Int. J. Anal. Appl. (2025), 23:180

International Journal of Analysis and Applications

The Moderating Effect of Rural Policy Interventions on Comprehensive Rural Revitalization in China

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ABSTRACT. This research examines how rural technology acceptance and rural policy interventions influence comprehensive rural revitalization in China. It draws on the resource-based view (RBV), the technology adoption model (TAM), and development economics theory (DET) to investigate the roles of digital transformation across industry, ecology, culture, governance, and well-being domains. Using panel data from 30 provinces (2010–2023), the analysis employs fixed-effects models to estimate direct and moderating effects. The results show that rural technology acceptance can significantly enhance recovery outcomes. Rural policy interventions will strengthen this effect in regions with high rural technology acceptation and adoption, but will be ineffective or detrimental if digital readiness is low. The results highlight the importance of strong digital infrastructure, skills development, and integrated policy strategies to achieve sustainable rural transformation. The limitations and suggestions for future research also provides in the latter.

1. Introduction

Innovations like artificial intelligence (AI) and big data have permeated many facets of the social and economic landscape, serving as catalysts for modernization and change as a result of scientific and technological breakthroughs. Representing a 19.2% Compound Annual Growth Rate (CAGR). Likewise, the market for digital transformation is anticipated to develop at a compound annual growth rate (CAGR) of 28.5%, from USD 1,070.43 billion in 2024 to USD 4,617.78 billion by 2030 [1]. This rise highlights how digitalization is becoming a major tactic for raising competitiveness and attaining sustainable development on a worldwide scale. To improve economic resilience and adaptability, governments and organizations worldwide are spending more in digital transformation projects.

Received Jun. 8, 2025

2020 Mathematics Subject Classification. 91B74, 91B82.

Key words and phrases. moderating effect; rural technology acceptance; policy interventions; rural revitalization.

https://doi.org/10.28924/2291-8639-23-2025-180

ISSN: 2291-8639

Digital transformation is a key factor in the rural economy since it boosts infrastructure, productivity, and the efficiency of resource allocation, making it a strategic asset for rural economic growth. Growth and sustainable development in rural areas are greatly impacted by the incorporation of digital technologies into these sectors. With an emphasis on integrating digital transformation with industrial advancement in rural areas, researchers and practitioners acknowledge the urgency of this shift. To inform policymaking, this guideline attempts to evaluate the impact of rural industry' digital transformation on the region's social and economic advancement. Additionally, it seeks to foster digital transformation in the industrial sector, encourage integrated urban and rural development, and ease the broad acceptance and innovation of digital technology in rural areas.

A major force behind social and economic advancement is the digital transformation of industries, which makes it possible to enhance management, business models, and efficiency, all of which increase competitiveness and promote regional growth [2]. Through the improvement of infrastructure, innovation, and industrial integration, this transformation promotes high-quality growth in industries such as manufacturing, agriculture, and services. It reduces the digital gap and speeds up complete rural revitalization in rural areas by improving living conditions, generating jobs, and raising agricultural productivity [3]. Public well-being and national growth depend on rural development [4]. Rural development in China is hampered by urban-rural disparity, fast industrialization, and environmental stress [5]. Rural incomes were 2.39 times lower than urban incomes by 2023 [6]. China launched the Rural Revitalization Strategy in 2017 to solve the "three rural issues" of farmers, agriculture, and rural regions [7]. The five pillars of this strategy such as industrial prosperity, ecological livability, rural cultural development, efficient government, and enhanced quality of life, all support modernization and urban-rural integration [8]. This is to improve living conditions and reduce development disparities, each pillar forms the basis of a sustainable rural transformation [9].

