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How rural tourism development affects farmers' livelihood resilience: based on comprehensive survey data of rural revitalization in China

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Many rural areas regard the tourism livelihood strategy as an essential breakthrough to overcome poverty and improve the lives of farmers. Studies have explored the income increasing effect of rural tourism on farmers' families, but few have focused on the impact of rural tourism on farmers' livelihood resilience under the requirements of rural sustainable development. The purpose of this paper is to explore the impact of rural tourism development on the livelihood resilience of rural households, using 987 households from the China Rural Revitalization Survey as case studies. The urban–rural gap in farmers' livelihood resilience was found to be narrowing. The rural tourism development has a significant promoting effect on enhancing the livelihood resilience of farmers. Specifically, the enhancement effect is mainly reflected in strengthening the livelihood buffering capacity, and the enhancement effect is most potent among high livelihood resilience farmers, non-poverty-stricken farmers, and farmers in the eastern region. The results of the mediation effect model indicate that livelihood factor mobility and livelihood strategy diversity are critical variables in the improvement process, with mediation effects accounting for 12.3 and 30.2%, respectively. The results of the moderation effect model further indicate that in enhancing farmers' livelihood resilience through rural tourism development, subjective wellbeing and perceived fairness play a positive moderating role. The findings contribute to a deeper understanding of whether and how rural tourism development can enhance farmers' livelihood resilience. We emphasize the need to develop rural tourism according to local conditions and implement precise policies to guide farmers in scientifically participating in rural tourism.

KEYWORDS

livelihood strategy diversity, rural development, quality of life, deep learning, subjective perception

1 Introduction

The sudden outbreak and rapid spread of COVID-19 in 2019 have profoundly impacted the economic development, livelihoods, and wellbeing of countries worldwide (Kumar et al., 2023). Data indicates that COVID-19 led to an increase in global poverty levels from 8.3% in 2019 to 9.2% in 2020, plunging approximately 8 million workers into poverty. Particularly in China's relatively vulnerable rural areas, the sustainable development of farmers' livelihoods faces immense pressure (Wang and Zhao, 2023). On one hand, strict pandemic control measures, such as home isolation and business closures, have limited the livelihood strategies available to farmers (Li et al., 2023). On the other hand, increased costs for pandemic

prevention have diminished the quality of farmers' livelihoods (Hu and Dong, 2023). The frequent occurrence of natural disasters, the sudden outbreak of the novel coronavirus, and the volatility of the economic market all reflect the characteristics of variability, uncertainty, and complexity in the livelihood environment, which have become the new normal (Zhai et al., 2024). Under this "new normal," existing strategies to enhance livelihood resilience and elasticity have failed to grasp systemic transformations and long-term changes, proving insufficient to support the sustainability of livelihoods. In the post-pandemic era, farmers urgently need to stimulate their internal development dynamics and enhance their livelihood resilience to cope with the recurring emergence of natural environments and significant social events (Wang et al., 2021).

In 1992, Chambers and Conway (1992) introduced the concept of "Livelihood Resilience," defining it as the capacity of residents to resist and gradually adapt to shock events. In 2007, the Intergovernmental Panel on Climate Change (IPCC) emphasized that "to address the development needs of the poorest and most vulnerable populations on Earth, there is a need to pay more attention to human livelihoods" and defined livelihood resilience as the ability of households and communities to cope with external event shocks, including their self-learning and self-organizing capabilities (Liverman, 2008). Therefore, from the perspective of subject attributes, livelihood resilience is distinctly different from livelihood elasticity and livelihood recovery power. Livelihood resilience is an inherent characteristic of humans, emphasizing that individuals or communities, when facing various risk shocks, not only possess effective prevention, response, and recovery capabilities but also demonstrate the ability to grow as a system (Donovan, 2020). Linking livelihood approaches with resilience thinking can enhance the understanding of livelihood dynamics, reflecting the historical inevitability of farmers shifting from meeting survival needs to pursuing richer and higher-quality lives. It is in line with the objective laws of economic and social development.

The academic community has constructed a relatively systematic framework for evaluating livelihood resilience, primarily composed of three approaches: First, there is the evaluation framework based on livelihood resilience, which commonly employs the "exposure—sensitivity—adaptive" framework to assess livelihood resilience (Ibraimova et al., 2023; Insani et al., 2022). Second, scholars argue that assessing livelihood resilience should place a significant emphasis on livelihood capital, leading to the development of evaluation indicators encompassing natural capital, social capital, physical capital, human capital, and financial capital (Jurjonas and Seekamp, 2018). Third, as represented by Speranza et al. (2014) the concept of livelihood resilience as the ability to mitigate external disturbances and pressures while maintaining or enhancing the fundamental attributes and functions of existing livelihoods is operationalized into three dimensions: buffering capacity, self-organizing capacity, and learning capacity.

Against the backdrop of China's great victory in poverty alleviation, enhancing the resilience of farmers' livelihoods is about improving the farmers' development capabilities (Li et al., 2019). In practice, China's anti-poverty efforts have always emphasized building the development capabilities of poor farmers and focusing on the sustainable development of livelihoods (Chen and Lu, 2024). The targeted poverty alleviation policy has made the construction of development capabilities for poor farmers an essential part of poverty

alleviation, and the implementation of industrial poverty alleviation policies is also based on the sustainable development of farmers' livelihoods. Rural tourism, as an essential industrial poverty alleviation method in China's targeted poverty alleviation, has a high degree of relevance with agriculture, a profound closeness with farmers, and a significant degree of dependence on rural areas, perfectly aligning to enhance the resilience of farmers' livelihoods (Li et al., 2024).

Rural tourism possesses employment inclusiveness and strong industry correlation that traditional industries cannot match (Zemenu and Sahil, 2020), stimulating new livelihood opportunities within rural areas' production and living space structure. Many rural regions regard tourism livelihood strategies as an essential breakthrough for overcoming poverty and improving the lives of farmers (Van et al., 2022). However, in actual development, the growth of rural tourism has yet to achieve the expected positive effects. On the one hand, driven by profits, rural tourism development has squeezed out and even replaced traditional agricultural activities of farmers, disrupting the original stable livelihood structure of farmers and causing irreversible changes in their livelihood structure (Jorge et al., 2022). According to the "2024 China Rural Tourism Development Report," 2024 rural tourism attracted approximately 8.86 million farmers to wholly or partially abandon traditional rural livelihoods and work in cities. On the other hand, the seasonality characteristic of rural tourism exacerbates the uncertainty of farmers' livelihoods (Lasso and Dahles, 2018; Su et al., 2022).

Building on this context, Chen et al. (2020) pioneered the "livelihood resilience" approach to describe the "capabilities" that farmers develop during rural tourism development. Through field interviews and participatory observation, they assessed the livelihood resilience of communities in rural tourism destinations in China. Subsequently, scholars have engaged in rich discussions on the livelihood resilience of rural tourism destinations, with research areas including national ecological parks (Bu et al., 2023), mountain tourism areas (Xie et al., 2024), characteristic tourist villages (Xiao et al., 2022; Yu et al., 2023), and tourism poverty alleviation villages (Dang et al., 2022). Despite this, to our knowledge, the academic community still needs to research the impact of rural tourism development (RT) on the farmers' livelihood resilience (FLR).

Therefore, this paper utilizes the 2020 China Rural Revitalization Survey (CRRS) database, which includes survey data from 987 households across 115 administrative villages, to explore the impact of RT on the FLR. Specifically, our objectives are to answer the following questions: (1) What is the level of livelihood resilience among Chinese farmers after the eradication of absolute poverty? (2) How can we accurately understand the internal mechanisms by which rural tourism development affects the FLR? (3) To what extent, if at all, does RT impact the FLR? (4) How do these impacts vary among farmers with different livelihood capabilities, different levels of livelihood resilience, different household poverty alleviation statuses, and regions? (5) Through what intermediary and moderating mechanisms does rural tourism development affect the FLR? This paper provides a comprehensive assessment of FLR from three dimensions: buffering capacity, self-organizing capacity, and learning capacity. It employs the ordinary least squares (OLS) method to examine the impact and heterogeneity of RT on FLR, uses a mediation effect model to analyze the mediating processes of livelihood element mobility and livelihood strategy diversity, and applies a moderation effect model to analyze the moderating processes of farmers' subjective wellbeing, risk perception, and perception of fairness.

