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Article

The mechanism and boundary conditions of farmers' income increase in financial services: A case study of Yunnan Province

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Abstract: Finance is the core of the modern economy and the bloodline of the real economy; adherence to the people-centered value orientation and the financial services of the real economy as the fundamental purpose is an important connotation of the road of economic development with Chinese characteristics. Financial work is distinctly political and people-oriented, and must consciously practice the concept of the people, serve agricultural and rural development and farmers to increase their income and contribute to the common prosperity of farmers and rural areas. This study is based on the key factors affecting the multidimensional poverty of rural households—external rural financial resources availability and internal rural household entrepreneurship, rural household risk resilience, and rural household financial capability joint analysis. Based on financial exclusion theory, financial inclusion theory, poverty trap theory, and financial literacy theory, to build a logical framework between the rural financial resources availability, farmers' financial capability, farmers' entrepreneurship, farmers' risk management capability, and farmers' poverty, and then empirically explore the optimization mechanism of poverty reduction for farmers, and analyze the heterogeneity of the financial resources availability, to reduce the return to poverty caused by the lack of entrepreneurial motivation and the low level of risk resilience of rural households. The study aims to improve the farmers' financial capability and promote sustainable and high-quality development of rural households. In this study, we modeled financial resource availability and rural household poverty using structural equations and surveyed rural households using a scale questionnaire. It was found that financial resource availability significantly affects rural household risk resilience, farmers' entrepreneurship, and rural household poverty and that rural household risk resilience significance mediates the relationship between financial resource availability and rural household poverty, financial capability plays a significant moderating role. However, the mediating effect of farmers' entrepreneurship on the availability of financial resources and farmers' poverty is insignificant. Here, we put forward corresponding countermeasures and recommendations: guiding the allocation of financial resources to key areas and weak links; optimizing financial services; and building a long-term mechanism.

Keywords: financial resource availability; multidimensional poverty; farmers' entrepreneurship; risk resilience of rural household; financial capability; rural revitalization

1. Introduction

1.1. Background of the study

1) Background of Implementing the Rural Revitalization Strategy Since the 19th National Congress of the Communist Party of China.

A summary of the information related to the availability of financial resources and its impact on rural household income in the context of China's rural revitalization strategy since the 19th National Congress of the Communist Party:

Guiding Financial Resource Allocation for Rural Revitalization: Since the 19th

National Congress, China has been actively promoting the rural revitalization strategy to accelerate the development of an agricultural powerhouse. Financial support plays a crucial role in this process. Regulatory authorities, including the People's Bank of China, the China Banking and Insurance Regulatory Commission, the China Securities Regulatory Commission, the Ministry of Finance, and the Ministry of Agriculture and Rural Affairs, jointly issued guidelines on financial support for rural revitalization. These guidelines emphasize increased lending to key areas of rural development, particularly for food security-related credit needs. As of April 2023, China's outstanding agricultural loans have reached 53.16 trillion yuan, representing a year-on-year growth of 16.4%.

Innovating Rural Finance to Empower Revitalization: Rural financial innovation aims to promote the adoption of effective financial products and services that meet the needs of rural economic entities. The central government's policy document emphasizes stable and expanded reforms in inclusive rural finance, introducing more collateral-free, low-interest, and sustainable financial products. Financial technology (fintech) also contributes to rural revitalization by enhancing financial services through digital inclusion.

Roles of Financial Institutions: Development policy banks, state-owned commercial banks, joint-stock commercial banks, and rural small and medium-sized financial institutions all play different roles in supporting rural revitalization. Encouraging financial institutions to establish specialized branches helps extend basic services to county-level rural areas.

In summary, strategic allocation of financial resources and innovative approaches are critical for increasing rural household income and achieving rural revitalization in China (WANG, 2023).

2) The Background of Building Financial Power and Taking the Road of Financial Development with Chinese Characteristics has just been proposed.

Finance will "make money out of money" and realize "people help others". Traditional rural finance is more about the pursuit of economic efficiency and economic benefits. Rural finance should adhere to the vision of "serving the majority rather than the few", and when serving rural revitalization, it should not only be a simple capital investment but also pay more attention to the humanistic care of finance (Du and Tian, 2024). In the context of China's pursuit of financial strength through its unique development path, this background holds significant value.

Policy Guidance and Strategic Positioning: China's distinctive approach to financial development emphasizes serving the real economy, promoting financial innovation, and implementing reforms. This strategic positioning guides the rational allocated financial resources and directly impacts rural revitalization and income enhancement. Clear policy objectives enable targeted measures, ensuring improved accessibility and effectively utilizing financial resources.

Rural Revitalization and Household Income: Rural revitalization is a key goal within China's financial development strategy. Financial resource availability directly affects economic activities and living standards for rural residents. By strengthening financial support, expanding product coverage, and improving accessibility, policymakers can contribute to entrepreneurship, investment, and income growth among rural households.

Fintech and financial inclusion: China's focus on financial technology (fintech) has played a crucial role. Digital inclusion has strengthened rural financial services to benefit more people. Fintech innovations have addressed traditional pain points and improved the accessibility and efficiency of finance resources.

In summary, this background provides a clear direction for China's financial development, contributing positively to rural revitalization, income growth, and the vision of a robust financial nation (Du and Tian, 2024).

3) Background of Yunnan's Development Strategy Positioning in the New Era

The value of Yunnan's development strategy is in promoting increased income for rural households through financial measures.

Gateway to South and Southeast Asia: Yunnan's unique geographical location, bordering Myanmar, Laos, and Vietnam, positions it as a gateway to South and Southeast Asia. The province actively participates in the Belt and Road Initiative, aiming to enhance economic connectivity. This strategic positioning facilitates cross-border trade, investment, and market access. Improved financial services can empower rural households by enabling better market access, export opportunities, and income diversification.

Ecological Civilization Pioneer: Yunnan boasts rich ecological resources, earning titles like the "Kingdom of Plants" and "Kingdom of Animals." Prioritizing environmental protection and sustainable development aligns with Yunnan's commitment to ecological civilization. By adhering to green practices, Yunnan can enhance the quality of agricultural products, meet environmental standards, and create value-added opportunities for farmers.

High-Quality Leapfrog Development: Yunnan aims for high-quality, leapfrogging development, emphasizing efficiency and effectiveness. This approach directly impacts rural income by fostering innovation, improving agricultural productivity, and promoting value chains. Financial inclusion, investment facilitation, and risk management are important components of this strategy.

In summary, Yunnan's strategic positioning provides a fertile ground for financial initiatives that can raise the standard of living of rural households, enhance livelihoods, and contribute to sustainable growth (HE, 2022).

4) Practical Background

The practical background of research on how financial resources can promote increased income for rural households (Meng and Liu, 2023).

Given the construction of a financial powerhouse on the road to financial development with Chinese characteristics, the rural revitalization strategy has become an important initiative to achieve sustainable rural economic development. At the same time, inclusive finance emphasizes providing fair and accessible financial services to all segments of society, especially meeting the financial needs of difficult groups. Combining rural revitalization with inclusive finance is a new path for promoting rural economic development, and is of great significance for achieving the comprehensive construction of a modern socialist country.

Specifically, the relationship between rural revitalization and financial inclusion is reflected in the following aspects (Zhang and Liu, 2024).

Solving the problem of unbalanced development between urban and rural areas: rural revitalization helps to narrow the gap between urban and rural areas and achieve

social equity. Inclusive finance supports rural economic development and sinks financial resources to every farm household and farmer in need.

Promoting agricultural modernization and food security: rural revitalization can improve the efficiency of agriculture production and guarantee national food security. Inclusive finance provides loans, financing, and other financial services to rural enterprises, farmers' cooperatives, and individual farmers to help them develop their agricultural industries.

Promoting the diversification of rural industries and employment opportunities: rural revitalization is conducive to creating more employment opportunities, absorbing surplus rural labor, and easing urban employment pressure. Inclusive finance supports the construction of rural infrastructure and helps lift the rural poor out of poverty, further contributing to farmers' income growth.

Rural revitalization and inclusive finance promote and complement each other, and together they contribute to rural economic development and social progress (Zhang and Liu, 2024).

5) Theoretical Background

The financial system has five major functions: mobilizing savings, allocating resources, promoting corporate governance, facilitating risk trading and diversification, and facilitating the trading of goods and labor contracts. By giving full play to the five major financial functions, we will develop rural finance and promote agricultural capital accumulation, investment efficiency improvement, and technological innovation, thereby promoting economic growth. The effect of developing rural finance and promoting agricultural economic growth is achieved through agricultural scientific and technological innovation, and there is a transmission path of "rural financial development-agricultural scientific and technological innovation-agricultural economic growth" (Hu and Ren, 2021).

In the context of the rural revitalization strategy, rural finance has an important theoretical background as a key element that contributes to increasing the income of farm households. Theoretical logic of rural financial development: rural financial development involves many aspects, including financial institutions, financial products, and financial services. One theoretical viewpoint emphasizes the "local knowledge paradigm" or "market process paradigm", which means that rural financial needs are met through market mechanisms and rural financial development is promoted. Under the rural revitalization strategy, rural financial reform has become necessary to support the development of the rural economy (He, 2022).

Practical logic of rural financial reform and development: analyze the socio-economic structure and financial needs of rural areas and understand the financial needs of rural households. Take stock of the progress of rural financial reform and interpret the specific deployment of the rural revitalization strategy concerning rural financial reform. Proposals are made to effectively promote rural financial reform for better-serving farm households and contributing to rural economic growth (Hu and Ren, 2021).

Theory of comparative advantage: According to the theory of comparative advantage, the choice of rural industries should consider the resource endowment and building capacity of poor areas. Whether industrial projects have associated driving effects and whether they are adapted to market demand are important considerations

for rural financial poverty alleviation (Liu, 2022).

Heckscher-Ohlin theory: this theory emphasizes the correlation of industrial development. Rural financial poverty alleviation should focus on the integrity of the industrial chain, from planting, and processing to marketing, to form industrial synergy (Liu, 2022).