Because it increases employment, farmer incomes, and economic resilience, the industrial sector's success serves as the cornerstone of comprehensive rural revitalization. Increasing market access and optimizing structures are necessary for the growth of rural industries [10]. Improvement and diversification can be facilitated by combining new industries like e-commerce and rural tourism with more established sectors like services and agriculture [11]. China's primary industries generated 8.98 trillion yuan in added value in 2023, which accounted for 5.94% of GDP growth [12]. With over 90,000 primary processing businesses still operating and agricultural product quality surpassing 97.8%, 60% of rural revitalization subsidies are directed towards industrial development. Agricultural services spanned more than 131,000 square kilometres, and rural online transactions totaled 2.49 trillion yuan [12]. 91 million smallholder farmers have profited as a result. With notable increases in food sector investment, rural retail sales of 6.4 trillion yuan, and tourism development encompassing 1,597 villages, technology has contributed 63.2% to agricultural advancement [13]. By boosting supply chain efficiency, encouraging innovation, and enhancing productivity, digital transformation via AI, IoT, and big data is propelling rural industrial growth [14].

Adoption of technology is significantly impacted by the digital revolution of rural sectors. Digital technologies can increase perceived advantages and usability, but they can also cause resistance and confusion in rural areas. The success of digital technology adoption and, consequently, rural revitalization depends on technology adoption. While high adoption speeds up economic integration and growth, low adoption restricts access to digital technologies and limits the results of transformation [15]. Designing successful policies that promote rural development requires an understanding of this dynamic. Increasing access to digital tools through infrastructure, education, and financial incentives is a major function of policy interventions, particularly in poor or rural locations. These actions support all-encompassing rural revitalization and aid in closing the digital divide [16]. Furthermore, digital diffusion is influenced by geographic proximity to key regions, with places nearer the center experiencing faster benefits. However, because of poorer knowledge and resource transfers, adoption will be slower in rural areas [17].

This research combines the resource-based perspective, technology adoption model, and development economics. It emphasizes the moderating of mitigating roles of policy and technology adoption. When combined, these revelations offer a thorough theoretical framework for encouraging coordinated rural revitalization.

This research highlights that the adoption and application of digital technologies in rural industries is crucial to achieving China's rural revitalization goal. Since the launch of the Rural Revitalization Strategy in 2017, the Chinese government has introduced a variety of supportive policies, such as financial incentives and digital skills training, to facilitate the digital transformation of agriculture [18]. These efforts have significantly improved farmers' ability to adopt digital tools and laid a significant foundation for the modernization of rural industries and the revitalization of the rural economy and society.

Despite advancements, there is still a lack of digital infrastructure in rural areas and a low rate of technology use. Long-term initiatives to increase digital participation and skills as wider social cooperation are necessary for the development of digital applications in agriculture, governance, and services. Additionally, rural technology acceptance differs from place to place, and through interregional economic ties, its effects frequently transcend local borders. This might change impacts rural regeneration as it extends across areas.

The inexorable trend of digital transformation is driving China's industrial development and comprehensive rural revitalization at a critical juncture. In addition to modernizing rural industries and increasing production efficiency, digital technologies also help achieve objectives like better quality of life, ecological livability, and efficient government. The distinctive resources and traditional knowledge present in rural regions provide a solid basis for this shift. Regional differences in public services, finance, and infrastructure, however, continue to be problems. Utilizing local advantages, strengthening policy support, increasing digital acceptance, and encouraging innovation are the main topics of this research, which aims to combine rural technology acceptant with rural revitalization.

Even if previous studies have recognized the value of digital technology in fostering rural revitalization in China, there are still a lot of unanswered questions. A thorough examination of the various stages of development and the real world applications of technology in fields like e-commerce and smart agriculture is lacking, despite the fact that the technology acceptance of rural industries has evolved concurrently with the swift advancement of technology and changes in policy. Second, the majority of earlier studies have tended to ignore how rural inhabitants' adoption of technology process of digital transformation. The impact of digital transformation on rural users' attitudes, behaviors, and perceptions, and how they impact rural revitalization outcomes, has received little consideration. Third, despite playing a significant role in determining the success of digital efforts, the moderating influence of governmental involvement has not been studied. In particular, little is known about how local government policies affect rural digital competencies and adoptive an environment that encourages digital adoption. It is to create a framework for the rural technology acceptance of rural industries and all-encompassing rural revitalization, these deficiencies must be filled.