The marginal contributions of this study are as follows: First, by adopting a resilience perspective and integrating the sustainable livelihoods approach, a framework for the sustainable FLR is constructed, which broadens the research horizon of farmers' sustainable livelihoods and deepens the academic connection between tourism economics and sustainable livelihood theory. Second, the 2020 China Rural Revitalization Survey (CRRS) is a large-scale national rural tracking survey initiated and implemented by the Rural Development Institute of the Chinese Academy of Social Sciences. This database covers 10 provinces (autonomous regions), 50 counties (cities, districts), 156 townships (towns), 308 administrative villages, and 3,883 households in China, collecting a total of 15,554 individual data points, providing comprehensive data support for academic and policy research on rural revitalization. Based on the CRRS survey data and econometric models, this paper empirically examines the impact and heterogeneity of RT on FLR, expanding the application of tourism economics in the sustainable development of farmers' livelihoods and providing evidence to support the involvement of rural tourism in rural revitalization. Finally, to reveal the "black box" mechanism of how RT affects FLR, this paper, based on the sustainable livelihood resilience framework of farmers and from the perspective of "poverty alleviation through industry," analyzes the mediating effects of livelihood element mobility and livelihood strategy diversity, and investigates the moderating effects of farmers' subjective wellbeing, risk perception, and perception of fairness.

The paper is organized as follows. A sustainable livelihood resilience framework for farmers and research hypotheses are proposed in Section 2. Materials and methods in Section 3. Results and Discussion are presented in Section 4 Results and 5 Discussion, respectively. The conclusions are summarized in Section 6.

2 Theoretical analysis and research hypothesis

2.1 Sustainable framework for FLR

The concept of "sustainable livelihood" originates from Sen et al. (1982) research on poverty, referring to a means of making a living

that allows individuals or households to recover or enhance their capabilities and assets in the face of stress and shocks without undermining natural resources. After extensive research, the academic community has proposed various frameworks for sustainable livelihoods. Among them, the Sustainable Livelihoods Approach (SLA) framework proposed by the UK's Department for International Development (DFID) is highly regarded, emphasizing the vulnerability context in which people with low incomes utilize different types of capital to implement livelihood strategies, as well as the organizational and institutional environment.

Based on the SLA framework, in the context of vulnerable environments and complex economic backgrounds, the sustainable livelihoods of farmers are constituted by three elements: livelihood capital, livelihood strategies, and livelihood outcomes (Liu et al., 2020). However, this represents an ideal state and needs careful consideration of the dynamic interactions between farmers and the external environment and the internal dynamics of the development of livelihood elements (Folke, 2006). This paper integrates the sustainable livelihood theory and extends the traditional sustainable livelihood analysis framework from a resilience perspective, constructing a drawing the framework for the sustainable FLR shown in Figure 1.

The Sustainable Livelihood Resilience Framework for Farmers comprises livelihood risks, livelihood systems, and livelihood resilience. Livelihood risks refer to all possible situations that farmers face in sustaining their livelihoods, including changes in the external environment (natural disasters, policy changes, social transformations) and the long-term accumulation of unstable factors within the farmers themselves (illness, education) (Sun et al., 2023). The livelihood system refers to the capital, strategies, and environment of farmers' livelihoods. Livelihood resilience refers to the ability of farmers to maintain long-term stable development under various scenarios.

Based on the livelihood resilience analysis framework proposed by Speranza et al. (2014), the resilience of farmers' livelihoods includes explicitly three dimensions: buffering capacity, self-organization capacity, and learning capacity. Buffering capacity refers to the ability of farmers to maintain their functional attributes when dealing with internal and external disturbances; self-organization capacity refers to

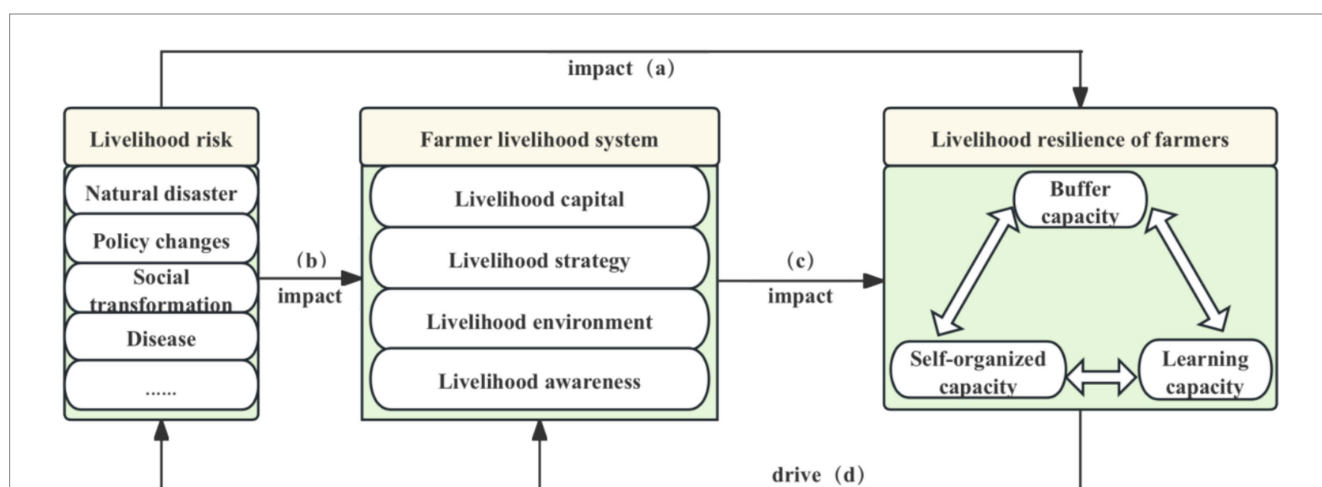


FIGURE 1 Sustainable framework for FLR.

the ability of farmers to establish communication with the outside world, as well as to integrate with the local economic, social, and institutional environment; learning capacity implies the ability of farmers to acquire knowledge or skills and to exchange new knowledge and innovative production skills (Zhao et al., 2024).

Within farmers' sustainable livelihood resilience system, they face a complex and variable natural and social environment in their production and daily life. The resulting livelihood risks exert significant pressure on farmers' livelihoods and directly affect their livelihood resilience (Barrett et al., 2021) (Figure 1a). They also impact the farmer's livelihood system, leading to notable changes in the stock of livelihood capital and the space for livelihood strategies (Figure 1b). To adapt to and maintain the needs for survival and development, the farmer's livelihood system drives the resilience of their livelihood (Figure 1c). As livelihood resilience enhances, it compels livelihood risks and the livelihood system to maintain their original state or transform into a new state under the influence of resilience (Figure 1d), achieving a virtuous cycle in the sustainable livelihood resilience system.

2.2 Research hypothesis

Based on the Sustainable Livelihood Resilience Framework and drawing from the "Poverty Alleviation Theory," the impact of RT on FLR can be analyzed from the perspective of "industry-driven poverty alleviation." As an external shock variable, RT relies on rural resource conditions, is market-oriented, and aims to create economic and social benefits. Developing RT encourages farmers to participate actively, cultivates their development capabilities, promotes the flow of livelihood elements, and drives the optimization of livelihood strategies, ultimately enhancing the FLR.

2.2.1 The impact of RT on the FLR

According to the structured Marxist political ecology theory, RT serves as an essential tool and driving force for the value transformation of the "Two Mountains Theory," reshaping the development model of the rural economy. Firstly, RT development is characterized by inclusiveness, diversity, and sustainability,

which helps diversify farmers' income (Li and Yang, 2021). This increase in economic revenue breaks the previous reliance of farmers' livelihoods on single agricultural output, reduces sensitivity to market fluctuations, and enhances the buffering capacity of farmers when facing natural disasters or market changes.