Hirschman Benchmark: according to the Hirschman Benchmark, rural financial poverty alleviation should be done in a way that works better under specific conditions or environments. For example, customized financial services should be provided to meet the needs of farmers in different regions and to support rural industrial development and poverty reduction (Liu, 2021).

In short, theory and practice are intertwined to provide guidance and support for rural financial development, which helps to realize the goal of rural revitalization.

1.2. Research questions

1) What are the factors influencing rural households' poverty?
2) Does farmers' entrepreneurship and risk resilience of rural households mediate the relationship between financial resources availability and rural households' poverty?
3) Does financial capability moderate between the financial resource availability and poverty among rural households?

2. Objective

2.1. Our research has three objectives:

1) To study the factors influencing rural households' poverty.
2) To investigate the role of financial resource availability in rural households' poverty.
3) To investigate whether farmer entrepreneurship and risk resilience of rural households mediate the relationship between financial resources availability and rural households' poverty.

2.2. Our research hypothesis development:

H1: The availability of financial resources will positively influence rural households' poverty.

Mechanism analysis demonstrates that digital financial development objectively facilitates the participation of rurally poor households in economic activities, alleviating their credit and financing constraints. Moreover, it subjectively enhances the perceived social status of rural relative poor households and boosts their confidence in the future (Duan and Yuan, 2024).

H2: The availability of financial resources will positively influence rural entrepreneurship.

Through Stata's empirical analysis, that finance has a tremendous role in promoting entrepreneurship among rural households and that it is important to increase the innovation of financial service products, combine the government and banks, and change the entrepreneurial households' paper also aims to promote the adoption of

correct financing methods by farmers and the rational use of government policy preferences, so that farmers can effectively and qualitatively start their businesses, to realize the prosperous development of rural revitalization (Wang, 2022).

H3: The availability of financial resources will positively influence the risk resilience of rural households.

The study identified the positive impact of DIF, especially in areas with poor market environments and transportation infrastructure. The study also highlights the mediating effects of increased rural entrepreneurship and reduced rural-urban income gap in enhancing rural economic resilience. The findings emphasize the potential of DIF in promoting sustainable rural economic development (Li et al., 2024).

H4: Rural entrepreneurship mediates the relationship between the availability of financial resources and rural households' poverty.

Digital inclusive finance achieves this by increasing farmers' willingness to engage in e-commerce, enhancing health awareness, and promoting consumption (Wang, 2022).

H5: The risk resilience of rural households mediates the relationship between the availability of financial resources and the rural households' poverty.

Geography and social resources are the main influences on rural vulnerability, followed by the standard of living. Income influences severe multidimensional poverty (Shen and Hu, 2024).

H6: Rural entrepreneurship will positively influence rural households' poverty.

Entrepreneurship by households effectively mitigates multidimensional relative poverty. Entrepreneurship has differentiated effects on households with varying degrees of relative poverty, with a greater poverty reduction impact on those experiencing higher levels of multidimensional relative poverty. Entrepreneurship accelerates land circulation and the accumulation of social capital among households, thereby alleviating multidimensional relative poverty. Therefore, it is essential to focus on multidimensional poverty identification and precise governance, create a favorable entrepreneurial environment, and use policy incentives to encourage active participation in the entrepreneurial wave (Duan and Yuan, 2024).

H7: The risk resilience of rural households will positively influence rural households' poverty.

The frequent occurrence of natural disasters in ethnic minority areas that have been lifted out of poverty has become an important task for poverty eradication and rural revitalization in the new era. Natural disasters under the influence of multiple factors, such as meteorology, geology, topography, and human activities, generally lead to a higher risk of poverty return for disaster-prone farmers. The root cause of their vulnerability lies in the shortage and incompleteness of the coping capital stock consisting of natural capital, public capital, physical capital, human capital, social capital, and financial capital. Under the historical trend of transitioning to resilient governance, the governance of disasters and the return to poverty should return to a people-centered paradigm. Through institutional design and process reengineering, cultivating and constructing "resilient small farmers" and "resilient villages", comprehensively and sustainably enhancing the disaster capital stock and structured disaster coping capacity of disaster-prone farm households, only then can the problem of returning to poverty due to disasters be fundamentally curbed (Shen and Hu, 2024).

H8: Financial capability will moderate the relationship between the availability of financial resources and rural households' poverty.

Insights into mediating and moderating roles: financial self-efficacy shows significant mediating roles, especially in the multiple paths of purchase attitudes and perceived behavioral control, reinforcing its critical position in personal financial product purchase intentions. While financial literacy plays an important moderating role in some cases, it does not play such a role in pathways related to subjective norms (Zhou and Liu, 2024).

Scope of Population: In this study, we have adopted a more stringent criterion to define rural households in Yunnan Province.

Scope of Location: In this study, we have adopted a more stringent criterion to define rural households in Yunnan Province.

Scope of Variables:

Financial resource availability improves the income level, quality of life, and resilience to the risk of rural households through multiple channels, thus providing integrated support to rural households in achieving their poverty reduction goals.

The independent variable is the availability of financial resources of rural households, and the dependent variable is the poverty of rural households. The mediating variables of rural entrepreneurship and risk resilience of farmers may have mediating effects on the relationship between farmer poverty and financial resource availability. How they may have an impact could be to increase farmer income, reduce poverty levels, and lower the effect of risk on capital inflows. The moderating variable is financial capability, which may affect the degree to which farmer financial resource availability affects rural households' poverty. If farmers have relatively good financial capabilities, they may be able to manage their financial affairs effectively and convert financial resources into effective means of reducing poverty. However, if financial capacity is weak, farmers may not have adequate access to their financial resources to overcome poverty. See **Figure 1**.

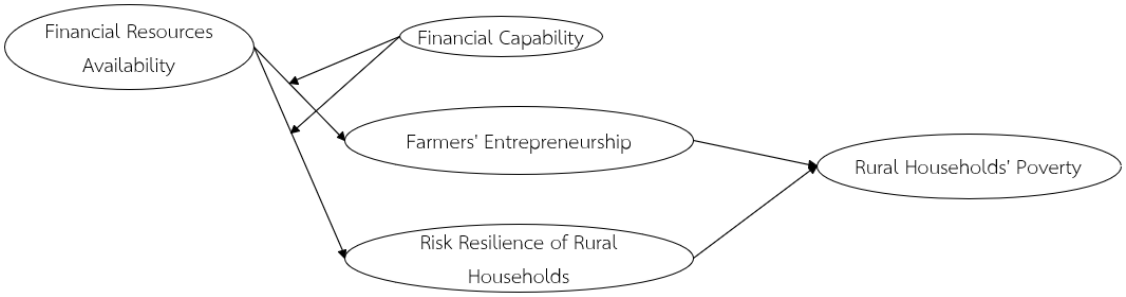

Figure 1. Research framework graph.

Scope of Time: Data were collected in 2024 through questionnaire stars. As we all know, the outbreak of the unprecedented and protracted novel coronavirus pneumonia epidemic at the end of 2019 has profoundly impacted the economy and society after three years of epidemic prevention and control. Use post-pandemic data to get financial information under the normal conditions of the household.

3. Methodology

This part begins by describing the research paradigm used in this study, outlining the research design in three steps. Firstly, the theoretical framework is presented in the first step, followed by the second step, which tests the validity of the theoretical framework using quantitative analysis, and the third step, which explains the theoretical framework using qualitative analysis. A summary of the study's main processes and action plan follows this.

3.1. Explanatory sequential mixed method research

Mixed methods research exists when a researcher combines quantitative and qualitative research techniques, methodology, approaches, concepts, or language into a single study. Such research combines inquiry methods of induction (discovery of patterns), deduction (testing of theories and hypotheses), and abduction (developing and relying on a set of explanations. The fundamental principle of mixed methods involves understanding the strengths and weaknesses of each approach to produce a superior study design to mono-methodological studies because they combine complementary strengths and non-overlapping weaknesses (Timans et al., 2019). See **Figure 2**.

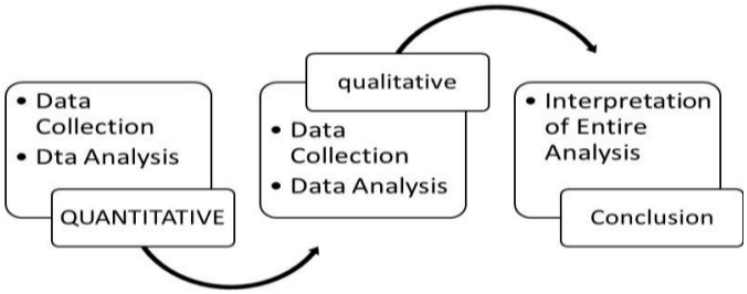

Figure 2. Explanatory sequence design flowchart.

3.2. Research theoretical model

Research Roadmap Diagram: The research is planned to follow the research ideas of "theory reference → framework construction → current situation analysis → empirical test → policy recommendation", and the specific research technical route is shown in the **Figure 3**.

Cite Space text mining and other methods were used to collect and analyze the literature with the keywords "rural finance", "rural poverty" and "farmers' income". Based on the data of the China Household Income Survey, the China Household Panel Survey, and the China Household Finance Survey, this paper horizontally evaluates the development of rural financial resources allocation among provinces in Yunnan Province and describes its temporal evolution trend vertically. To clarify the income distribution of rural households in Yunnan Province, field surveys and multi-period household surveys were carried out in the sampled villages, and the development level and form of financial resources of villages were measured by principal component analysis and entropy weight method, to form cross-layer and multi-period data matching between village and rural households, and compare them with the results of the above-mentioned national survey to verify the randomness and representativeness

of the survey data.