Thus, the main research question is "How is the rural technology acceptance of rural industries influencing the comprehensive rural revitalization in China?" And "What role do technology adoption and policy interventions play in this process?"

The two specific research objectives can be:

1. to investigate how rural industries' attitudes and behaviors about digital technology are influenced by digitalization and how this impacts the results of rural revitalization as the function of rural technology adoption,

2. to examine how the digital environment and local government assistance affect the relationship between technology adoption and the effectiveness of rural revitalization projects as the moderating effect of rural policy interventions.

2. Literature Review

2.1 Resource-based View (RBV)

A strategic framework for comprehending how internal resources generate competitive advantage is offered by the Resource-Based View (RBV), especially when considering the digital transformation of rural sectors [19]. Digital resources including ICT infrastructure, digital apps, digital management skills, and digital industries are rare, valuable, unique, and irreplaceable in rural places [20]. These traits make it possible for rural communities to develop contemporary, technologically advanced industries in place of traditional agriculture and services. Different development outcomes are influenced by the variety and scarcity of digital resources, especially in areas with differing degrees of infrastructure and adoption. Effective digital technology integration can boost output, enhance supply chains, and open up new markets in areas, all of which set the stage for long-term development and rural revitalization [21].

Additionally, the RBV framework highlights that the integration and deployment of resources are just as important to digital transformation in rural areas as their availability. Rural digital transformation approaches are contextually specific and challenging to reproduce, offering competitive advantages due to customised applications, regional innovations, and government-led efforts [22]. As rural areas develop their digital management skills, the convergence of digital resources—such as data sharing, real-time analytics, and e-commerce—also contributes to the development of a dynamic digital ecosystem that fosters economic resilience and industrial upgrading [23]. In addition to achieving industrial prosperity, these regions also accomplish more general objectives of comprehensive rural revitalization [24] such as ecological well-being, efficient governance, and enhanced quality of life, by keeping an eye on the ecology and conserving their culture.

2.2 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a basic framework for understanding how rural users adopt and engage with digital technologies [25]. In rural areas, perceived usefulness (the belief that technology increases productivity and income) and perceived ease of use (the ease of use of the technology) are key determinants of digital technology adoption. As rural areas are exposed to new innovations such as smart farming, e-commerce platforms, and digital management systems, the ease and effectiveness of these tools directly determine farmers' willingness to use them [26]. However, low levels of digital literacy, lack of training, and technical complexity can limit adoption, particularly among older or less educated rural populations [20].

The TAM also emphasizes how technology adoption acts as a mediator in tying rural industries' digital transformation to more general objectives of rural revitalization [24]. Rural communities' adoption of digital technologies improves when they receive the right kind of infrastructure, training, and legislative incentives [23]. Better governance, access to new markets and services, and more effective agricultural production all result in increased economic growth and a higher standard of living. As a result, in addition to describing the behaviors of specific users, the TAM offers insights on how to strategically support rural digital transformation through tailored assistance that improves perceived benefits and usability [22].

2.3 Development Economics Theory (DET)

Development Economics Theory (DET) offers a macroeconomic perspective on how digital transformation can act as a catalyst for rural transformation. It emphasizes that economic development is not just about increasing productivity, but also about structural transformation, shifting from traditional agriculture to more productive sectors such as agricultural processing, services and knowledge-based industries [23, 27]. In the rural context, digital transformation supports this transformation in three stages: increasing agricultural productivity through precision farming in the early stages, promoting the growth of rural industries through e-commerce and agricultural processing in the post-industrial stage, and providing access to financial services, education and information platforms in the post-industrial stage [28]. These digital advances contribute to the modernization of rural areas by optimizing industrial structures, improving public services and increasing social equity, which are the main goals of comprehensive rural revitalization [29].

The key role of government policies in addressing market failures and shaping development direction is central to DET's focus on rural digital transformation. Such transformation will require government investment in infrastructure, financial incentives for technology adoption, and programs to promote digital literacy and human capital [21]. Policy interventions will not only reduce barriers to technology adoption but also increase technology adoption among rural populations. By combining government support with market mechanisms, DET explains how rural areas can advance their development levels through coordinated digital transformation. As digital facilities, applications, management, and industries develop, they will contribute to inclusive growth, strengthen local governance, and promote sustainable rural livelihoods, in line with the goals of industrial prosperity, green living, and improved quality of life [24].