Secondly, RT development has given rise to new business formats and management models, such as the homestay economy and the sale of specialty agricultural products. The evolution of these new formats has propelled the innovative transformation of farmers' livelihood methods, shifting from traditional agricultural production to RT services. RT not only helps alleviate the livelihood pressures brought about by agricultural production risks but also strengthens the stability of farmers' livelihood structures (Su et al., 2018).

Finally, optimizing RT environment has facilitated the process of resource sharing and community collaboration among farmers, providing significant support for the innovation and efficiency enhancement of farmers' livelihoods. Cultural and natural resources, through the platform of RT, can be effectively integrated and utilized, increasing farmers' income through value addition and achieving a comprehensive upgrade of farmers' livelihood methods during the resource transformation process. This promotes the value conversion of farmers' livelihood resources and enhances the resilience of farmers' livelihoods (Figure 2). Based on this, the paper proposes the following hypothesis:

H1: RT can enhance the FLR.

2.2.2 The intermediary transmission mechanism of RT on FLR

Firstly, RT promotes the separation of inefficient agricultural labor from land. Research indicates that RT is an effective way to facilitate land transfer (Mao et al., 2014). Prior to RT, farmers primarily relied on agricultural income, making the possibility of land transfer relatively low. RT reduces farmers' dependency on traditional agriculture, providing opportunities for them to transfer their land, with tourism income being distributed between the parties involved in the land transfer (Zhuang, 2023). While RT encourages farmers to transfer their land, it also promotes the transfer of agricultural labor.

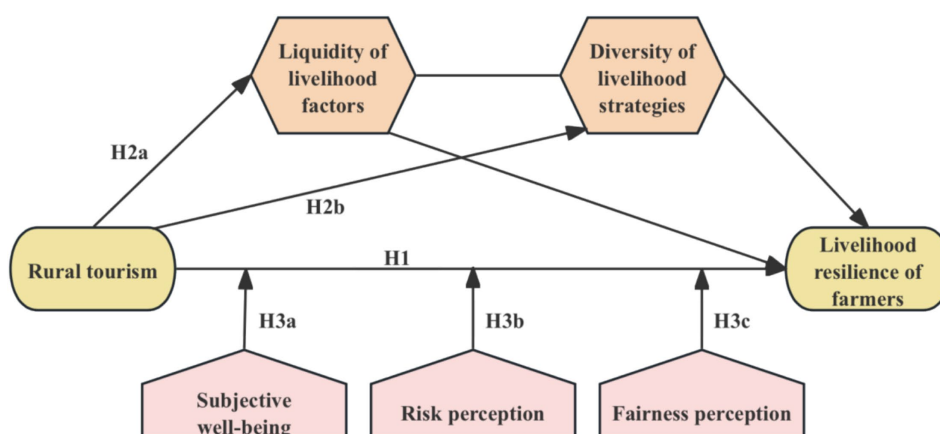


FIGURE 2 Mechanism diagram of the impact of RT on FLR.

Secondly, RT can encourage farmers to participate in skill training. On the one hand, RT provides an economic foundation for farmers to engage in skill training voluntarily; on the other hand, it can motivate farmers to improve their service levels through forms such as tourism income subsidies and awards for obtaining tourism service skill certifications, thereby effectively facilitating the transition of agricultural labor to the tourism service industry (Su et al., 2016). Land transfer and employment in tourism encourage farmers to explore diverse livelihood strategies, such as shifting from agricultural labor to tourism services, from traditional crop cultivation to diversified RT operations, and from wage labor to individual entrepreneurship.

In summary, agricultural production is inherently unstable, and under uncertain conditions, factors such as natural disasters and price fluctuations can lead to instability in farmers' livelihoods. The side businesses in tourism of farmers can effectively cope with the risks of livelihood reversal (Figure 2). Based on this, the paper proposes the following hypotheses:

H2a: RT enhances the FLR by promoting the mobility of livelihood elements.

H2b: RT enhances the FLR by increasing the diversity of livelihood strategies.

2.2.3 The regulation and transmission mechanism of RT on FLR

Subjective wellbeing is a subjective perception based on objective gains. It is an essential concept of an individual's psychological state, mediating the relationship between effect perception (cognition) and participation intention (intention). Existing studies have shown that the stronger the satisfaction and subjective wellbeing of residents in tourist destinations, the higher their enthusiasm for participating in tourism, thereby the more significant the positive effects generated by tourism (Suess et al., 2018).

Risk perception is an individual's subjective judgment of the characteristics and severity of external risks (Walelign et al., 2016). According to the vulnerability analysis framework, an individual's ultimate risk aversion awareness will influence their behavior. Although RT provides non-agricultural employment opportunities for farmers, it also increases their sensitivity to external risk perception. As farmers belong to the "relatively disadvantaged group" in RT, their ability to discern and obtain economic market information is limited, and they face social risks and production technology risks in participating in RT activities. Therefore, under the goal of minimizing risk, the higher the degree of risk perception among farmers, the lower their willingness and investment in participating in tourism, limiting the enhancing effect of RT on livelihood resilience.

Fairness perception is an individual's evaluation of equal opportunities, processes, and distributions in life, and it serves as a touchstone for testing social equity and harmony (Luo et al., 2022). As Wegener (2000) emphasized, just and equitable social norms facilitate the smooth operation of individuals' instrumental rationality logic. In the social context of "it is not the scarcity but the inequality that is feared," rural residents' participation in the democratic decision-making of village collective leadership elections and daily operations allows their pursuit of equality and the need for respect to be better satisfied, increasing the enthusiasm of farmers to participate in

community activities (RT), and effectively strengthening the positive impact of RT on enhancing the FLR (Figure 2). Based on this, the paper proposes the following hypotheses:

H3a: Subjective wellbeing plays a positive moderating role in the enhancement of FLR by RT.

H3b: Risk perception plays a negative moderating role in the enhancement of FLR by RT.

H3c: Fairness perception plays a positive moderating role in the enhancement of FLR by RT.

Based on the above analysis, Figure 2 presents a simple mechanism diagram.

3 Materials and methods

3.1 Variable definitions

Dependent variable: This paper, based on the livelihood resilience analysis framework proposed by Speranza et al. (2014) (the three main attributes of livelihood resilience, namely buffering capacity, self-organization capacity, and learning capacity), draws on the research approach of Gao et al. (2024), and constructs an evaluation index system for FLR (FLR) from the three dimensions of buffering capacity, self-organization capacity, and learning capacity (Table 1).

Independent variable: Rural tourism (RT), as a form of tourism that uses the natural and cultural objects of the countryside as attractions, can demonstrate the comprehensive utilization of rural and regional resources and the environment. Based on the characteristics of RT in China and the availability of data, this paper refers to the relevant studies of Liu et al. (2024). It constructs an index system for RT from two aspects: tourism supply development and reception level (Table 1).

Mediating variables: The mediating variables in this paper are livelihood element mobility (LEM) and livelihood strategy diversity (LSD). Land transfer is an essential driving force in promoting the mobility of livelihood elements. At the same time, the changes in income from land renting directly affect farmers' willingness to participate in land transfer. This paper uses land transfer and income from land renting to measure the mobility of farmers' livelihood elements. Income diversity is a direct reflection of livelihood strategy diversity. Drawing on the research approach of Rhoda and Munguzwe (2018), this paper constructs an income Simpson index to measure livelihood strategy diversity. The specific formula is as follows:

$$simpson_i = 1 - \sum_{\mu} \frac{P_{i,\mu}^2}{\mu}$$

where i represents a specific farmer, μ represents a source of income, ν is the total number of the farmer's income sources, and $P_{i,\mu}$ represents the proportion of the μ -th income source of farmer i in the total income. The larger the income Simpson index, the higher the degree of livelihood strategy diversity.