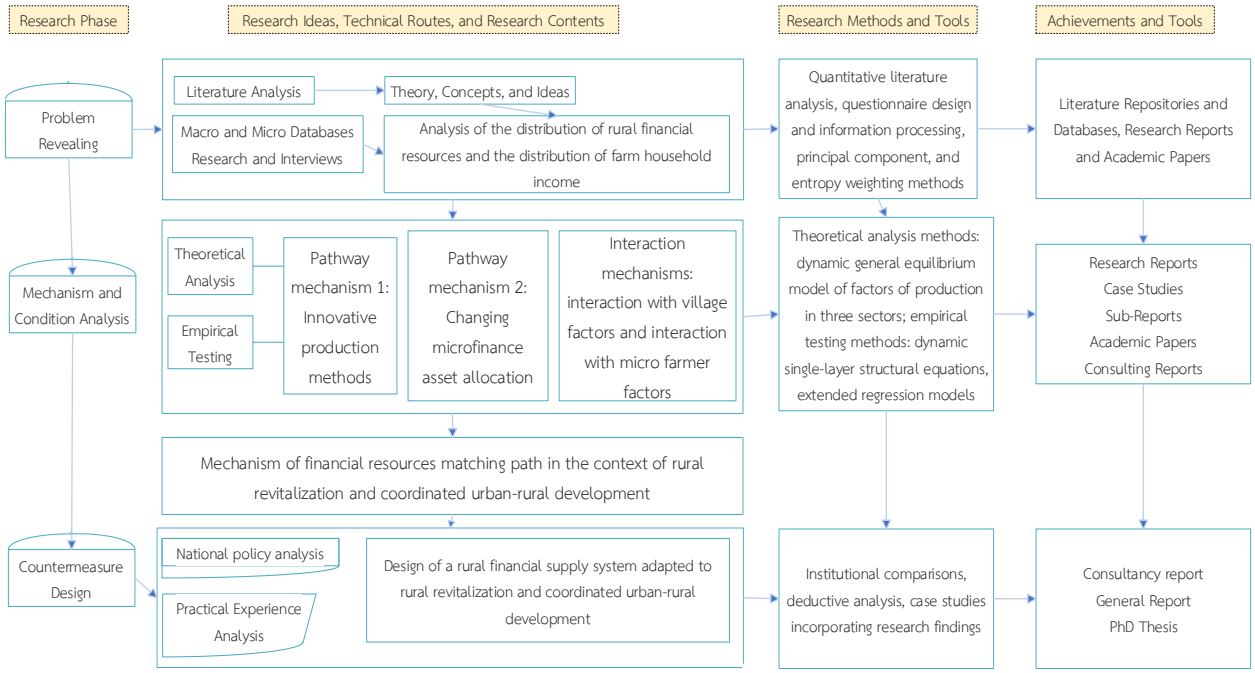

Figure 3. Research roadmap.

3.3. Quantitative study

This study explores the relationship between financial resource availability and rural households' poverty, the mediating role of farmers' entrepreneurship and risk resilience of rural households, and the moderating role of financial capability between the two. To achieve this purpose, the Schumpeter innovation theory, social capital theory, human capital theory, poverty vulnerability theory, financial inclusion theory, financial literacy theory, and other related theories are first elaborated comprehensively, and through reviewing and evaluating the existing literature, the linkages between the independent variables, dependent variables, mediating variables, and moderating variable of this study are established, the gaps in the research are identified, and the theoretical model of this study is formed.

1) Pilot Survey

A pilot survey is a small-scale preliminary study conducted before the main research project to test and refine the research methodology. The primary goal of a pilot survey is to identify and address any potential issues with the research design, data collection instruments, and procedures before implementing them on a larger scale.

Knowledge of conditional process analysis's mechanics, mathematics, and principles opens up analytical doors. The PROCESS model in Smart PLS supports path analysis and PROCESS. Path analysis is a regression-based technique for estimating models with multiple dependent and independent variables. Unlike PLS-SEM, it is a one-step method that uses equally weighted metrics for multiple measures per construct and operates on unstandardized data (Hayes, 2022).

2) Population and Sample

(1) Population

Samples from rural households under 94 ordinary or minority autonomous counties in Yunnan Province, China.

According to the latest data, at the end of 2023, the resident population of Yunnan Province was 46.73 million. Among them, the urban resident population was 24.73 million and the rural resident population was 22 million, with an urbanization rate of 52.92%.

(2) Sampling frame

The observation object of this project includes two levels: village dwellings and rural households in village dwellings, in which the rural households are nested in the village dwellings, which is a typical hierarchical structure. In the field investigation, the final observation sample is to be obtained by stratified sampling according to probability proportion:

In the first step, using the latest statistical data from (The China County Statistical Yearbook), 94 ordinary counties or ethnic minority autonomous counties in Yunnan Province were arranged in stratified or multivariate cluster analysis according to the characteristics of economic and social development level and population education level, and about 1 to 3 county-level units with different development levels were randomly selected in each layer or category, to ensure that the counties chosen were representative of Yunnan Province.

In the second step, one to three townships were randomly selected from each selected district, and two to three administrative villages were sampled from each chosen township, for a total of about 50 representative villages.

In the third step, 15 to 30 rural households in each administrative village were randomly selected to carry out a household observation survey with the help of the roster of rural households in the selected villages, or the Gaode map was used to construct a household-level sampling frame based on the residential location of the households.

(3) Sampling technique and sample size

The sample size is the number of complete responses your survey receives. It represents only a portion of the larger group (population) whose opinions or behaviors you want to study. For example, if you are researching vehicle ownership preferences among U.S. adults, your sample size is the number of respondents who participated in your survey.

To calculate sample size, consider the following factors:

Population Size (N): The size of the population you are studying.

Margin of Error (e): The acceptable deviation from the true population parameter (usually expressed as a percentage).

Z-Score: The number of standard deviations a given proportion is away from the mean. Common z-scores for different confidence levels:

95% confidence level: Z-score ≈ 1.96

99% confidence level: Z-score ≈ 2.58

The formula for sample size (N) is: $N = Z^2 \times P \times (1 - P)/e^2$

where:

(z) is the z-score corresponding to the desired confidence level.

(p) is the estimated proportion (usually 0.5 for maximum variability).

(e) is the margin of error (expressed as a decimal).

This study employs more stringent criteria to define rural households in Yunnan Province, farmers interviewed currently reside in rural areas of Yunnan Province, using a convenience sample and planning to base subsequent empirical analyses on these 500 households, spread across more than 60 different villages.

To ensure the representativeness of the sample and the reliability of the analysis, researchers tend to choose relatively large sample sizes to cope with the complicated nature of the comparison and the variability of the data. however, Bentler and Chou (1987) suggested that the sample size to the number of free parameters ratio can be as low as 5:1 under normal and elliptic theories, especially when the variable indicators are large and the correlated factor loadings are large. The number of questionnaire questions in this study was 35. Referring to the questionnaire return rate of Xiong (2016), the sample size was determined to be 7 times the number of questions, i.e. 35 × 7 = 245.

The multi-stage sampling method is used for sampling in this thesis. The sampling methodology for studying the availability of financial resources to farmers requires a comprehensive consideration of the purpose of the study, the available resources, the characteristics of the study population, and the requirements of the research design. The sampling stages of this study are as follows.

The first phase included 14 prefectural and municipal cities in Yunnan Province. The second stage divides the region into three main areas based on the southern, northern, and western regions. The third stage is the cities in each region. The last stage is a purposeful sampling from each city as a target sample. See **Table 1**.

Table 1. The sampling stages of this study.

Stage1	**Stage2**	**Stage3**	**Stage4**
14 prefectural and municipal cities in Yunnan Province	Southern	Yuxi	22
		Honghe	17
		Puer	7
		Wenshan	12
		Xishuangbanna	16
	Northern	Zhaotong	96
		Qujing	60
		Kunming	131
	Western	Baoshan	14
		chuxiong	28
		Dali	70
		Dehong	13
		Lincang	12
		Lijiang	6
Total			504

3) Questionnaire Construction

The researcher will use a questionnaire to collect data.

(1) Designing the questionnaire

The researcher designed a questionnaire on the relevant variables based on the

research concepts, theories, and literature review. Chapter 2 of this thesis details the literature on the variables included in the questionnaire. Tang, Q. and Yang, S. W. (2020) have explored these variables and are well-grounded. The researcher created sentences for the questionnaire based on each item and again thoroughly checked the linguistic usage.

The questionnaire consisted of questions that included the following variables. The questionnaire consisted of 5 variables: financial resources availability, rural household poverty, farmers' entrepreneurship, risk resilience of rural households, and financial capability. Drawing insights from the literature review, the researcher established the measurement structure for the variables. Subsequently, a 5-Likert scale was employed to formulate statements based on the variables. Subsequently, a 5-Likert scale formulated statements based on the identified items.

(2) Examine the tool's quality

Validity check. The researcher will apply the content validity test to assess the validity of the questionnaire, starting with the research query summary. If the IOC value of the questionnaire content is equal to or greater than 0.5, the questionnaire is valid.

(3) Data collection

The researcher used a questionnaire to collect data from rural households under 94 ordinary or minority autonomous counties in Yunnan Province. Data collection will be conducted through an online questionnaire system.

(4) Analysis of the data

The statistics will be used for PLS-SEM analysis. The researcher chose statistical methods consistent with the predetermined research objectives and aligned with established scientific or social science concepts. This study first utilized descriptive statistics to analyze basic demographic information such as location, gender, age, education, and size/number of people in my household.

3.4. Qualitative analysis to explain the relationship between the variables in the model

The purpose of the qualitative analysis was to explain the reasons for the quantitative analysis results through in-depth interviews. Qualitative analysis collects data through interviews with the target population. Then, it analyzes the data to understand better ambiguous, contradictory, or anomalous data found during the quantitative analysis phase.

The mechanism analysis of this study investigates the transmission mechanism of macroeconomic financial resources to micro-level household income using a 1-to-1-to-1 single-layer mediation model. Employ a single-layer moderated mediation model to examine the boundary conditions under which financial resources contribute to income growth, focusing on the micro-level effects of household entrepreneurship, risk resilience, and the moderating role of household financial capability.

The countermeasure design mainly uses the methods of institutional comparison, deductive analysis, case analysis, and other techniques to analyze the national strategies on rural financial development, rural revitalization, and urban-rural coordinated development, as well as relevant practical experience at home and abroad,

and further combines the conclusions of the path mechanism obtained from the research of this topic, constructs a countermeasure system for matching the supply and demand of financial resources with the coordination of micro subjects and macro environment and puts forward relevant policy suggestions.

