen our understanding by demonstrating that digital technology functions not merely as an external tool, but also as an endogenous mechanism that reshapes the adaptive and risk-resistant capacities of local economies.

It is worth noting that the effects of digital village construction may vary across counties with different structural characteristics. For agriculture-oriented counties, the policy may primarily enhance resilience through smart agriculture, agricultural digitalization, and rural e-commerce development. In contrast, for more industrialized counties, digital village initiatives may operate more through industrial upgrading and the digital integration of local production networks. In addition, counties with deeper financial development may be better positioned to translate fiscal support into effective digital investment, thereby strengthening the policy's resilience-enhancing effects. These potential differences suggest that local industrial structure and financial capacity should be taken into account when interpreting the policy's impact.

First, the benchmark estimations offer compelling evidence that digital village development meaningfully strengthens county economic resilience. This conclusion is consistent with the broader literature on economic resilience (Martin, Sunley, 2015). Despite acknowledging the critical role of digital infrastructure in influencing resilience (Chen *et al.*, 2025), existing studies have predominantly examined this relationship within macro-level or city-oriented frameworks. A distinctive contribution of the current work is its application of a quasi-natural experimental design to verify the effectiveness of a specifically targeted policy, i.e., the National Digital Village Pilot Policy, at the county level. After this policy was launched, pilot counties experienced notable gains in economic resilience, illustrating that well-calibrated policy interventions can convert digital technology into a powerful catalyst for resilience enhancement. This finding enriches our understanding of policy effects by suggesting that, in the face of complex external shocks, targeted digital policies can strengthen local self-adjustment and recovery capabilities more rapidly and effectively than purely market-based mechanisms.

Second, the examination of transmission channels yields substantive and original evidence on the specific processes through which digital village development contributes to enhanced county economic resilience. To begin with, the results confirm that digital village construction strengthens resilience by promoting local innovation capacity, validating the notion that "innovation serves as the moat of economic resilience." The study further highlights the key role of digital technology in this process. The widespread application of digital technologies creates new platforms for the flow and recombination of innovation factors, stimulating endogenous innovation dynamics within counties. Prior research has shown that digital inclusive finance significantly fosters agricultural innovation (Huang, Wang, 2022). The current study extends such evidence by providing microlevel verification of how digital technology translates into tangible innovation output at the county level. Alternatively, the current study finds that digital village construction substantially increases the intensity and efficiency of local fiscal investment. This result is aligned with existing research that emphasizes that digital governance enhances government performance (Wenchao, Dan, 2024). Digital technologies make fiscal allocation and supervision precise and transparent, enabling public finance to support sustainable and resilient economic development more efficiently. Together, the two mechanisms, i.e., innovation-driven and fiscal support, constitute the core channels through which digital village construction reinforces county economic resilience, offering a clear and actionable framework for understanding how digital technology transforms into economic resilience.

Finally, the dynamic effect results presented in Figure 1 provide new insights into the sustainability of policy effects. The findings show that after the policy's implementation, the policy effect remains significant and persistent over time, without evidence of attenuation. The results imply that digital village initiatives generate enduring and persistent benefits, instead of producing only transient effects. the results demonstrate that digitalization provides sustained support for county economic resilience under continuous policy implementation, offering sustained endogenous momentum for local resilience. This finding carries important policy implications: continuous investment in digital transformation is critical for achieving sustainable rural economic development.

Conclusions and recommendations

Research Conclusions

Using panel data from 2,278 counties over the period of 2006–2023, the current study employs a DID identification strategy to assess not only the overall effect of digital village development on county economic resilience but also the mechanisms through which these effects manifest. The empirical evidence clarifies how digital transformation supports resilient and high-quality county development, yielding three major conclusions:

(1) Digital village initiatives markedly reinforce county economic resilience. Following the rollout of the pilot program, treated counties exhibit substantially higher resilience than their non-pilot counterparts, and this pattern holds across extensive robustness analyses.

(2) The enhancement effect operates through two key channels. Digital village construction stimulates local innovation dynamics and improves fiscal investment structures and efficiency, jointly strengthening counties' capacity to absorb and adapt to shocks.

(3) The benefits of digital village development exhibit clear persistence. Evidence from the dynamic effect tests indicates that the policy's influence does not dissipate quickly; instead, it remains significant over time without evidence of attenuation, underscoring the importance of sustained digital investment for long-term rural resilience and sustainable growth.

Managerial and Policy Implications

Drawing from the findings, the current study offers several primary policy insights:

(1) Consolidate the digital infrastructure base to ensure broad and equitable access. Narrowing regional digital infrastructure disparities should remain a central task of digital village development. Public authorities are encouraged to expand investment in next-generation digital infrastructure, including 5G, IoT systems, and integrated data platforms, to support counties in building a resilient and interconnected digital environment that is capable of absorbing external shocks.