Moderating variables: The moderating variables include subjective wellbeing (SWB), risk perception (RP), and fairness perception (FP). Subjective wellbeing is an essential concept for evaluating the psychological state of farmers. Based on the survey

TABLE 1 Explanation of evaluation indicators for RT and FLR.

	First-class indicators	Second-class indicators	Definition of indicators
RT	Development of tourism supply	Tourism resource endowment	Number of major tourist attractions
		Tourism employment supply	Number of households participating in the rural tourism industry in village
	Level of tourism reception	Number of tourist receptions	The number of tourists received in village that year
		Tourism reception quality	The number of overnight tourists received in village that year
FLR	Buffer capacity	Cultivated area	The cultivated land area owned by rural households
		Proportion of household labor force	The ratio of the number of people aged 16–60 to the total number of family members
		The accessibility of small loans	Obtain small loans: Yes = 1, No = 0
		Home communication devices	The number of 4G/5G mobile phones owned by households
		Family savings	Total amount of household bank deposits (current and fixed-term) (Yuan)
		Social activities	The expenditure amount of farmers in terms of favors and gifts (Yuan)
		Social connections	The number of relatives and friends of farmers who can borrow money (over 5,000 yuan) (regardless of whether interest is given or not)
	Self-organized ability	Participation in public governance	The number of times to vote in village committee elections within a year
		Trust in public organizations	The trust level of farmers toward village cadres: from low to high, 1–5 points are assigned, with very trust = 5, relatively trust = 4, average = 3, relatively distrust = 2, and very distrust = 1
		Satisfaction with road traffic	The satisfaction level of the road conditions of the current village roads and entrance roads among farmers: 1–5 points from low to high, very satisfied = 5, relatively satisfied = 4, average = 3, not very satisfied = 2, very dissatisfied = 1
		Collective economic participation	Participation in cooperatives, village collective industries, and e-commerce: Yes = 1, No = 0
		Satisfaction with public governance	The satisfaction level of farmers with the work carried out by the village committee: 1–5 points are assigned from low to high, very satisfied = 5, relatively satisfied = 4, average = 3, not very satisfied = 2, very dissatisfied = 1
		Social trust	The trust level of farmers toward their neighbors: 1–5 points from low to high, very trust = 5, relatively trust = 4, general = 3, relatively distrust = 2, very distrust = 1
		Satisfaction with living environment	Farmers’ satisfaction with their living environment: rated on a scale of 1–5 from low to high, very satisfied = 5, relatively satisfied = 4, average = 3, relatively dissatisfied = 2, very dissatisfied = 1
	Learning ability	The education level of the household head	Scoring from low to high: graduate = 9, undergraduate = 8, college diploma = 7, high school = 6, vocational school = 5, vocational school = 4, junior high school = 3, primary school = 2, not in school = 1
		Internet skill training	Participate in e-commerce skills training: Yes = 1, No = 0
		Information skills training	Received computer or mobile internet training: Yes = 1, No = 0
		Information acquisition ability	The degree of satisfaction of daily needs such as production and life of farmers through online information acquisition: 1–5 points are assigned from low to high, with complete satisfaction = 5, basic satisfaction = 4, general = 3, less satisfied = 2, and completely unsatisfied = 1
Use of Internet functions		Is there any difficulty in using the functions of 4G/5G phones: basically no difficulty = 1, relatively difficult, only used for making and receiving calls = 0	
Skill certificate obtained		Do migrant workers have skill level certificates related to their current profession: Yes = 1, No = 0	

questionnaire data from the CRRS database, this paper selects “farmers’ satisfaction with their current life” as the measurement indicator. Farmers’ self-assessment of their confidence in the future can reflect their perception of external risks to a certain extent. It is generally believed that the more confident farmers are about the future, the lower their risk perception; correspondingly, their risk

aversion is weaker. This paper uses “farmers’ expectations for future life” to measure farmers’ risk perception. Farmers’ democratic evaluation of their social groups can effectively measure their perception of social fairness. This paper selects “Farmers’ Satisfaction with village committee elections” to measure farmers’ fairness perception.

Control variables: This paper controls for several relevant variables to control for the impact of other factors on FLR. At the individual level, controls are imposed for five variables: age, gender, marital status, political affiliation, and position within the village. At the village level, four control variables are selected: village location, transportation conditions, current development status, and the level of non-agricultural industry development.

The variable definitions are detailed in [Table 2](#).

3.2 Research methodology

- (1) Benchmark regression model: To empirically test the impact of RT on FLR, this paper constructs the following econometric model:

$$Y_i = \alpha + \beta_1 RT_i + \beta_2 controls_i + \varepsilon_i \quad (1)$$

In the [Equation 1](#), Y_i represents the FLR, RT_i represents RT of villages, $controls_i$ represents a series of control variables, and ε_i represents the random error term.

- (2) Mediation effect model: To test the mediating effect of livelihood factor mobility and livelihood strategy diversity on the FLR in RT, this paper draws on the mediation effect testing procedure proposed by [Wen and Ye \(2014\)](#), and uses the Bootstrap two-step method for analysis. The specific formula is as follows:

$$Y_i = \alpha_0 + \alpha_1 RT_i + \alpha_2 controls_i + \varepsilon_i \quad (2)$$

$$M_i = \beta_0 + \beta_1 RT_i + \beta_2 controls_i + \varepsilon_i' \quad (3)$$

$$Y_i = \gamma_0 + \gamma_1 RT_i + \gamma_2 M_i + \gamma_3 controls_i + \varepsilon_i'' \quad (4)$$

In the [Equations 2, 3 and 4](#): Y_i represents the FLR, RT_i represents RT of villages, M_i represents mediating variables such as livelihood factor mobility and livelihood strategy diversity, $controls_i$ represents a series of control variables, and $\varepsilon_i, \varepsilon_i', \varepsilon_i''$ represents the random error term.

- (3) Moderation effect model: To test the moderating effects of subjective wellbeing, risk perception, and equity perception on the livelihood resilience of RT, this paper constructs a moderation effect model by introducing the interaction terms between subjective wellbeing and RT, risk perception and RT, and equity perception and RT, based on the benchmark regression model. The specific formula is as follows:

$$Y_i = \alpha + \beta_1 RT_i + \beta_2 M_i + \beta_3 M_i \times RT_i + \beta_4 controls_i + \theta_i \quad (5)$$

In the [Equation 5](#), Y_i represents the FLR, RT_i represents RT of villages, $M_i \times RT_i$ represents the interaction term between moderating

variables and RT, $controls_i$ represents a series of control variables, and θ_i represents random error.

3.3 Data sources

The data in this article is sourced from the 2020 China Rural Revitalization Survey (CRRS). The CRRS project is a large-scale national survey on agriculture, rural areas, and farmers conducted by Rural Development Institute, Chinese Academy of Social Sciences. The CRRS project was launched in 2020 and conducts a tracking survey every 2 years. Currently, two phases have been conducted (as the research team only provided a comprehensive description and analysis of the first phase survey data, this article only uses data from 2020). After discarding observations with missing or abnormal data, this article ultimately retained 987 farmer samples.

4 Empirical results and analysis

4.1 Analysis of the measurement results of FLR

FLR exhibits group heterogeneity and spatial heterogeneity. [Figure 3](#) displays the density distribution curves of FLR under different circumstances. [Figure 3a](#) shows that the density distribution curve of livelihood resilience for households receiving minimum living allowances is narrower and shorter than that for non-minimum living allowance households. Additionally, the average livelihood resilience for minimum living allowance households is 0.151, while the average for non-minimum living allowance households is 0.234. This indicates that, in terms of overall distribution and mean values, the livelihood resilience of minimum living allowance households is significantly lower than that of non-minimum living allowance households, implying that the former is more likely to experience a reversal in their livelihoods when faced with disturbances and shocks.