4. Results

We will introduce the collection and analysis of the research. The study employs a research methodology known as the "Explanatory Sequential Mixed Methods Design." The parts comprise two distinct stages: a quantitative and a qualitative phase. The quantitative analysis section will collect data in two stages: pilot study and formal study. The pilot study section will outline the basic information of data collection, and conduct basic feature analysis and descriptive statistical analysis of the pilot study data. The formal study stage will use the questionnaires that passed the pilot study test, and the SPSS 27.0 software will be used to test for significant homogeneity bias in the questionnaires. Subsequently, qualitative interviews are conducted in the subsequent phase to acquire a more profound comprehension of unclear, contradictory, or anomalous data that were uncovered during the quantitative analysis phase. Afterward, the Smart-PLS software will be used to analyze the correlation between variables and the hypothesis paths, providing data support for the qualitative interviews and the conclusion analysis in this part.

4.1. Descriptive statistical analysis

During the formal survey phase, 582 online questionnaires were distributed on the So Jump website, and 582 questionnaires were collected, resulting in a response rate of 100%. All received questionnaires were reviewed and screened. Any questionnaires with randomly filled responses, such as those filled in less than 100 seconds, were deleted. Additionally, questionnaires exhibiting a strong pattern of repeated identical choices or options were considered invalid and excluded. After excluding 78 invalid questionnaires, the number of valid questionnaires in the pre-survey stage was 504, with a valid response rate of 86.60%. The analysis is based on the valid questionnaires from the formal survey sample, with specific information shown in **Figures 4–9**, and **Table 2**.

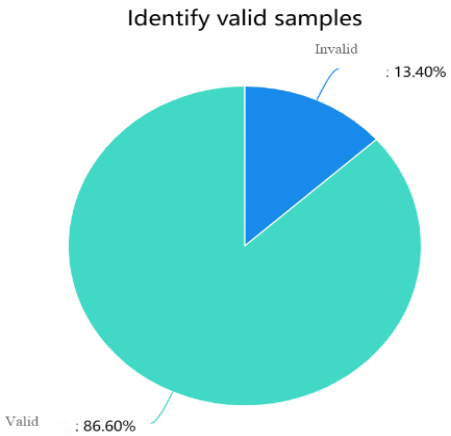

Figure 4. Identify valid samples.

Regarding the gender of the head of household, there were 361 male respondents, accounting for a high proportion of 71.63%.

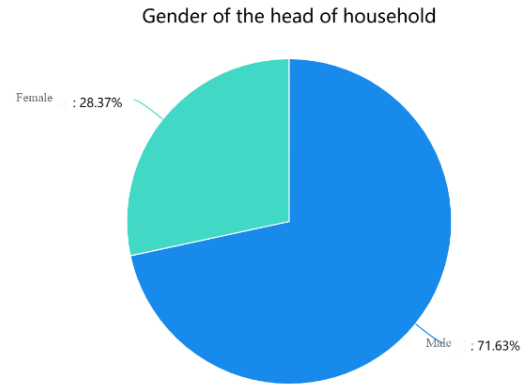

Figure 5. Gender of the head of household.

Regarding the age of the head of household, the majority distributed between 31 and 60 years, accounting for 82.15% of the total.

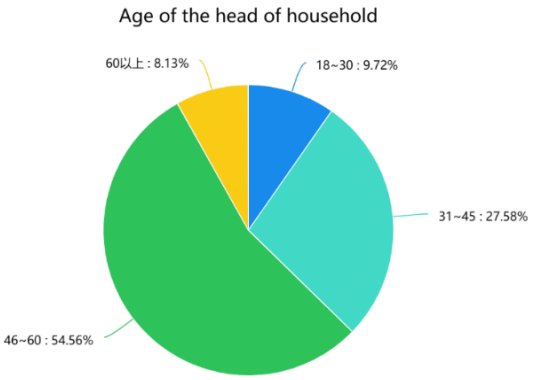

Figure 6. Age of the head of household.

Regarding education level, the head of household with primary school and junior high school accounted for 56.35% of the total. In comparison, the next highest percentage was 21.83% of the total number of university college degrees and above.

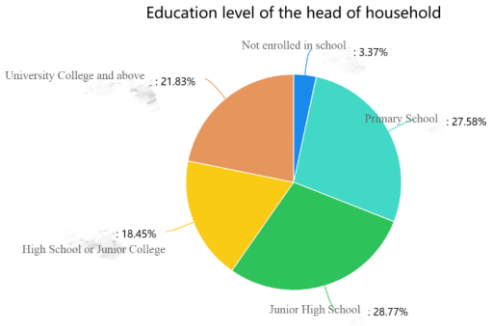

Figure 7. Education level of the head of household.

Regarding household size, most family members are concentrated in the number of 4 to 5 members, accounting for 59.72% of the total.

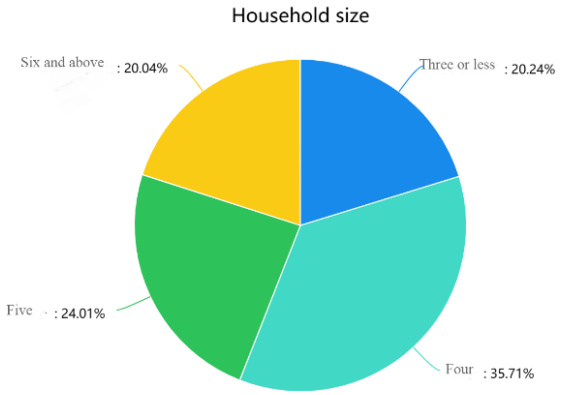

Figure 8. Household size.

In the question item, whether there is a member of the family who is a member of the Communist Party or a village cadre, the percentage of those who fill in no is in the majority, amounting to 59.33%.

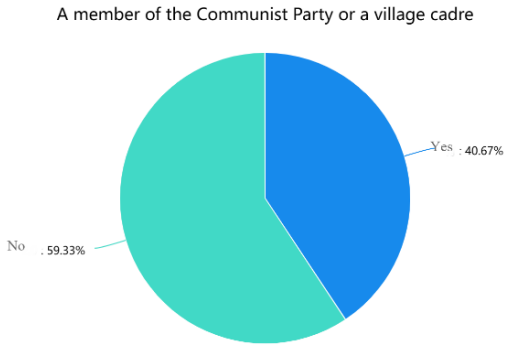

Figure 9. A member of the Communist Party or a village cadre.

Table 2. Formal study descriptive statistics (N = 504).

Demographic		**Frequency**	**Percent (%)**	**Cumulative Percent (%)**
Gender	Male	361	71.63	71.63
	Female	143	28.37	100.00
AGE	18–30 years	49	9.72	9.72
	31–45 years	139	27.58	37.30
	46–60 years	275	54.56	91.87
	60 years and over	41	8.13	100.00
EDU	Not enrolled in school	17	3.37	3.37
	Primary School	139	27.58	30.95
	Junior High School	145	28.77	59.72
	High School or Junior College	93	18.45	78.17
	University College and above	110	21.83	100.00
Household size	Three or less	102	20.24	20.24
	Four	180	35.71	55.95
	Five	121	24.01	79.96
	Six and above	101	20.04	100.00

Table 2. (*Continued*).

Demographic		Frequency	Percent (%)	Cumulative Percent (%)
Communist Party members or village cadres	Yes	205	40.67	40.67
	No	299	59.33	100.00
In Total		504	100.0	100.0

4.2. Test of construct validity

Reliability is mainly used to test the consistency and stability of a scale. Smart-PLS's reliability indicators include Cronbach's Alpha and CR values (Hair et al., 2017). The results of the reliability test of this study are presented in **Tables 2** and **3**. Cronbach's alpha values for all the variables ranged from 0.735 to 0.921, which were all above the 0.7 criterion. The composite reliability (CR) values ranged from 0.745 to 0.921, which is also higher than 0.7, indicating that the reliability of this study is acceptable.

Table 3. The reliability and validity test of the first order constructs.

First Order Constructs	Items	Loading	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DC	DC1	0.658	0.735	0.807	0.835	0.57
	DC2	0.885				
	DC3	0.893				
	EC3	0.515				
EP	EP1	0.774	0.743	0.745	0.854	0.661
	EP2	0.842				
	EP3	0.821				
FE	FE1	0.820	0.771	0.771	0.867	0.686
	FE2	0.827				
	FE3	0.837				
FM	FM1	0.889	0.753	0.774	0.859	0.672
	FM2	0.848				
	IF3	0.713				
FR	FR2	0.844	0.769	0.794	0.866	0.683
	FR3	0.871				
	FR5	0.761				
IF	FF1	0.945	0.921	0.921	0.95	0.863
	FF2	0.935				
	FF3	0.907				
LP	LP1	0.883	0.91	0.91	0.937	0.788
	LP2	0.908				
	LP4	0.888				
	PO2	0.871				

Table 3. (*Continued*).

First Order Constructs	Items	Loading	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
	SP2	0.806				
	SP3	0.847				
SP	SP4	0.903	0.901	0.902	0.927	0.716
	SP5	0.838				
	SP7	0.835				
	SR1	0.892				
SR	SR2	0.905	0.863	0.863	0.916	0.785
	SR4	0.861				

The main indicators for measuring validity are content validity, convergent validity, and discriminant validity. All measurement items used in the formal survey of this study are derived from mature scales that have been validated both domestically and internationally. Each variable has three or more measurement items, that have passed the validity tests during the pilot study, indicating good content validity. In Smart-PLS, the indicators used to measure convergent validity are Average Variance Extracted (AVE) and factor loadings. The indicators used to measure discriminant validity include the square root of the AVE for each variable and its correlation coefficient, cross-loadings of the items, and the Heterotrait-Monotrait Ratio (Hair et al., 2017).