Therefore the conceptual framework with hypothesis development are presented as follows:

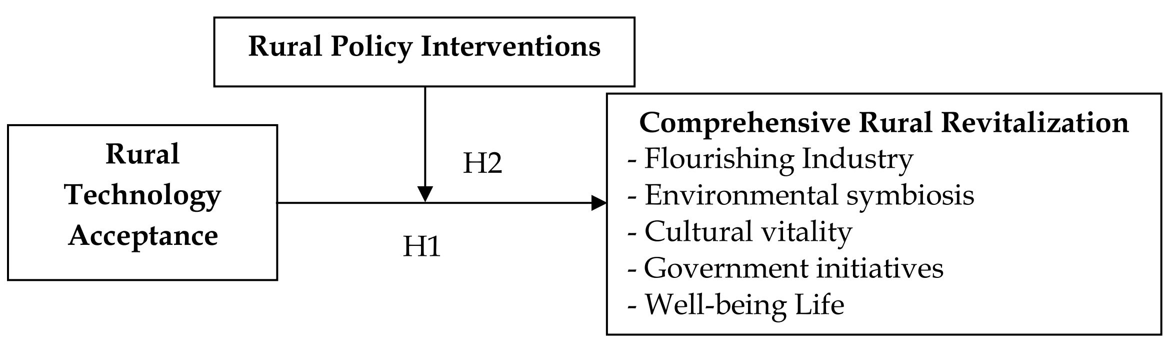

Figure 1. Conceptual Framework

Hypotheses for this research can be:

Hypothesis 1: Rural technology acceptance has a positive relationship to the comprehensive rural revitalization.

Hypothesis 2: Rural policy interventions has a moderating effect on the relationship between rural technology acceptance and comprehensive rural revitalization.

3. Methodology

This research analyzes the digital transformation of rural areas and its impact on rural revitalization in 30 of 33 provincial-level regions in China from 2010 to 2023. The 14-year time period was chosen because: (1) rural digital transformation accelerated after 2010 due to major government policies and infrastructure investment; (2) the 2017 Rural Revitalization Strategy and the 2018–2022 Digital Rural Construction Program marked a turning point in linking digital transformation with sustainable rural development; and (3) the time frame allows for long-term analysis of the impacts of digital policies and innovations across all dimensions of economy, society, ecology, culture, and governance. The sample data from 30 provinces over 14 years yields 420 samples using 20 indicator variables. The dataset consists of 8,400 observations, providing comprehensive coverage for multi-dimensional analysis of rural technology acceptance, rural policy interventions, and outcomes (comprehensive rural revitalization).

3.1 Data Collection Procedure

This research uses data from the 2023 National Bureau of Statistics annual report, provincial-level reports, and official data sources, focusing on rural population, agricultural output, digital infrastructure, and income in 30 provinces. Data from Tibet, Hong Kong, Macao, and Taiwan were excluded because these were not suitable to research framework. The 2010–2023 panel data covers key periods of rural digital transformation and policy implementation [30]. Missing values were imputed, and outliers were handled to ensure data quality.

3.2 Statistical Techniques

Statistical software like STATA 14 and SPSS, which are both popular in social science research because to their strong data processing and statistical analysis capabilities, were utilized to examine the data [31]. The following modules were used in the specified analysis: econometric analysis for more complex techniques like multiple regression and panel data analysis; statistical analysis for descriptive and inferential statistics; and data management for importing, cleaning, and organizing data.

3.3 Stationarity Test

Using the Levin-Lin-Chu (LLC) unit root test, the panel data from 2010 to 2023 was examined for reliability. This test determines whether there are any patterns in the data that could lead to an irrational regression, or if the data is stationary [32]. Using STATA, the LLC test's null hypothesis is taken to be stationary. The data set is deemed suitable for additional analysis since the findings demonstrate that every variable has a p-value less than 0.01, thereby rejecting the null hypothesis and verifying stationary [33] (see table 3).