[Figure 3b](#) presents the density distribution curves of FLR categorized by income levels from low to high, namely the lowest income group (those with income in the 0–25% range), the lower-middle income group (those with income in the 25–50% range), the upper-middle income group (those with income in the 50–75% range), and the highest income group (those with income in the 75–100% range). Comparatively, as income levels increase, so does the FLR. The average livelihood resilience values for the low, lower-middle, upper-middle, and high-income intervals are 0.163, 0.221, 0.241, and 0.295, respectively.

[Figure 3c](#) presents the density distribution curves of FLR according to administrative divisions. The curves for urban and non-urban areas are nearly coincident, and the average values of FLR are close, at 0.246 and 0.223, respectively. This suggests that, when examining the urban–rural gap from the perspective of FLR, the gap can be considered to be narrowing.

[Figure 3d](#) shows the density distribution curves of FLR according to geographical location. The curves for the central and western regions are similar, with high-density concentrations of FLR in the range of [0.17, 0.22], and the average values are close, at 0.209 and 0.215, respectively. The density distribution curve for the eastern region has two peaks, at [0.18, 0.21] and [0.45, 0.70], with an average

value of 0.262, significantly higher than that of the central and western regions. Possible reasons include, on the one hand, the higher level of socio-economic development in the eastern region, where farmers have relatively higher income levels, providing more buffering space for their livelihoods; on the other hand, the relatively well-developed rural infrastructure and well-established education and training systems in the eastern region contribute to a better livelihood environment and higher livelihood skills among farmers, which helps to enhance their livelihood resilience.

4.2 Analysis of the impact of RT on FLR

The regression results of the impact of RT on FLR are shown in Table 3. Column (1) indicates that, without including control variables, the regression coefficient for RT is 0.074, which does not pass the significance test at the 10% level. Column (2) shows that with the inclusion of control variables and controlling for individual fixed effects, the regression coefficient for RT is 0.106, which is significant at the 5% statistical level. This suggests that RT contributes to the enhancement of FLR. This result is generally consistent with the actual situation in rural China. As a new industrial model, RT integrates tourism activities with local resource elements in an organic way, stimulating new livelihood opportunities and patterns within rural areas' production and living space structure and promoting non-agricultural employment

and low-barrier entrepreneurship for farmers, strengthening their livelihood resilience. H1 of this paper is supported.

4.3 Endogeneity test

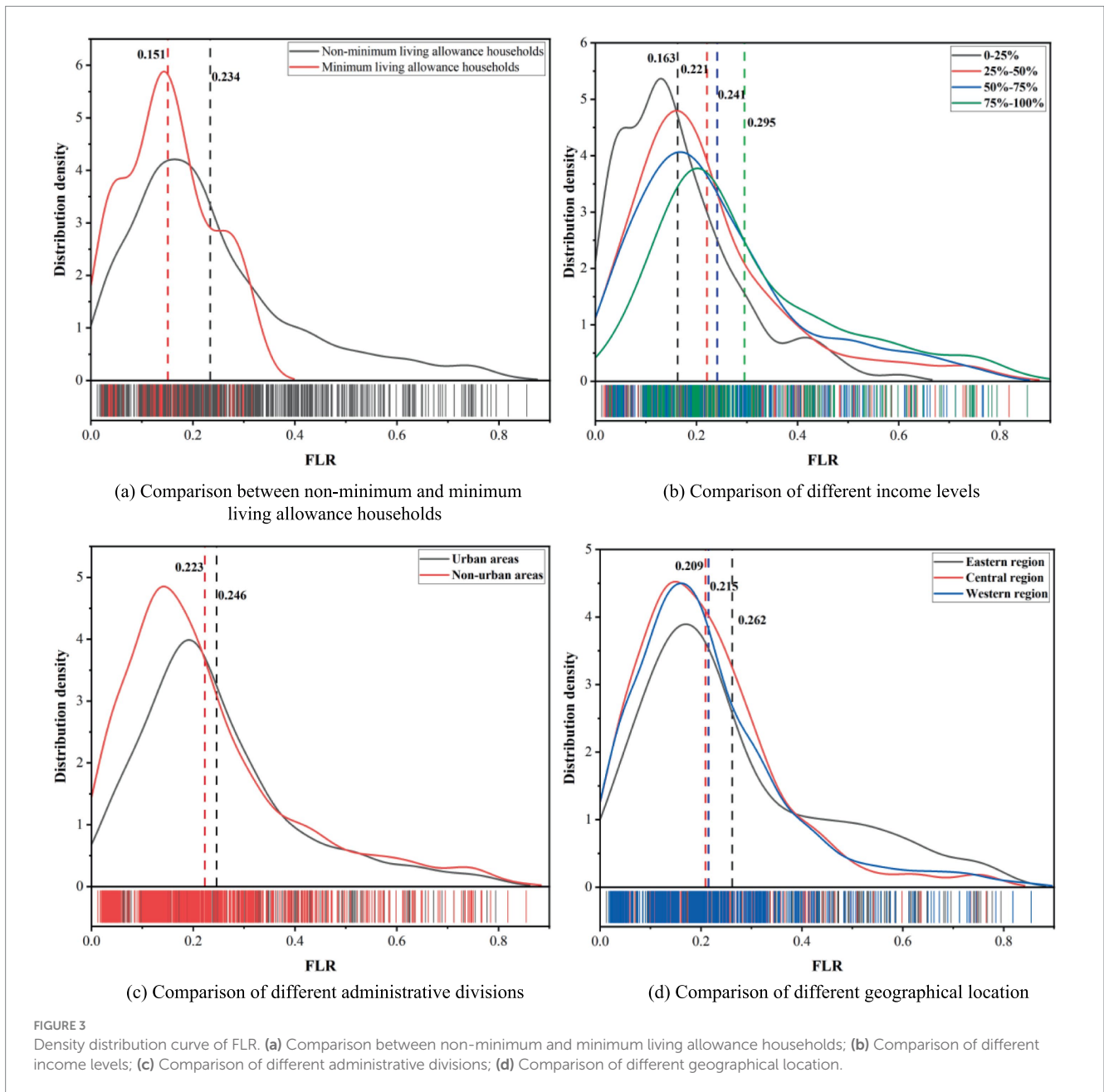
Numerous factors affect FLR. Although control variables were included in this paper's baseline regression model, there may still be an issue of omitted variable bias. Additionally, there could be a reverse causality between RT and FLR. To address this, the paper refers to the method Zhang et al. (2023). used. It selects "village terrain conditions" as an instrumental variable for two-stage least squares estimation (2SLS) to address potential endogeneity issues.

On the one hand, the terrain conditions where farmers reside can affect RT resources and the difficulty of infrastructure construction, which is highly related to the scale of RT and the accessibility for tourists, satisfying the relevant condition of the instrumental variable. On the other hand, as a natural geographical characteristic variable, the terrain conditions of the residence are not related to economic and social development factors and do not directly affect FLR, which complies with the homogeneity assumption of the instrumental variable. The regression results based on the estimation of the two-stage least squares are shown in Table 4.

Column (1) reports the estimation results of the first stage, with the estimated coefficient for village terrain conditions being 0.009,

TABLE 2 Variable definition.