In this study, the validity indicators of each variable were obtained by running the PLS algorithm. The Bootstrapping resampling method was also employed, with 2000 iterations, to determine the significance of the factor loadings of each variable and the factor loadings and importance of the first-order variables corresponding to the second-order reflective variables, as shown in **Table 4**. All variables have factor loadings above 0.556 and are significant at a 0.001 level, this is a relatively stringent standard, but still acceptable in some cases. Additionally, all variables have AVE values above 0.5, indicating average convergent validity in this study (Hair et al., 2017).

Table 4. The reliability and validity test of the second-order constructs.

Second Order Constructs	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Farmers' Entrepreneurship	0.85	0.851	0.889	0.572
Financial Capability	0.8	0.847	0.875	0.701
Financial Resources Availability	0.889	0.901	0.911	0.512
Risk Resilience of Rural Households	0.851	0.862	0.89	0.579
Rural Households Poverty	0.89	0.904	0.914	0.55

4.3. Financial literacy right and wrong test analysis

The financial competency dimension has a financial literacy question item, which is not a scale question but a right-or-wrong question, and this section is analyzed using the following methodology:

The test shows no significant difference between the right and wrong financial knowledge questions and financial literacy dimensions in the 504 questionnaires formally surveyed, with 53.6% of the respondents testing their financial knowledge correctly.

The overall financial literacy of the interviewed farm households is low, as evidenced by weak willingness to pay attention, insufficient financial knowledge, and conservative risk appetite. Then, what factors affect the financial literacy of the interviewed household heads? **Figure 10** categorizes the education level of the heads of households into five groups, showing the differences in the level of concern about economic and financial issues among the five groups of individuals. It can be seen that a higher percentage of household heads with high school education and above choose "extremely concerned" and a lower percentage choose "never concerned" than those with middle school education and below. The chi-square value of the chi-square test is 26.352, corresponding to a *p*-value of 0.049*, which proves that there is indeed a significant difference in the distribution of the level of concern among the five groups.

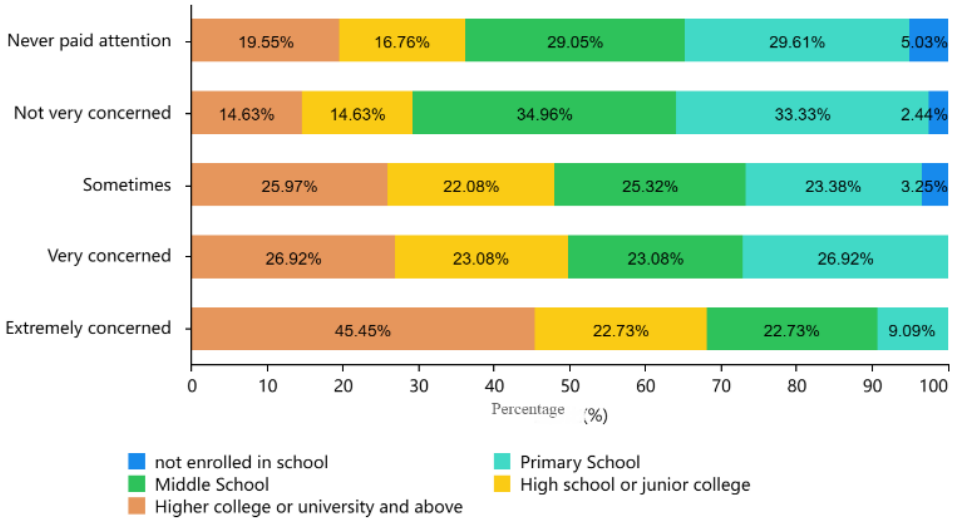

Figure 10. Cross diagram of education and economic and financial concerns.

Figure 11 continues the cross-plot showing trends in education and investment. The wider the width of the bar corresponding to the label on the horizontal axis, the greater the weight of the number of heads of household corresponding to that label. As can be seen, a higher proportion of household heads with high school education and above are risk-averse and a lower proportion are risk-averse than those with middle school education and below. The chi-square value of the chi-square test is 30.279, corresponding to a *p*-value of 0.017*, which proves that there is indeed a significant difference in the distribution of the level of concern among the five groups.

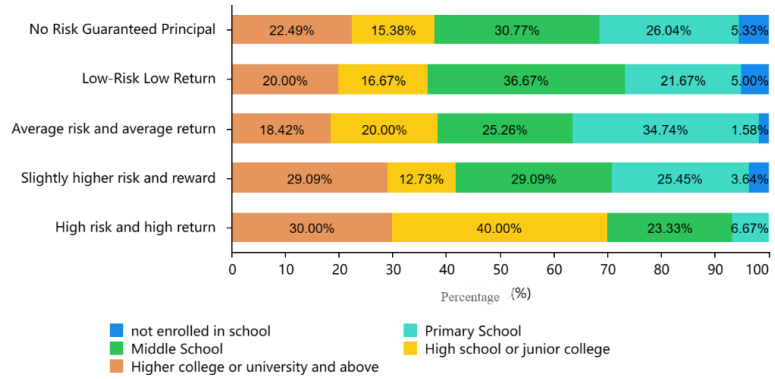

Figure 11. Cross diagram of education and investment tendency.

Figure 12 divides the interviewed farmers into five groups: never use, seldom use, sometimes use, often use, and always use, and compares the distribution patterns of per capita household income among the five groups. It can be seen that the mean value of income is slightly higher for individuals who use more frequently compared to those who never use, seldom use, and sometimes use. The distribution pattern of income is uneven, with a steep slope as the frequency of use increases. The analysis of variance (ANOVA) for income and frequency of credit card use showed an F-value of 7.235, which corresponds to a p-value of 0.000^{**} (** $p < 0.01$), indicating that the frequency of credit card use exhibits a statistically significant relationship with per capita household income.

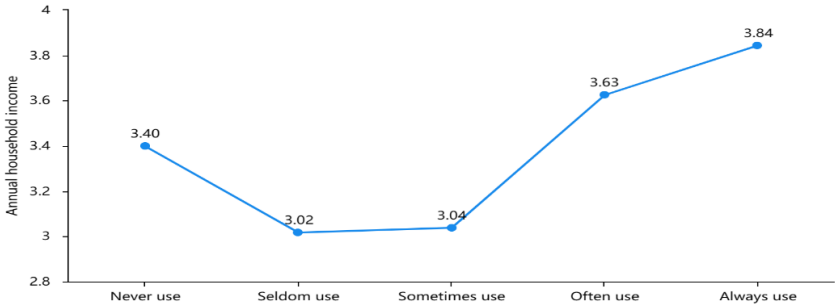

Figure 12. Comparison of credit card usage frequency and annual household income ANOVA.

4.4. Direct effects testing

In this study, we used Smart-PLS to execute the PLS algorithm, obtaining R representing the proportion of the dependent variable explained in the model. We performed the main effects analysis on 504 samples using bootstrapping sampling. The structural equation modeling SEM regression relationship table includes a total of two types of relationships, namely the influence structure relationship and the measurement relationship. First: regardless of the influence structure relationship or measurement relationship, the standardized path coefficient value is usually used to indicate the relationship situation; second: if it presents significance, it demonstrates that there is a significant influence/measurement relationship, and vice versa, it suggests that there is no influence/measurement relationship between the terms; and third: if a larger number of path coefficients do not present significance, it indicates

that the model is worse, and it is recommended to reset the model relationship i.e., to adjust the model (Zhou and Ma, 2024).

Following the recommendations of Hair et al. (2017), we reported the path coefficients, standard errors, *t*-values, and *p*-values for the structural model using a 5000-sample resample bootstrapping procedure, as shown in **Table 5**. Based on these findings, the following conclusions can be drawn:

Table 5. Analysis of the percentage of correct financial literacy responses.

Name	Options	Frequency	Percentage (%)	Cumulative Percentage (%)
Knowledge of interest rates	Incorrect	263	52.18	52.18
	Correct	241	47.82	100.00
Inflation knowledge	Incorrect	362	71.83	71.83
	Correct	142	28.17	100.00
Knowledge of investment risks	Incorrect	76	15.08	15.08
	Correct	428	84.92	100.00
Add up the total		504	100.0	100.0

Financial resource availability significantly positively affects rural households' poverty (0.112, $p < 0.05$). Financial resource availability significantly positively affects farmers entrepreneurship (0.536, $p < 0.001$). Financial resource availability significantly positively affects the risk resilience of rural households (0.564, $p < 0.001$). The risk resilience of rural households significantly positively affects rural households' poverty (0.567, $p < 0.001$). Farmers' entrepreneurship does not significantly positively affect rural households' poverty (0.037, $p > 0.01$).

4.5. Mediation effects testing

Mediation Effects Testing To test the mediation hypotheses, we followed the suggestions of Preacher and Hayes (2004, 2008) by bootstrapping the indirect effect. If the confidence interval does not straddle a 0 then we can conclude that there is significance. As can be seen from the table below, the mediation effect analysis involves a total of four models, as follows:

As shown in **Table 6**, From the results in the table below, we can see that H5: FRA > RRRH > RHP ($\beta = 0.319$, $p < 0.001$), indicating the presence of a full mediation effect of risk resilience of rural households in the financial resource availability on rural households' poverty, supporting the hypothesis.

Table 6. Hypothesis testing direct effects.

Hypothesis	Relationship	Original sample (O)	Standard deviation (STDEV)	*T* statistics (|O/STDEV|)	*P* values
H1	FRA > RHP	0.112	0.056	2.012	0.044
H2	FRA > FE	0.536	0.033	16.322	0.000
H3	FRA > RRRH	0.564	0.038	14.958	0.000
H6	FE > RHP	0.037	0.046	0.814	0.416
H7	RRRH > RHP	0.567	0.050	11.304	0.000

However, the indirect effect of financial resources availability on rural households' poverty through farmers' entrepreneurship was not significant, as shown in **Table 7**. FRA > FE > RHP (β = 0.02, p > 0.05). This means that farmers' entrepreneurship does not significantly positively mediation affect the financial resources available in rural households' poverty, leading to the rejection of hypothesis H4.

Table 7. Hypothesis testing indirect effects.