3.4 The Hausman test

The Hausman test [34], which determines if the unobserved effects are connected to the explanatory variables, was used to select between the Fixed Effects Model (FEM) and the Random Effects Model (REM). According to the test results, $chi^2 = 56.949$, $p < 0.01$ in model 1, and $chi^2 = 9.586$, $p < 0.05$ in model 2, which rejected the null hypothesis (see table 4). Therefore, FEM were selected as the better model to examine the relationship between revitalization and digital transformation in rural areas in models 1 and 2 [35].

3.5 The descriptive statistics

The mean, variance, standard deviation, minimum, and maximum values of variables such as rural technology acceptance, rural policy interventions, and comprehensive rural revitalizations are among the significant features of a data collection that are summarized by descriptive statistics [36].

3.6 Hypothesis Testing

Hypotheses were tested using multiple regression analysis, mediation, and control. Level of significance ($p < 0.05$ or 0.01), regression coefficients, t-value, and Adj. R^2 are used to assess statistical and practical significance [37].

3.7 Normality Test

Normality was assessed using skewness and kurtosis. All variables showed in table 1 are in the acceptable ranges (skewness: -0.006 to 0.625; kurtosis: -0.904 to 0.353), confirming a nearly normal distribution [38].

3.8 Correlation Analysis

The Pearson's correlation coefficients as showed in table 2 ranged from -0.427 to 0.402, indicating moderate to strong relationships between the main variables, supporting further analysis [37].

Therefore, the model equations are as follows:

Equation 1: $REV_{it} = \alpha_1 + \beta_1 TAC_{it} + \varepsilon_{it}$

Equation 1 is used to test hypothesis H1, while equation (2) is used to test hypothesis H2 for Moderated effects model.

Equation 2 $REV_{it} = \alpha_2 + \beta_2 TAC_{it} + \beta_3 (TAC_{it} \times RPO_{it}) + \varepsilon_{it}$

Where;

REV_{it} is a comprehensive rural revitalization (including Flourishing Industry, Environmental symbiosis, Cultural vitality, Government initiatives, and Well-being Life) in province *i* in year *t*;
TAC_{it} is a rural technology acceptance in province *i* in year *t*;

RPO_{it} is a moderator variable indicating the extent of rural policy interventions in province *i* in year *t*;

ε_{it} is a random error term.

4. Results

The adoption of technology is more erratic and widely distributed in rural areas due to economic disparities. The uneven influence of economic disparities on technology adoption in rural areas is reflected in the mean of 0.097 and standard deviation of 0.163 (see table 1), which show that while some regions adopt technology more rapidly than others [39]. The implementation intensity of policy interventions in rural areas is relatively low (mean = 0.097, SD = 0.163), and there are notable regional variations. This suggests that policy efforts are not distributed evenly, which could result in varying levels of effectiveness. It also emphasizes the need for more focused and consistent interventions to guarantee equitable development in rural areas [40].

Using skewness and kurtosis values, the normalcy of the variables such as rural technology acceptance and rural policy interventions was evaluated. The majority of skewness readings, which roughly indicated symmetry, fell between -0.006 and 0.625 [41]. Even the rural technology acceptance had a slightly right skew (0.625). The majority of kurtosis values were between -1 and 1, suggesting a distribution that was nearly normal. The data approximates normalcy well, despite not being entirely normal. The central limit theorem permits minimal deviations due to the big sample size (n = 420), enabling trustworthy parameter and regression studies [42].