Type	Variable	Variable declaration
Dependent variable	Farmers' livelihood resilience (FLR)	Calculated based on survey data
Independent variable	Rural tourism (RT)	Calculated based on survey data
Mediator variable	Livelihood element mobility (LEM)	Whether to transfer land from the family: Yes = 1, No = 0
	Livelihood strategy diversity (LSD)	Total rental income from renting out land by households (Yuan) Simpson Index of Household Total Income Diversity
Moderator variable	Subjective wellbeing (SWB)	The satisfaction of the household head with their current life, from low to high, ranges from 1 to 5 points. The values are: very satisfied = 5, relatively satisfied = 4, average = 3, relatively dissatisfied = 2, very dissatisfied = 1
	Risk perception (RP)	The homeowner's expectations for future life are rated on a scale of 1-5 from high to low: very good = 1, slightly better = 2, average = 3, slightly worse = 4, significantly worse = 5
	Fairness perception (FP)	The satisfaction level of the household head toward the village committee election, from low to high, ranges from 1 to 5 points. The values are: very satisfied = 5, relatively satisfied = 4, average = 3, relatively dissatisfied = 2, very dissatisfied = 1
Control variable	Gender	Head of household gender: Male = 1, Female = 0
	Age	Age of head of household
	Marital status	Household head's marital status: Married = 1, Other = 0
	Political status	Whether the household head is a member of the Communist Party of China or a member of a democratic party: Yes = 1, No = 0
	Position within the village	Is the household head a village official: Yes = 1, No = 0
	Village location	Is the village a suburban area of the city: Yes = 1, No = 0
	Village transportation conditions	Distance between Village Committee and County Government (kilometers)
	Current situation of village development	Is the village a poverty-stricken village: Yes = 1, No = 0
Development level of non-agricultural industries in villages	The proportion of employees in the secondary and tertiary industries to the total labor force	



which is significant at the 5% statistical level, and the F -statistic is 5.73. This indicates that the instrumental variable is significantly positively correlated with RT, meeting the relevance requirement for the choice of the instrumental variable. Column (2) shows that in the second stage, the regression coefficient for RT is 0.984, and it passes the significance test at the 5% statistical level. This suggests that after addressing the endogeneity issue, the impact of RT on FLR remains significant, which is consistent with the baseline regression results. Furthermore, the Cragg-Donald Wald F statistic is 247.185, satisfying the condition that the F -statistic is above the threshold of 16.38, indicating no weak instrumental variable problem. The Kleibergen-Paak rk LM statistic rejects the null hypothesis at the 1% statistical level, indicating that the instrumental variable is influential. Comparing the regression coefficients of RT between the instrumental variable regression and the baseline regression, the absolute value of

the coefficient for RT in the instrumental variable regression is slightly lower than that in the baseline regression. This suggests that the baseline regression, affected by endogeneity issues, overestimates the role of RT in enhancing the FLR.

4.4 Robust test

To enhance the credibility of the empirical research findings, this paper conducts the following robustness checks, with the results presented in Table 5. First, the econometric model is altered by replacing the OLS model in the baseline regression with a Tobit model. Column (1) shows that the regression coefficient for RT is 0.106, which passes the significance test at the 5% statistical level, consistent with the baseline regression results. Second, to eliminate

TABLE 3 Benchmark regression results.

Variable	FLR	
	(1)	(2)
RT	0.074 (0.045)	0.106** (0.042)
Gender		0.012 (0.018)
Age		-0.004*** (0.000)
Marital status		0.033** (0.015)
Political status		0.046*** (0.012)
Position within the village		0.054*** (0.014)
Village location		-0.011 (0.011)
Village transportation conditions		-0.001 (0.000)
Current situation of village development		0.056*** (0.011)
Development level of non-agricultural industries in villages		0.074*** (0.018)
Individual	Yes	Yes
N	987	987
R ²	0.379	0.353

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

the impact of outliers, the dependent variable in the sample is subjected to a 1% trimming at both the top and bottom, with the results shown in Column (2). The regression coefficient for RT is 0.118, significant at the 1% statistical level. Third, the core explanatory variable is replaced; the duration of RT is used in place of RT index used in this paper, with the regression results shown in Column (3). The regression coefficient for RT is 0.104, which passes the significance test at the 1% statistical level. In summary, all three robustness checks shown in Table 5 indicate that the regression coefficients for RT pass the significance tests. This suggests that the baseline regression results in this paper are robust and credible, indicating that RT contributes to the enhancement of FLR.

4.5 Heterogeneity analysis

4.5.1 Test results based on heterogeneity of farmers' livelihood capacity

Livelihood resilience consists of three dimensions: livelihood buffering capacity, self-organization capacity, and learning capacity. Therefore, does the impact of RT on different dimensions of livelihood resilience exhibit heterogeneity? As shown in Table 6, the enhancing effect of RT on FLR is primarily reflected in the strengthening of livelihood buffering capacity, with a regression coefficient of 0.138,

TABLE 4 Results of endogeneity test.

Variable	(1)	(2)
	First stage	Second stage
RT		0.984** (0.450)
Village terrain conditions	0.009*** (0.000)	
Control variable	Yes	Yes
Individual	Yes	Yes
F-statistic	5.73	
Cragg-Donald Wald F		247.185
Kleibergen-Paak rk LM		126.16
N	987	987
R ²	0.145	0.172

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

which is significant at the 1% statistical level. Rural tourism is innately enriching the populace, increasing farmers' income through the "tourism multiplier effect" and "trickle-down effect," and promoting the transformation of farmers' livelihood resources, thereby enhancing farmers' livelihood buffering capacity. Additionally, RT enhances farmers' livelihood learning capacity, with a regression coefficient of 0.098, which passes the significance test at the 10% statistical level. This indicates that during RT, the conduct of skills training positively impacts the enhancement of farmers' cultural knowledge and skills. However, due to the lag in education and training, the enhancing effect of RT on farmers' livelihood learning capacity is not significantly strengthened in the short term. The impact of RT on farmers' livelihood self-organization capacity is not statistically significant, implying that RT has yet to promote the construction of social networks among farmers (such as neighbor relationships, community organizational relationships, etc.).

4.5.2 Test results based on heterogeneity of FLR

The impact of RT on FLR may exhibit structural changes at different levels. The benchmark regression analysis in the previous text did not consider the impact of RT on the entire conditional distribution of FLR, so it could not fully portray the impact of RT on FLR or verify whether RT exhibits a "Matthew Effect." Therefore, this paper further employs quantile regression methods to examine the impact of RT on farmers at different levels of livelihood resilience.

As shown in Table 7, the influence of RT on FLR varies across different levels of livelihood resilience. Specifically, at the 0.25 and 0.50 quantiles, the regression coefficients for RT are 0.077 and 0.067, respectively, which are significant at the 10% statistical level. At the 0.75 and 0.90 quantiles, the regression coefficients for RT are 0.134 and 0.262, respectively, and both pass the significance test at the 5% statistical level. This indicates that the impact of RT on FLR follows a "U-shaped" trend that first decreases and then increases. This result is similar to the conclusion drawn by Su (2023). However, this does not imply that RT has a "weaker benefit" characteristic, as the promotional effect of RT on farmers with higher livelihood resilience is the most significant. The possible reasons are that when FLR is low, there is a large room for improvement, and RT, due to its unique comparative advantage, has a more significant marginal effect on FLR. On the other hand, according

TABLE 5 Results of robustness test.

	(1)	(2)	(3)
Variable	Replace with Tobit model	1% truncation above and below the sample	Replace the core explanatory variable
RT	0.106** (0.045)	0.118*** (0.040)	0.104*** (0.019)
Control variable	Yes	Yes	Yes
Individual	Yes	Yes	Yes
N	987	968	940
R ²	0.165	0.156	0.157

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE 6 Heterogeneity test results based on farmers' livelihood ability.

Variable	(1)	(2)	(3)
	Buffering capacity	Self-organization capacity	Learning capacity
RT	0.138*** (0.042)	0.079 (0.096)	0.098* (0.059)
Control variable	Yes	Yes	Yes
N	987	987	987
R ²	0.156	0.163	0.195

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

to the resource endowment theory, farmers with higher livelihood resilience will actively participate in rural tourism based on their livelihood advantages, achieving sustainable livelihood development.

4.5.3 Test results based on heterogeneity of family poverty alleviation situation

Improving the livelihood resilience of poor households is the bottom-line task for consolidating poverty alleviation achievements and effectively connecting them with rural revitalization. It is also an essential requirement for achieving shared prosperity. However, most of these households have a weak economic foundation, possess singular resource endowments, and lack professional skills, so whether they can enjoy the benefits of RT merits further exploration. In this paper, based on the database indicator "Has your household ever been a registered poverty-stricken household," the entire sample is divided into non-poverty and poverty households. The regression results are shown in columns (1) and (2) of Table 8. The results show that the impact of RT on the livelihood resilience of non-poverty households is 0.126, which is significant at the 1% statistical level. RT also has a significant positive effect on the livelihood resilience of poor households, but it is only 0.029. This indicates that RT has not continued to play a "pro-poor" role. The possible reason is that although the poverty alleviation project has played a solid external intervention role in breaking the vicious cycle of poverty farmers and has dramatically improved the quality of life of poverty farmers, on the whole, under the guidance of the poverty alleviation work idea that emphasizes hardware over software, the problem of weak self-development capabilities and insufficient internal motivation of households that have been lifted out of poverty, as

TABLE 7 Heterogeneity test results based on FLR.