Hypothesis	Relationship	Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
H4	FRA > FE > RHP	0.02	0.025	0.808	0.419
H5	FRA > RRR > RHP	0.319	0.038	8.388	0.000

4.6. Moderation affects testing

The concept of moderation pertains to a scenario wherein the association between two constructs is not consistent, but rather contingent upon the values of a third variable, known as a moderator variable. The moderator variable, also known as a construct, can alter the magnitude or even the orientation of the association between two constructs inside the conceptual framework.

Table 8 shows the standardized beta coefficient of 0.216 indicating the link between financial resource availability and rural households' poverty, with financial capability as a moderator. The interaction term between FRA and FC showed significance (t = 2.951, p = 0.003 < 0.05). This suggests that the moderator variable (FC) differs significantly in the extent of its effect at different levels when FRA affects RHP, as can be seen in the simple slope table and graph below. The result shows that financial capability moderated the relationship between financial resource availability and poverty among farm households.

Table 8. Hypothesis testing moderating effects.

Hypothesis	Relationship	Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
H8	FC x FRA =>RHP	0.216	0.073	2.951	0.003

Simple slopes delve into the differences in the effect of the independent variable *X* on the dependent variable *Y* when the moderating variable is at different levels: First: simple slope analysis is required if it shows a moderating effect, and vice versa; second: simple slope analysis refers to affect the independent variable on the dependent variable *Y* (i.e., the significance of regression coefficients, etc.) when the moderating variable is at three different levels; and third: the three levels of the moderating variable are the mean level, the high level (the mean plus one standard deviation), and the low level (the mean minus one (mean plus 1 standard deviation); Fourth: If there is a moderating effect, the moderating effect can be described in depth in conjunction with a simple slope table and a simple slope diagram.

The association between financial resource availability and rural households' poverty is depicted by the three lines in **Figure 13** Slope Plot, with one line representing low levels of the moderator construct financial capability and the other lines representing average levels and high levels. Typically, a low level of financial

capability is defined as one standard deviation below the average, as indicated by the red line in **Figure 13** Slope Plot. Conversely, a high level of financial capability is defined as one standard deviation above the average, as represented by the green line in **Figure 13** Slope Plot. The difference in the magnitude (slope) of the effect of the independent variable *X* on the dependent variable *Y* when the moderating variable *Z* is taken at different levels is the specific case of the moderating effect. The positive moderating effect is evident in the association between the interaction term and the endogenous structure of the model, with a coefficient of 0.228. Thus, the slopes of the high and low moderating lines are almost reversed. This link between financial resources availability and rural households' poverty moderates the variable of financial capability. See **Figures 14** and **15**.

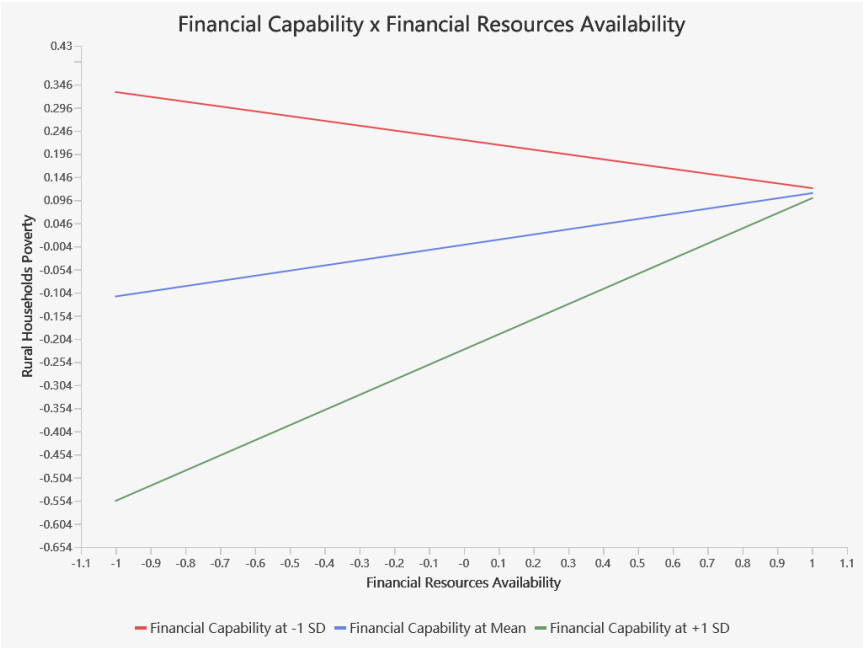

Figure 13. Slope plot.

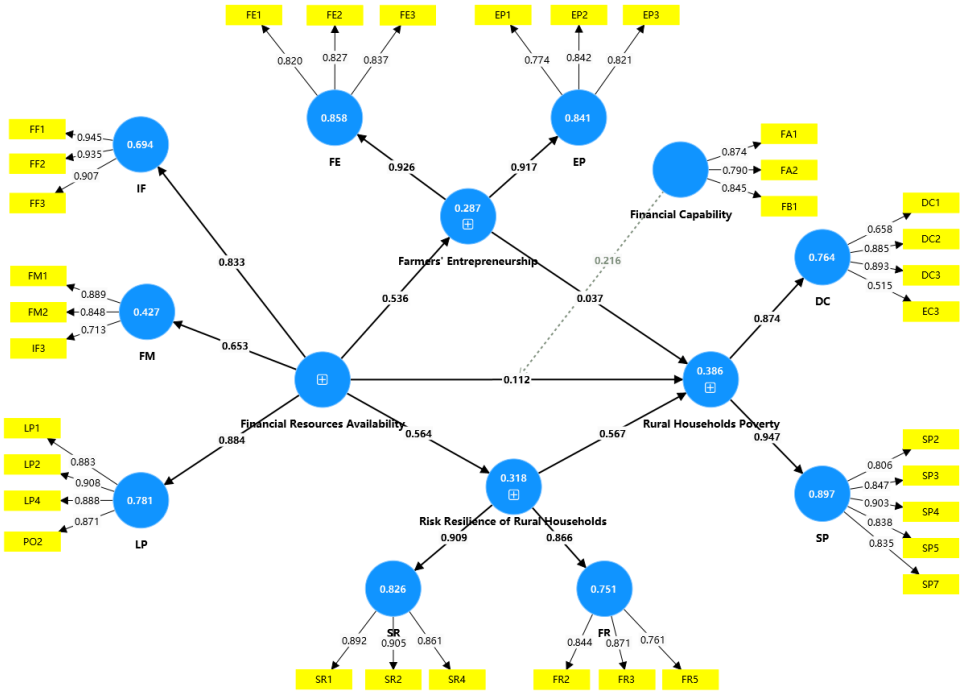

Figure 14. Pls-sem—PLS.

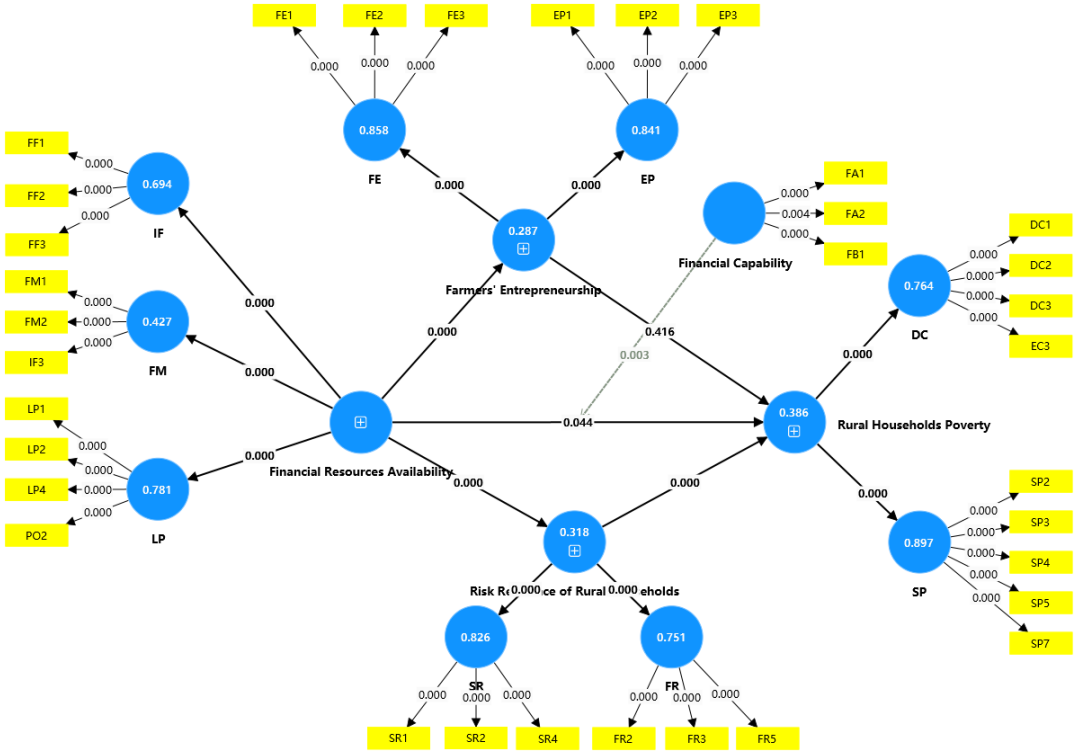

Figure 15. Pls-sem—BT.

4.7. Conclusion of quantitative analysis

In the quantitative analysis section, statistical analysis software such as SPSS 27.0 and Smart-PLS were used to conduct descriptive statistics, reliability analysis, factor analysis, test the direct effects, mediating effects, and moderating effects of the model, as well as predict the model's fit based on the 504 valid sample data collected through a questionnaire survey. As shown in the analysis results in **Table 9**, 5 main

hypotheses were validated, except for three hypotheses related to the direct effect of the availability of financial resources and farmers' entrepreneurship to promote rural households' poverty reduction, the indirect effecting of Farmers' entrepreneurship mediates the relationship between the financial resource availability and rural households' poverty (H6 and H4), which were not supported. The other hypotheses have passed the data test.

Table 9. Summary of results of hypotheses testing.