Table 1 Descriptive Statistics

Variable	Sample	Minimum	Maximum	Mean	SD	Kurtosis	Skewness
Comprehensive Rural Revitalization (REV)	420	0.054	0.726	0.289	0.117	0.066	-0.006
Rural Technology Acceptance (TAC)	420	0.000	1.000	0.097	0.163	-0.904	0.625
Rural Policy Interventions (RPO)	420	0.059	1.000	0.340	0.171	0.353	0.013

Note: 420 samples total 8,400 observations

4.1 Results for Analysis of Correlation

Significant correlations between the primary variables and Comprehensive Rural Renewal (REV) were found using the Pearson correlation analysis (table 2). The significance of digital adoption was shown by the strong positive correlation ($p < 0.01$) between rural technology acceptance (TAC) and CRR. On the other hand, there was a negative correlation ($p < 0.01$) between rural policy invention (RPO) and CRR, suggesting inconsistent or difficult implementation [43]. These trends show how technology, human capital, and industrial structure interact [44] and how digital policy initiatives need to be improved [45]. Even though the correlations offer a framework for interpretation, additional research is required to validate the causal relationship. A multiple correlation (VIF) test was also performed to make sure the model was robust. This research used the variance inflation factor (VIF) to assess the coexistence of several variables. As shown in table 2, all VIF values were below 5, indicating no serious coexistence of several variables [46]. The highest VIF value was that of the rural technology acceptance (3.622), following the comprehensive rural revitalization (1.846), and rural technology acceptance (1.776). These results confirmed that the predictors were sufficiently independent for reliable regression analysis.

Table 2 Correlation Matrix

Variable	REV	TAC	RPO	VIF
REV	1			1.846
TAC	0.402**	1		3.622
RPO	-0.427**	-0.129**	1	1.776

**p<0.01

4.2 Results for Stationarity Test

Table 3, the LLC figures all surpass the crucial value, ranging from -9.139 (rural technology adoption) to -5.561 (rural policy interventions). The dependent variable, the overall rural revitalization variable, exhibits considerable stationarity (-5.603, $p < 0.01$). The variables that exhibit stationarity include policy initiatives and rural technology uptake. The null hypothesis of nonstationarity for all variables is severely rejected by these findings. Because it eliminates worries about ambiguous associations, the constant stationarity across all variables is especially significant because it improves the trustworthiness of later panel data analysis [47].

Examining the long-term effects of digital development indicators on rural regeneration requires an understanding of their stability over time, which is indicated by the high stationarity of digital-related variables. The robustness of the model is further supported by the control variables' stationarity, which enables a more accurate estimation of the influence of digital factors on rural revival while simultaneously accounting for other influencing factors. In conclusion, the findings of the LLC test offer a strong basis for applying panel data analysis methods, guaranteeing that the connections uncovered in further investigations are not the consequence of non-stationary processes. The findings of the study on how digital development affects rural revival are more reliable because all the factors are stationary.

Table 3 Stationarity Test Results of Variables

Variable	LLC	Results
Comprehensive Rural Revitalization (REV)	-5.603**	Stationary
Rural Technology Acceptance (TAC)	-9.139**	Stationary
Rural Policy Interventions (RPO)	-5.561**	Stationary

**p<0.01

4.3 Results for Hypothesis Test

This research employs fixed effects modeling (FEM) to conduct the empirical analysis (see table 4), drawing on the theoretical framework laid out in figure 1, which explores the interaction between rural technology adoption and comprehensive rural revitalization. The selection is informed by the results of the Hausman test and the nature of the relationship of the variables. This research investigates how factors such as rural technology adoption and rural policy interventions influence comprehensive rural revitalization. In particular, this research constructs and applies main and moderating effects models. This comprehensive methodology allows for a sensitive exploration of the complex interactions among variables, aiming to reveal the inherent relationship between these factors and their overall impact on rural economic development. Table 4 provides the constructed equation (1). The main effects of rural technology adoption and comprehensive rural revitalization are tested, which is used to assess the individual effects of the rural technology adoption variables on comprehensive rural revitalization (H1). Model 2 in table 4 analyzes equation (2), which is used to assess the moderating effects of rural technology adoption and rural policy interventions on comprehensive rural revitalization (H2).