Variable	(1)	(2)	(3)	(4)
	0.25	0.50	0.75	0.90
RT	0.077* (0.039)	0.067* (0.033)	0.134** (0.062)	0.262** (0.127)
Control variable	Yes	Yes	Yes	Yes
N	987	987	987	987
R ²	0.169	0.181	0.103	0.128

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

formerly registered poverty households, has not been fundamentally changed. Their enthusiasm for participating in rural tourism is low, making it difficult for them to enjoy the benefits of RT effectively.

4.5.4 Test results based on regional heterogeneity

Addressing the issue of unbalanced regional development is a crucial pathway to achieving shared prosperity. As mentioned earlier, there is regional heterogeneity in FLR, so does the impact of RT on FLR exhibit regional differences? Analysis of regional heterogeneity can provide a basis for formulating differentiated RT policies. This paper categorizes the research samples into the eastern, central, and western regions according to the standards of the National Bureau of Statistics of China, and the regression results are shown in columns (3), (4), and (5) of Table 8. The results indicate that the positive impact of RT on the FLR in the central region is the most prominent, with a regression coefficient of 0.157. In the eastern region, the regression coefficient for RT is 0.149, which passes the significance test at the 5% statistical level. However, RT has no significant enhancing effect on the FLR in the western region. The possible reason is that, compared to the central and eastern regions, the western region has long been supported by national policies, leading to some farmers developing a dependency on these policies. Once it is observed that others can quickly obtain economic benefits from the policies, other farmers will follow suit. Over time, this practice can easily create a "butterfly effect," diminishing the motivation of farmers to actively participate in rural tourism activities, thus resulting in a statistically insignificant impact.

4.6 Mechanism analysis

The analysis above indicates that FLR is heterogeneous, both in terms of group and spatial structure. Overall, RT is beneficial for enhancing FLR. So, how does RT affect FLR? This paper explores how RT influences FLR through mediating and moderating mechanisms.

4.6.1 Mediation effect test results

Table 9 reports the test results of how RT affects the FLR through the mobility of livelihood elements and the diversity of livelihood strategies. Columns (1) and (3) are the results of the first step in the mediation effect test, which examines the impact of RT on the mobility of livelihood elements and the diversity of livelihood strategies, respectively. The results show that the regression coefficients are statistically significant at 1%. Specifically, the positive impact effect of RT on the mobility of livelihood elements is 0.053. From the perspective of resource elements, RT relies on a rich and diverse array

TABLE 8 Test results based on the poverty alleviation situation of farmers and regional heterogeneity.

Variable	(1) Non-poverty households	(2) Poverty households	(3) Eastern region	(4) Central region	(5) Western region
RT	0.126*** (0.045)	0.029* (0.014)	0.149** (0.068)	0.157** (0.072)	0.047 (0.064)
Control variable	Yes	Yes	Yes	Yes	Yes
N	854	133	339	199	449
R ²	0.149	0.182	0.219	0.149	0.149

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

of natural resources, providing opportunities for transforming land use in rural areas and revitalizing idle farmer resources. From the perspective of industrial elements, rural tourism can convert rural ecological landscapes, farmhouses, agricultural tools, and agricultural and cultural resources into operable assets, transforming rural areas' ecological and folk cultural resources into economic benefits, thereby increasing the income farmers receive from land rentals (Kaptan et al., 2019).

Column (3) shows that RT has a significant positive impact on the diversity of livelihood strategies, with an effect size of 0.034. This indicates that RT significantly promotes the diversity of farmers' total income. Based on the measurement indicators of farmers' total income diversity used in this paper, this means that, on one hand, RT can increase farmers' agricultural income and promote the diversified operation of agriculture, forestry, animal husbandry, and fishery; on the other hand, RT can facilitate non-agricultural employment for farmers, enhance the diversity of non-agricultural income, break the instability of farmers' dependence on a single livelihood, and improve the resilience of farmers' livelihoods.

Columns (2) and (4) present the results of the second step in the mediation effect test. The results show that the regression coefficients for RT, livelihood element mobility, and livelihood strategy diversity all pass the significance tests. This indicates that the mobility of livelihood elements and the diversity of livelihood strategies are important mediating variables in enhancing FLR through RT.

Additionally, previous studies have indicated that the Sobel test has greater statistical power than the method of sequentially testing regression coefficients (MacKinnon et al., 2002). Therefore, this paper presents the results of the Sobel test, Goodman-1 test, and Goodman-2 test for significance under the Sgmediation command in Stata software (see Table 9). The results show that all three tests pass the significance tests in the mediation effect tests for livelihood element mobility and livelihood strategy diversity, indicating that livelihood element mobility and livelihood strategy diversity partially mediate in the RT-enhancing FLR. Specifically, the mediating effect proportion of livelihood element mobility in the enhancement of FLR by RT is 12.3%, and the mediating effect proportion of livelihood strategy diversity is 30.2%. H2a and H2b of this paper are supported.

4.6.2 Monitor effect test results

Table 10 reports the results of the moderating effect test for subjective wellbeing, risk perception, and fairness perception. In column (1), the estimated coefficient for the interaction term between subjective wellbeing and RT is significantly positive at the 1% statistical level, indicating that farmers' subjective wellbeing has a

TABLE 9 Results of the mediation effect test based on livelihood factor mobility and livelihood strategy diversity.

Variable	(1) LEM	(2) FLR	(3) LSD	(4) FLR
RT	0.053*** (0.018)	0.106** (0.045)	0.034*** (0.012)	0.106** (0.044)
LEM		0.025*** (0.006)		0.053*** (0.013)
LSD				
Control variable	Yes	Yes	Yes	Yes
N	987	987	987	987
R ²	0.142	0.153	0.171	0.155
Sobel test		0.013*** (Z = 3.671)		0.032*** (Z = 4.982)
Goodman-1test		0.013*** (Z = 3.552)		0.032*** (Z = 4.532)
Goodman-1test		0.013*** (Z = 3.794)		0.032*** (Z = 4.354)
Mediation effect		0.013*** (Z = 3.671)		0.032*** (Z = 4.982)
Direct effect		0.093** (Z = 2.059)		0.074** (Z = 2.064)
Total effect		0.106** (Z = 2.124)		0.106** (Z = 2.117)
Proportion of mediation effect		12.3%		30.2%

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

positive moderating effect on the enhancement of FLR by RT. This is consistent with the research conclusion of Wang et al. (2022), that is, the stronger the subjective wellbeing of farmers, the higher their enthusiasm for participating in rural tourism, and the more significant the positive effects of RT on farmers. H3a of this paper is supported.

Column (2) shows that the estimated coefficient for the interaction term between risk perception and RT is significantly negative at the 10% statistical level, indicating that farmers' risk perception has a negative moderating effect on the enhancement of FLR by RT. Compared to farmers with low-risk perceptions, households with high-risk perceptions have more robust psychological defenses and aversion to rural tourism, leading to lower participation in rural

TABLE 10 Results of the moderation effect test based on subjective wellbeing, risk perception, and fairness perception.

	(1)	(2)	(3)
Variable	SWB	RP	FP
RT	0.523*** (0.202)	-0.174* (0.095)	0.125 (0.130)
SWB	0.031*** (0.007)		
RT × SWB	0.158*** (0.050)		
RP		-0.030*** (0.007)	
RT × RP		-0.042* (0.019)	
FP			0.014*** (0.005)
RT × FP			0.005 (0.029)
Control variable	Yes	Yes	Yes
N	987	987	987
R ²	0.166	0.171	0.166

The values in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

tourism, which reduces the promotional effect of RT on their livelihood resilience. H3b of this paper is supported.