(2) Advance digital upgrading across industries to support diversified economic structures. Promoting digital applications along agricultural and manufacturing value chains while simultaneously nurturing emerging sectors, such as rural e-commerce and smart agriculture, can enhance industrial agility and adaptive capacity. Such transformations are essential for strengthening counties' overall economic resilience.

(3) Optimize the structure of fiscal investment and establish a coordination mechanism between fiscal policy and digital strategies. Public finance should prioritize digitalization and innovation, improving allocation efficiency and targeting precision to provide institutional guarantees for enhanced resilience.

(4) Foster innovation ecosystems and talent development to enhance endogenous momentum. Digital village construction depends not only on hardware investment but also on the aggregation of innovation resources and human capital to sustain long-term endogenous growth and cumulative policy effects.

(5) Improve digital governance capacity to enhance risk response and policy execution efficiency. Leveraging digital tools to strengthen government governance and public trust can create a more stable environment for development, especially during crises or structural adjustments.

Policy design should also take county-level heterogeneity into account. For agriculture-dominated counties, priority should be given to smart agriculture, rural e-commerce, and the digitalization of agricultural value chains. For industry-dominated counties, greater emphasis should be placed on digital upgrading of industrial chains and workforce skills training. In addition, differentiated fiscal strategies should be adopted across regions with varying fiscal capacities to improve policy effectiveness.

Limitations and Future Research Directions

Although it offers meaningful insights, the current study is not without constraints. First, the empirical analysis draws largely on county-level macro indicators, enabling the identification of overall policy outcomes but preventing a finer-grained evaluation of heterogeneous resilience effects that are associated with specific digital technologies. Future research can incorporate microlevel data from enterprises or households to examine specific technological pathways. Second, although this study identifies innovation capacity and fiscal investment as the primary mediating mechanisms, other transmission channels may also exist. Future research could further examine more specific micro-level mechanisms, such as farmers' digital literacy and rural social capital networks, both of which may influence how effectively digital village policies are implemented and diffused. Exploring these channels would help build a more comprehensive analytical framework for understanding how digitalization contributes to county-level economic resilience.

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SKAITMENINIŲ KAIMŲ PLĖTRA STIPRINANT EKONOMINĮ APSKRIČIŲ ATSPARUMĄ: DVEJOPAS INOVACIJŲ PAJĖGUMO IR FISKALINIŲ INVESTICIJŲ VAIDMUO

Yang Cao, Fei Teng

Santrauka. Didėjant pasauliniam ekonominiam nestabilumui ir plėtojant kaimo atgaivinimo strategiją apskričių ekonominio atsparumo stiprinimas tampa svarbia prielaida užtikrinti bendrą nacionalinės ekonomikos stabilumą. Nors ankstesniuose tyrimuose analizuoti įvairūs ekonominio atsparumo veiksniai, vis dar trūksta empirinių įrodymų, susijusių su valstybės inicijuotomis skaitmeninėmis politikos priemonėmis ir veikimo mechanizmais. Siekiant įvertinti, ar institucinė skaitmenizacija veikia kaip kanalas, per kurį skaitmeninių kaimų iniciatyvos formuoja apskričių lygmens ekonominį atsparumą, šiame tyrime Nacionalinė skaitmeninių kaimų pilotinė programa pasitelkta kaip egzogeninis politikos pokytis. Remiantis regioninio ekonominio atsparumo teorija ir technologijomis grindžiamos inovacijų krypties teoriniais principais, sudarytas apskričių lygmens panelinių duomenų rinkinys, apimantis 2006–2023 m. laikotarpį, o politikos poveikiui vertinti taikytas skirtumų skirtumų (angl. *difference-in-differences*) metodas. Empiriniai rezultatai atskleidė, kad skaitmeninių kaimų programos reikšmingai ir patikimai didina apskričių ekonominį atsparumą. Šį poveikį daugiausia lemia du pagrindiniai mechanizmai: inovacijų pajėgumo stiprinimas apskrityse ir vietinių fiskalinių investicijų didinimas. Tyrimas suteikė svarbių vadybinių ir viešosios politikos įžvalgų, galinčių prisidėti prie regioninio ekonominio stabilumo stiprinimo ir kaimo plėtros strategijų optimizavimo skaitmeninėje eroje. Jie leidžia teigti, kad įtrauki skaitmeninė infrastruktūra ir koordinuoti fiskaliniai bei skaitmeniniai mechanizmai yra esminės prielaidos stiprinti apskričių atsparumą rizikoms ir atsigavimą po ekonominių sukrėtimų.

Reikšminiai žodžiai: skaitmeninių kaimų plėtra; apskričių ekonominis atsparumas; inovacijų pajėgumas; vietinės fiskalinės investicijos.

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