Table 4 Regression Results from Panel Data during 2010-2023

Variable	Comprehensive Rural Revitalization (REV)	Comprehensive Rural Revitalization (REV)
Constant	0.274** (0.016)	0.278** (0.015)
Rural Technology Acceptance (TAC)	0.125** (0.048)	0.178** (0.050)
Rural Policy Interventions (RPO)		-0.266** (0.031)
TAC*RPO		1.037** (0.346)
No. of observations	8,400	8,400
F-Test	53.691**	45.574**
Ajd. R^2	0.335	0.347
Hausman Test	56.949**	9.586*
Model	FEM	FEM

Note: Standard error in parentheses, **p<0.01, *p<0.05

Model 1 examines the direct effect of rural technology acceptance (TAC) on comprehensive rural revitalization (REV) using panel data from 2010 – 2023 and a Fixed Effects Model (FEM) approach. The adjusted R^2 value can explain approximately 33.5% of the variation in comprehensive rural revitalization by rural technology acceptance, reflecting its moderate explanatory power. The F-test (53.691, $p < 0.01$) is statistically significant overall, meaning that the rural technology acceptance together significantly predicted comprehensive rural revitalization. The Hausman test (56.949, $p < 0.01$) shows that the FEM is appropriate, as it controlled for the unobserved heterogeneity across units, such as provinces or regions that may affect comprehensive rural revitalization. Thus, hypothesis 1 is supported.

Model 2 tests whether rural policy interventions (RPO) moderates the relationship between rural technology acceptance (TAC) and comprehensive rural revitalization (REV). The model uses the interaction of (TAC × RPO) to analyze this effect. The adjusted R^2 value shows that the model explains 34.7% of the variance in comprehensive rural revitalization, which is slightly better than model 1 (33.5%). The inclusion of the interaction term increases the explanatory power. The F-test (45.574, $p < 0.01$) is statistically significant, confirming that the sum of TAC, RPO, and their interaction can significantly predict comprehensive rural revitalization. The Hausman test (9.586, $p < 0.05$) shows that the FEM is still acceptable, meaning that the model is suitable for controlling for unobserved heterogeneity across units, such as provinces. Model 2 can be interpreted as technology acceptance remains significant and has a stronger positive impact than in model 1. Promoting digital literacy, access to digital tools, and community readiness are essential for rural revitalization. Policy alone is challenging; rural policy interventions still has a negative impact, confirming that current rural policy interventions may be inconsistent and ineffective or poorly implemented. The attenuating effect of rural technology acceptance suggests that a significant interaction term suggests that technology adoption enhances rural policy effectiveness, such that in low rural technology acceptance areas, rural policy interventions may still impact comprehensive rural revitalization. [48] proposed that the adoption of rural technologies and the promotion of the application of digital technologies in agricultural production and rural community development can drive the overall rural economic and social revitalization. On the other hand, this research results contradict the research of [49] state that the adoption of rural technologies does not necessarily mean sustainable development, especially if the technology is introduced without community participation or adaptation to the local context. They point out that technology adoption can "block" or "negate" local innovations and widen the gap between those with access to technology and those without, leading to uneven development. In high rural technology acceptance areas, the same rural policy may actually drive progress, and rural technology acceptance acts as a facilitator, making the rural policy more effective. Model 2 provides deeper insights than model 1. Although model 1 approves the direct effects of rural technology acceptance and comprehensive rural revitalization, model 2 reveals the specific nature of rural policy success, which is dependent on the level of technology adoption. This is consistent with the work of [43] who stated that these findings show that policy interventions can magnify the impact of technology adoption when aligned with appropriate technology adoption strategies. And [49] who suggested that structural factors play an important role in rural revitalization, while policy interventions alone may require complementary strategies to achieve the desired results. Therefore, any rural policy interventions should be developed in aggregation with programs that establish capacity and digital readiness. Thus, hypothesis 2 is supported.