Column (3) reports that the estimated coefficient for the interaction term between fairness perception and RT is significantly positive at the 1% statistical level. This indicates that the higher the level of fairness perception, the stronger the enhancing effect of RT on FLR, meaning that fairness perception has a significantly positive moderating effect on the enhancement of FLR by RT. H3c of this paper is supported. The possible reason is that the higher the farmers' perception of fairness, the greater their recognition and trust in democratic participation, and they are more willing to exercise their democratic rights to realize self-worth and achieve sustainable livelihood development.

5 Discussion

Although it is a typical fact in existing research that rural tourism is conducive to enhancing the FLR (Bu et al., 2023; Li et al., 2024; Liu et al., 2023; Xie et al., 2024), the mechanism of action and the nonlinear threshold effect of RT on the FLR have not yet been explored. Since the exact mechanism via which RT affects the FLR is unknown, strategies and programs that aim to encourage rural households to engage in rural tourism scientifically lack precision and target. Therefore, this paper analyzes the impact effect and mechanism of RT on the FLR. Subsequently, a threshold model is constructed to analyze the nonlinear threshold effect of RT on the FLR.

This paper's inspection results demonstrate that the growth of rural tourism significantly improves the FLR, which aligns with Xu and Bao (2022)'s research findings. This demonstrates that the current growth of rural tourism in China is an addition to rural households'

primary means of subsistence, exhibiting a state of coordinated coexistence with the original livelihood methods. However, this paper is not a repetitive study of existing literature, and there are significant differences between the two. First, the research perspective is innovative. This study constructs a FLR framework from the perspective of resilience, analyzes the impact mechanism of RT on the FLR, expands the application of resilience theory, and deepens the academic connection between tourism economics and sustainable livelihood theory. Second, some scholars have found in empirical research that under the drive of interests, the development of rural tourism crowds out or even replaces the traditional production activities of rural households, destroys the original but relatively stable livelihood structure and mode of rural households, and triggers an irreversible change in the traditional livelihood structure (Chen et al., 2018; Lasso and Dahles, 2018). This is completely different from the conclusions of this study. The possible reason is that the above related literature all conduct long-term tracking surveys of specific micro case sites, such as agricultural heritage communities in Japan and Komodo fishing villages in Indonesia. However, this paper is based on the national conditions and policy background of China, and based on the data of the 2020 China Rural Revitalization Survey (CRRS), it explores the impact effect of RT on the FLR. It can not only reflect the localization of China's tourism economic research, but also strive to enrich the research system of China's tourism and sustainable livelihoods, and also provides a special contribution from the Chinese case for the research on tourism economy and livelihood resilience.

Finally, based on the idea of perceived value, this study investigates how rural households' subjective wellbeing, perceptions of risk, and perceptions of fairness moderate the effects of RT on the FLR. Subjective wellbeing is one of them; it positively modifies the effect of RT on the FLR. The findings of Suess et al. (2018), who postulated that "tourism benefits affect residents' willingness to participate in tourism work through subjective wellbeing and life satisfaction," are in line with this conclusion. In rural tourism destinations, rural households, as a unique "role identity," participate in the development process of rural tourism and thereby generate new economic and socio-psychological benefits, significantly enhancing their quality of life and subjective wellbeing. In turn, their livelihood effects of participating in RT are also significantly enhanced (Wang et al., 2020). Risk perception has a negative moderating effect on the impact of RT on the FLR, indicating that although rural tourism brings a broad employment space, the uncontrollability of various risks during the livelihood transformation process leads rural households to consider both income maximization and risk minimization. This is similar to the research conclusions of Yu et al. (2024), which state that rural households' livelihood systems are embedded in natural, social, political, economic, and institutional environments, and the ultimate behavioral decisions of rural households may vary greatly due to different degrees of risk perception.

6 Conclusions and recommendations

6.1 Conclusion

Rural tourism, as an "industry-driven poverty alleviation" model within China's "targeted poverty alleviation" strategy, has played a significant role in improving the quality and efficiency of agriculture, promoting the prosperity and stability of rural areas, and increasing

farmers' income. It is also highly anticipated to advance the rural revitalization strategy. Based on the 2020 China Rural Revitalization Survey (CRRS) database, this paper tests the impact and mechanisms of RT on the FLR from the perspective of resilience by building a benchmark regression model, a mediation effect model and a moderation effect model. The primary conclusions drawn from this study are as follows.

- (1) RT significantly enhances the FLR, a conclusion that holds after discussions on endogeneity and robustness tests. Specifically, the enhancement effect of RT on FLR is primarily reflected in the strengthening of livelihood buffering capacity.
- (2) From the perspective of heterogeneity analysis, the positive enhancement effect of RT on the FLR in the eastern region is the most pronounced. At the same time, it has yet to show a significant positive effect in the western region.
- (3) RT can promote livelihood elements' mobility and increase livelihood strategies' diversity, thereby enhancing the FLR, the mediating effect proportions are 12.3 and 30.2%, respectively.
- (4) Farmers' subjective wellbeing and fairness perception play a positive moderating role in the enhancement of FLR by RT. In contrast, farmers' risk perception exerts a negative moderating effect.

6.2 Recommendations

- (1) Establish a long-term mechanism for RT to enhance the FLR. This paper has confirmed that RT helps to improve the FLR. Therefore, implementing "rural tourism" construction projects should be advanced steadily, and the depth of rural tourism resource endowments should be fully explored. By deepening the integration of industries and expanding the boundaries of rural production, conditions should be created for farmers to correctly participate in rural tourism activities, enhance their primary status in rural tourism participation, and reduce dependence on agricultural production.
- (2) Develop RT according to local conditions, reduce spatial differences through regional linkages, and collaboratively enhance the FLR. In the eastern regions, development should fully leverage economic, technological, and talent advantages to create "smart rural tourism." The central regions should actively integrate tourism resources across areas, implement regional planning, and build a collective force for RT, leveraging the "multiplier" effect of RT and the "penetration" effect on sustainable rural livelihoods. The Western regions should focus on regional and ethnic characteristics, adopt proactive employment absorption policies for rural tourism, pay close attention to the rural social structure conflicts and contradictions arising from endogenous factors such as population characteristics.
- (3) Continue to explore precision rural tourism, closely targeting the practical needs for enhancing FLR. In light of the empirical evidence that RT promotes the mobility of livelihood elements and the diversity of livelihood strategies, thereby enhancing FLR, efforts should be focused on the essential characteristics and development needs of farmers' livelihoods. Local governments should be encouraged to explore and implement targeted RT projects to stimulate farmers' enthusiasm for

non-agricultural employment, effectively alleviate constraints on labor mobility, and reduce the risks associated with a singular livelihood strategy.

- (4) Pay attention to farmers' subjective wellbeing and value public risk and fairness perception. In the process of RT affecting the FLR, farmers' subjective wellbeing, risk perception, and fairness perception play significant moderating roles. To address this, it is essential to enhance the risk governance capacity of public policies, establish transparent information management systems, ensure public policy participation, and alleviate the intervention of low happiness, high-risk perception, and low fairness perception on farmers' participation in RT.

We acknowledge that our study has two limitations. First, Because the CRRS database only updates data for 2020, we can only obtain cross-sectional data from 987 farmer households. A longitudinal survey over multiple periods is needed to track how FLR changes with RT. More critically, panel-data modeling has more explanatory power over the causality between RT and FLR. Second, as mentioned above, our study relies solely on the CRRS database to measure RT and FLR. For example, multivariate objective data on institutional and structural factors at group or village levels, e.g., should be incorporated in future studies.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

Author contributions

JN: Data curation, Formal analysis, Methodology, Project administration, Software, Visualization, Writing – original draft, Writing – review & editing. YZ: Conceptualization, Funding acquisition, Investigation, Project administration, Resources, Supervision, Validation, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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