Hypothesis No.	Hypothesis	Results
H1	Financial resource availability will positively influence rural households' poverty.	Supported
H2	Financial resource availability will positively influence Farmers' entrepreneurship.	Supported
H3	Financial resource availability will positively influence the risk resilience of rural households.	Supported
H4	Farmers' entrepreneurship mediates the relationship between the availability of financial resources and rural households' poverty.	Not Supported
H5	The risk resilience of rural households mediates the relationship between the availability of financial resources and the rural households' poverty.	Supported
H6	Farmers' entrepreneurship will positively influence rural households' poverty.	Not Supported
H7	The risk resilience of rural households will positively influence rural households' poverty.	Supported
H8	The financial capability will moderate the relationship between financial resource availability and rural households' poverty.	Supported

Rural household entrepreneurship refers to the process by which farmers with a certain amount of entrepreneurial capital and capacity, based on searching for or developing market space, reorganize the resources of various factors of production, open up new areas of production, and innovate in the form of business operations, to maximize their interests and expand the employment of their workforce. This concept emphasizes the active role of farm households in rural economic development by creating new enterprises or businesses related to agricultural economic activities based on agriculture. Farm household entrepreneurship helps to promote rural revitalization and farmers' income generation.

Empirical research in this study indicates that farmers' entrepreneurship will not positively influence rural households' poverty ($\beta = 0.037$, $p = 0.416$). Theme encoding displayed in qualitative research in this study that the notion of "digital technology and digital platforms", "financial development", and "rural revitalization" has been thoroughly examined in the interview. Digital technology focuses on technical tools and methods for processing and transforming data. Digital technology focuses on technical tools and methods for processing and transforming data. A digital platform is a comprehensive service hub that blends technology, data, and applications to support an enterprise's digital transformation.

In the empirical analysis results, some factors affect the insignificant impact of farmers' entrepreneurship on rural household poverty. The following are some of the possible reasons (Yuan, 2023).

Entrepreneurial environment and opportunities: the rural entrepreneurial environment may be underdeveloped with limited entrepreneurial opportunities. Lack of entrepreneurial resources, market information, and technical support may limit the effectiveness of farm household entrepreneurship. Entrepreneurial success requires

good access to markets, innovation, and management skills. If these conditions are inadequate, the impact of farm household entrepreneurship may be limited.

Risk and uncertainty: Starting a business involves having risks, including economic, market, technological, and managerial risks. A farming household may be unwilling to take on these risks or cannot afford to deal with them. Uncertainty is also a factor. The success of rural entrepreneurship depends not only on individual efforts but is also affected by the external environment, policies, and market fluctuations.

Structural problems: Rural poverty is often closely related to structural problems (e.g., land issues, education levels, infrastructure, etc.). Even if a farmer starts a business, if these problems are not addressed, conditions of poverty may remain.

Socio-cultural factors: Rural socio-cultural influences on entrepreneurial attitudes and behaviors. Traditional attitudes, social expectations, and cultural practices may influence the willingness of farmers to start a business.

In the empirical analysis, if the mediating role of farm household entrepreneurship as a link between the availability of financial resources and rural household poverty is insignificant, the following explanations may be possible (Zhou, 2024).

Impact of other factors: Apart from the availability of financial resources, other factors may affect farmers' entrepreneurship and poverty. For instance, factors such as social networks, level of education, market demand, etc. may directly affect farm household entrepreneurship, which masks the mediating role of the availability of financial resources.

Regional differences: Different regions have different financial environments and levels of development, which may result in the impact of financial resource availability on farm household entrepreneurship not being significant in some areas. Therefore, regional differences may need to be considered to explain the non-significance of the mediating effect.

Research methodology and sample selection: Factors such as research methodology, selection of data samples, and model setting may also affect the empirical results. If the sample is not representative or the model setting is not reasonable, it may lead to insignificant mediation.

4.8. Qualitative analysis

A qualitative study is a research methodology that centers on comprehending and interpreting social phenomena by gathering and analyzing non-numerical data. The primary objective of this study is to investigate and acquire a deeper understanding of the experiences, viewpoints, and interpretations of individuals or collectives (Creswell, and Poth, 2016).

Using word frequency statistics in NVivo facilitates the examination and comprehension of the frequency of occurrence of particular words or concepts within a given dataset. This technique helps identify terms that researchers often discuss or find relevant. Such identification can offer valuable insights into the primary themes, concepts, or subjects prevalent within the dataset.

The table below shows the frequency statistics of the top 20 words in the dataset about online learning. The table consists of many columns, namely "Word," "Length,"

"Count," and "Weighted Percentage (%)." **Table 10** provides an opportunity to analyze the frequency and weighted percentage of various words associated with online learning. The presence of words with higher frequencies and weighted percentages, such as "financial", "rural", "digital", "finance" and "poverty" indicates their importance and prevalence. Additional terms such as "inclusive," "development," "exclusion," and "income" exhibit noteworthy frequencies, suggesting their pertinence to the subject matter of rural financial resource availability.

Table 10. Word frequency.

Word	Length	Count	Weighted Percentage (%)
financial	9	123	2.84
rural	5	63	1.45
digital	7	60	1.38
finance	7	55	1.27
poverty	7	47	1.08
inclusive	9	43	0.99
development	11	29	0.67
exclusion	9	27	0.62
income	6	25	0.58
services	8	25	0.58
farmers	7	24	0.55
alleviation	11	23	0.53
households	10	22	0.51
areas	5	21	0.48
credit	6	17	0.39
policy	6	17	0.39
consumption	11	16	0.37
capability	10	14	0.32
needs	5	14	0.32
urban	5	14	0.32

A word cloud map is a graphical depiction of textual data in which the size of each word is proportional to its frequency or significance within a certain context. This tool offers a rapid and straightforward method for discerning the most prominent or often referenced words within a given text corpus.

Word cloud visualization can be useful as a valuable tool for investigating many aspects related to a topic, such as the domain of rural financial resource availability. Using word cloud visualization in rural areas financial resource availability can be a valuable tool for identifying important concepts, themes, or factors related to financial resource availability, multidimensional poverty among rural households, and influencing factors.See **Figure 16**.

Figure 16. Words cloud.

The large number of occurrences of the term “digital finance” in the word cloud may imply that respondents are sufficiently concerned or aware of digital finance. Digital finance usually means using technology and the Internet to improve financial services, such as mobile payments, online banking, and virtual currencies.

The terms “financial inclusion,” “financial exclusion,” “poverty,” and “financial development” appear in the word cloud, suggesting that financial exclusion is widespread globally, especially in non-developed countries, and that through financial inclusion, all members of an economy have access to formal financial services that are available and affordable, thus promoting a virtuous cycle of economic development and sustainability, and that financial inclusion can initially reduce the urban-rural The development of inclusive finance can initially reduce the income gap between rural and urban areas, however, the effect is more significant in specific regions.

In some regions, a favorable institutional environment can constrain the distorted allocation of financial capital and correct the negative effects of inclusive finance on poverty alleviation. Resource allocation structures of formal financial institutions that neglect disadvantaged groups are at the root of the failure of inclusive financial systems to achieve poverty reduction. A comprehensive understanding of these concepts contributes to a better understanding of the impact of the availability of financial resources on the income of farm households and how financial inclusion can mitigate financial exclusion and promote sustainable economic development.

The word cloud also includes the terms “rural revitalization”, “urbanization”, “alleviation”, “policy”, “consumption” and “financial capability”. These findings imply that respondents may have a keen interest in how the availability of financial resources affects aspects of multidimensional poverty among farm households. For example, urbanization has a complex impact on rural poverty. On the one hand, urbanization may provide more employment opportunities and improve farmers’ incomes. On the other hand, urbanization may also lead to rural exodus, exposing rural communities to the challenges of depopulation, aging, and resource loss.

4.9. Summary of the qualitative study

The qualitative part of the analysis was conducted using the NVIVO tool, with semi-structured interviews conducted mainly with 14 cases.

1) Word frequency analysis. The high weighted percentages and frequency of occurrence of terms such as "financial" and "digital" indicate their prevalence and importance. In addition, the high frequency of occurrence of the terminology "inclusive", ‘‘, "development", "services", and ‘policy’ indicate their relevance to the theme of financial resources availability. Further frequent occurrences of terms including "income", "exclusion", "promoting", "capability" and "alleviation" indicate that they are relevant to the topic of multiple poverty.
2) Thematic analysis. See **Table 11**, using manual encoding, the lines were divided into six themes. These themes included "Digital finance", "Poverty", "Financial inclusion", "Financial capability", "Rural revitalization", and "Financial development".

Table 11. The theme analysis to explain the hypothesis results.

The Theme	Main factors affecting the theme	Explanation of Quantitative Hypothesis Results
Digital finance Financial inclusion Rural revitalization	technological advancement, digital finance development, coverage, and adoption, financial technology (fintech)， depth of use, equal access, rural governance, ecology, community	H1: Financial resource availability will positively influence rural households' poverty. (Support) H2: Financial resource availability will positively influence Farmers' entrepreneurship. (Support) H3: Financial resource availability will positively influence the risk resilience of rural households. (Support)
Poverty Financial development	multidimensional poverty, relative poverty, poverty vulnerability, precision poverty alleviation, risk resilience, development capacity, social power, financial technology, financial efficiency, financial innovation	H4: Farmers' entrepreneurship mediates the relationship between the availability of financial resources and rural households' poverty. (Not Support) H5: The risk resilience of rural households mediates the relationship between the availability of financial resources and the rural households' poverty. (Support) H6: Farmers' entrepreneurship will positively influence rural households' poverty. (Not Support) H7: The risk resilience of rural households will positively influence rural households' poverty. (Support)
Financial capability	financial knowledge, financial skills, financial awareness, digital financial behavior	***H8:*** Financial capability will moderate the relationship between the availability of financial resources and rural households' poverty.

4.10. Summary comparison of quantitative study and qualitative study

This study mainly focuses on the following three research questions:

RQ1: What are the factors influencing rural households' poverty?