5. Conclusion

This research concludes that rural technology acceptance plays a key role in driving comprehensive rural revitalization in China. The analysis of data from 2010 to 2023 provides empirical evidence that regions with higher levels of technology acceptation and adoption have significantly superior outcomes in the dimensions of industry, ecology, culture, governance, and well-being. Model 1 shows the direct positive effect of technology adoption on rural revitalization [50], while model 2 emphasizes the importance of interaction effects, indicating that the success of rural policy interventions is significantly influenced in the Chinese context by the extent to which digital technologies are accepted and utilized locally [51]. In cases where digital readiness is high, rural policies are more effective and supportive of growth. On the other hand, in areas with low technology adoption, even well-intentioned policies can have limited or undesirable effects. Therefore, for China's rural revitalization strategy to be truly effective, policy design needs to be aligned with programs that strengthen digital infrastructure, enhance digital literacy, and foster a culture of technology use [52]. This research emphasizes the need for a dual approach, including investment in both technology adoption and adaptive policy structures. Local governments need to ensure that interventions are contextual, comprehensive, and capable of integrating technology as rural China continues to modernize. The collaboration between policy and technology will be significant to achieving sustainable development and narrowing the urban-rural gap. The research results have both theoretical and practical implications, indicating that future rural development will need to strategically integrate digital transformation into policy-making processes and be accompanied by government policy implementation to be most effective and sustainable [53].

6. Contributions

This research aims to improve theoretical understanding of rural development by integrating the resource-based view (RBV), the technology adoption model (TAM), and development economics theory (DET) into an integrated framework. The research demonstrates that technology adoption is not only an independent driver but also a moderator that enhances or attenuates the effects of rural policy interventions. This research fills a gap in the previous literature that often separates these variables by revealing the interactions between technology adoption and policies. The research framework provides a new explanation for regional differences in rural revitalization outcomes, thus providing a more approach to digital transformation process in the context of rural development.

From the perspective of managerial executives, the research provides actionable insights for rural development and rural business stakeholders. The research shows that investing in digital tools alone such as smart farming or e-commerce platforms is not enough. Executives also need to promote technology readiness by improving digital literacy and fostering innovations that benefit farmers or users. The results encourage rural industry leaders and development agencies to design training programs, user-focused digital platforms, and supportive environments that reduce barriers to adoption. This approach will not only increase productivity and efficiency, but also ensure that digital investments lead to measurable improvements in quality of life and industry performance.

In the government policymaker perspective, the results of this research provide significant evidence that policy interventions alone may be ineffective or even counterproductive if not joined with adequate local digital adoption. This research supports a parallel policy model that simultaneously supports the development of digital infrastructure and capacity. Policymakers should design specific strategies that take into account regional differences in digital readiness and tailor interventions accordingly. Moreover, the interaction effects found in this research highlight the need for cross-sectorial collaboration between governments, technology providers, and communities to ensure that policies are aligned with local capabilities and objectives, thus enabling inclusive and sustainable rural regeneration in line with national development goals.

7. Limitations and Suggestions

This research focuses on 30 provincial-level regions in China, which, although covering a large area, may not fully capture the digital transformation of rural areas in the entire local context, especially in remote or highly ethnically diverse regions. The results may have limited generalizability to other developing countries with different institutional frameworks or socio-cultural dynamics. Furthermore, this research only collected statistical or numerical data, which, while good, may overlook qualitative dimensions such as technological user perceptions, cultural attitudes, and informal institutional factors that may influence technology adoption and policy effectiveness in rural areas. This research treats rural policy interventions as static variables. In reality, this is a dynamic process influenced by continuous feedback loops, policy development, and technological advances. The model may need fully capture the effects of lags or non-linear relationships.

Future research could conduct comparative studies across countries or rural regions with similar socioeconomic conditions to investigate how digital literacy shapes the interaction between technology adoption and policy interventions. The focus group interviews or ethnographic fieldwork could provide a deeper understanding of how rural people perceive digital transformation, how they are affected by policies, and what local barriers or enablers exist beyond the measured indicators. Alternatively, future research could break down digital transformation into specific technologies such as precision agriculture, digital marketplaces, AI-based governance tools to assess the effectiveness and specific challenges of implementation across rural industries, which could better align with overall rural development goals.

Acknowledgements: This research project was financially supported by Mahasarakham University, Thailand. MS. Longfeng Liang is a Ph.D. Candidate in the Mahasarakham Business School, Mahasarakham University. She is now the lecturer at the Guizhou Normal University, China.

Conflicts of Interest: The authors declare that there are no conflicts of interest regarding the publication of this paper.

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