RQ2: Does farmer entrepreneurship, and risk resilience of rural households mediate the relationship between financial resources availability and rural households' poverty?

RQ3: Does financial capability moderate the relationship between financial resource availability, farmer entrepreneurship, and risk resilience of a rural household?

Table 12 seeks to achieve the three research objectives by comparing and analyzing quantitative and qualitative methods.

Table 12. Comparison of quantitative and qualitative analysis.

Research Questions	Quantitative Study	Qualitative study
RQ1	A key step in the structural model's evaluation is analyzing the path of coefficients connecting the latent variables. Therefore, the path coefficient's algebraic sign, magnitude, and significance must determine which factors can affect rural households' poverty. Farmers' entrepreneurship affects rural households' poverty with a standardized beta value of 0.037. The data standard error is 0.046, resulting in a t-value of 0.814. The p-value for this study is 0.416, high the 0.05 significance threshold, indicating statistically no significance. Furthermore, the 95% confidence interval is -0.064–0.117. Financial resource availability affects rural households' poverty with a standardized beta value of 0.112. The data standard error is 0.056, resulting in a t-value of 2.012. The p-value for this study is 0.044, low the 0.05 significance threshold, indicating statistical significance. Furthermore, the 95% confidence interval is -0.02–0.198. This study found that financial resource availability affects rural household poverty. The risk resilience of rural households affects rural households' poverty with a standardized beta value of 0.567. The data standard error is 0.05, resulting in a t-value of 11.304. A p-value of 0.000 is low at the 0.05 significance threshold, indicating statistical significance. Furthermore, the 95% confidence interval is 0.488–0.634. This study found that the risk resilience of rural households affects rural household poverty. Financial resource availability and rural households' poverty through risk resilience of rural households are examined in the indirect effect. A 0.319 standardized beta coefficient indicates a relatively positive correlation. This indirect impact is statistically significant due to its t-value of 8.388 and low p-value of 0.000. A 95% BCI from 0.248 to 0.397 suggests that the risk resilience of rural households does increase rural households' poverty.	In the interviews with experts, some of these factors contributed to having an insignificant impact of agro-entrepreneurship on agro-poverty. 1) Entrepreneurial environment and opportunities: the rural entrepreneurial environment may be underdeveloped with limited entrepreneurial opportunities. Lack of entrepreneurial resources, market information, and technical support may limit the effectiveness of farm household entrepreneurship. Entrepreneurial success requires good access to markets, innovation, and management skills. If these conditions are inadequate, the impact of farm household entrepreneurship may be limited. 2) Risk and uncertainty: Starting a business involves having risks, including economic, market, technological, and managerial risks. A farming household may be unwilling to take on these risks or cannot afford to deal with them. Uncertainty is also a factor. The success of rural entrepreneurship depends not only on individual efforts but is also affected by the external environment, policies, and market fluctuations. 3) Structural problems: Rural poverty is often closely related to structural problems (e.g., land issues, education levels, infrastructure, etc.). Even if a farmer starts a business, if these problems are not addressed, conditions of poverty may remain. 4) Socio-cultural factors: Rural socio-cultural influences on entrepreneurial attitudes and behaviors. Traditional attitudes, social expectations, and cultural practices may influence the willingness of farmers to start a business. The key force of financial support for the modernization and development of agriculture and rural areas: rural finance, as the power engine in the rural revitalization strategy, provides financial support for rural development. Giving full play to the functional role of financial support for the modernization of agriculture and rural areas can realize the comprehensive revitalization of the countryside in terms of prosperous industries, ecological livability, civilized rural customs, effective governance, and a rich life. Multiple roles of financial resources: finance deals not only with capital inputs and the efficient utilization of land and talent factors. By guiding the inflow of various types of financial capital into rural areas, revitalizing idle land resources in rural areas, and promoting large-scale and intensive land management, it will help to form capital agglomeration, land intensification, and talent concentration, that will provide a guarantee for the modernization and development of agriculture and rural areas. The potential of internal rural financial resources: Rural areas' idle funds should be fully utilized, especially in connection with the rural revitalization strategy and urban-rural integration. As an important part of the rural financial system, rural cooperative finance can provide effective financial support to rural households and contribute to forming a rural society with effective governance.

Table 12. (*Continued*).

Research Questions	Quantitative Study	Qualitative study
RQ2	Financial resource availability affects farmers' entrepreneurship with a standardized beta value of 0.536. The data standard error is 0.033, resulting in a t-value of 16.322. The p-value for this study is 0.000, low the 0.01 significance threshold, indicating statistical significance. Furthermore, the 95% confidence interval is 0.47–0.597. This study found that financial resource availability affects farmers' entrepreneurship. Financial resource availability affects the risk resilience of rural households with a standardized beta value of 0.564. The data standard error is 0.038, resulting in a t-value of 14.958. The p-value for this study is 0.000, low the 0.01 significance threshold, indicating statistical significance. Furthermore, the 95% confidence interval is 0.487–0.633. This study found that financial resource availability affects the risk resilience of rural households.	A collation of the interview data reveals that risk resilience plays an important role in the link between farm household poverty and financial resources. 1) Resilience to external shocks, e.g. risk resilient farmers are better able to cope with droughts, floods, or diseases, thereby protecting farm income. 2) Coping with internal stresses: Internal stresses within the farm household, such as family relationships, health problems, educational needs, etc., may also affect the state of poverty. Risk resilience helps a farmer household to remain stable in the face of these internal pressures and not fall into poverty. 3) Effective utilization of financial resources: risk resilience enables rural households to have better access to available financial resources, including savings, loans, insurance, etc. Risk-resilient rural households are more likely to utilize financial resources to increase their income and improve their living conditions, thereby reducing poverty.
RQ3	Financial resource availability and rural households' poverty through financial capability are examined as moderating effects. A 0.216 standardized beta coefficient indicates a relatively positive correlation. This indirect impact is statistically significant due to its t-value of 2.951 and p-value of 0.003. A 95% BCI from -0.055 to 0.280 suggests that financial capability moderates financial resource availability and rural households' poverty.	A collation of the interview data reveals that financial capability plays an important role in the link between farm household poverty and financial resources. 1) Effective utilization of financial resources: rural households with good financial capability can access and utilize financial resources, such as savings, loans, and insurance, more effectively. They can plan their finances and manage them better, thus mitigating the risk of poverty. 2) The rationality of financial decisions: a farmer with high financial capability is likely to be more likely to make rational financial decisions and to avoid over-borrowing or unnecessary consumption. This helps to maintain a stable economic situation and reduce the risk of poverty. 3) Transmission of financial literacy: Financially capable Farmers can pass on financial literacy to the next generation, improving the financial literacy of the entire household. This helps families to make better use of financial resources, thereby reducing poverty.

5. Conclusion and future work

5.1. Managerial implications

Innovation management has an important role to play in rural revitalization and income generation for farmers. We explore some relevant research and policy thinking:

Entrepreneurial activities in counties and farmers' income: Some scholars have found that entrepreneurial activities in counties positively impact the disposable income of rural residents. Entrepreneurial activities of micro, small, and medium-sized enterprises (MSMEs) and corporate enterprises (COs) contribute to narrowing the income gap between urban and rural areas. The size of the government has an "inverted U-shape" effect on entrepreneurial poverty reduction, with a small government contributing to the poverty reduction and income-generating functions of entrepreneurial activities, but over-expansion can hinder this process.

Government role: Governments play an important role in the relationship

between entrepreneurial activity and regional poverty. Especially in less developed regions, the role of government is more obvious. Therefore, governments should strengthen guidance and assistance and insist on combining liberalization and management to provide targeted help and guidelines for entrepreneurship.

Scientific and technological innovation: The introduction of advanced information management systems, such as the ERP system, helps to optimize the production, sales, and procurement processes and improve management efficiency.

Reform of the land system and the urbanization process: Deepen reform of the land system, gradually reduce the number of small farmers, and develop and expand the scale of agricultural production and operation. Promoting the equalization of basic public services between urban and rural areas, conditions are being created to allow more farmers to settle voluntarily in urban areas and to contribute to the transfer of rural labor for employment.

In conclusion, innovative management models, government support, and scientific and technological innovation are essential to promote income generation for farmers and rural revitalization.

5.2. Limitations of findings

At the outset, it is important to recognize that there may be some limitations in selecting the sample. The focus of my study was on rural household residents located in Yunnan Province, China. The sample was selected from a convenience sample of rural households. Villagers in different administrative villages have different perceptions and attitudes toward the availability of financial resources, and there are also differences in the level of development of each administrative county, all of which may lead to bias in the questionnaire results.

Moreover, there may be a need to strengthen further the identification of variables or characteristics that affect the availability of financial resources and poverty among rural households. Eight hypotheses were formulated in this study to examine the factors affecting the availability of financial resources to contribute to poverty reduction among farm households. The results of the study show that financial resource availability has a positive impact on poverty reduction among farm households. Whereas, farm household entrepreneurship has little effect on farm household poverty. In addition, the study also found that rural household risk resilience and financial capability positively affect rural household poverty. A thematic analysis of the online interviews revealed that various factors such as digital financial inclusion, financial development, financial literacy, rural revitalization, financial innovation, and risk resilience significantly impact farm poverty.

It is difficult to observe rural households' decision-making and action processes in the face of the external financial environment at the micro level. There is a lack of analysis of the integration and disaggregation of non-traditional e-finance and informal finance into the formal financial supply. Lack of complete measurement of farmers' financial capability, such as understanding financial and risk concepts.

In addition, the analysis shows that precision, relativity, vulnerability, and multidimensionality have important implications for farm poverty. However, it may be necessary to incorporate new theoretical frameworks and introduce additional

factors to study mechanisms and boundary conditions of financial poverty alleviation.

5.3. Areas for further research

Rural financial innovation: In-depth research on digital finance, rural financial technology innovation, and financial product design.

Rural financial regulation: Analyzing financial regulatory policies in Yunnan Province to ensure the rationality and sustainability of financial resource availability.

Rural financial education: Research on ways to improve the financial literacy of rural households to contribute to the wider use of financial resources availability

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