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Can Internet Use Improve Financial Literacy among Farmers?

—Based on Field Surveys in the Provinces of Henan, Hunan, and Chongqing

Longlong Duan, Jiale Zhang*, Hongjin Xin

School of Economics, Sichuan University, Chengdu, China
Email: *duanlonglong2006@126.com

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Abstract

In the context of the digital economy, leveraging the widespread use of the Internet to enhance the financial literacy of farmers has become a crucial goal for strengthening financial capabilities and achieving comprehensive revitalization of rural areas. A crucial goal is to strengthen financial capabilities and achieve comprehensive revitalization of rural areas. This paper, based on a field survey conducted in the provinces of Henan, Hunan, and Chongqing, analyzes 625 firsthand questionnaire data. By employing the CRITIC method and entropy-weighted TOPSIS method, a new method of financial literacy was developed. By employing the CRITIC method and entropy-weighted TOPSIS method, a restructured evaluation index system for Internet use and financial literacy among farmers is created. Using multiple regression models, the impact of Internet use and financial literacy among farmers is analyzed. The study finds that overall financial literacy among the surveyed farmers is relatively low. However, the level and quality of Internet use positively affect the enhancement of farmers' financial literacy, with the most significant improvement observed in financial literacy. However, the level and quality of Internet use positively affect the enhancement of farmers' financial literacy, with the most significant improvement observed in financial attitudes, followed by financial behavior and financial knowledge. Individually, farmers with higher education levels and higher family annual income have generally better financial literacy, while no significant differences are found between genders. Further analysis of heterogeneity reveals that age and migrant status have a negative correlation with improvements in financial literacy. Further analysis of heterogeneity reveals that age and migrant status have a negative correlation with improvements in financial literacy. Geographically, the marginal effect of Internet use on financial literacy is strongest in the rural areas of Henan, followed by Chongqing, with Hunan having the least impact. These conclusions

remain robust after stability tests. Devising scientifically effective public policies aimed at accelerating digital outreach in rural areas, genuinely improving and enhancing the financial literacy of farmers, and reducing the impact on financial literacy. This research provides empirical support for devising scientifically effective public policies aimed at accelerating digital outreach in rural areas, genuinely improving and enhancing the financial literacy of farmers, and reducing urban-rural income disparities.

Keywords

Financial Literacy, Internet Use, Farmers, Field Survey

1. Introduction

Comprehensive advancement of rural revitalization cannot be separated from the robust support of finance. Rural finance, as a vital component of China's financial system, plays a significant role in the development of rural economies. Therefore, in June 2023, the People's Bank of China and four other ministries jointly issued the "Guiding Opinions on Financial Support for Comprehensive Advancement of Rural Revitalization and Acceleration of Building a Strong Agricultural Country," emphasizing the establishment of a multi-level, widely-covered, and sustainable modern rural financial service system to effectively improve the basic financial service level in rural areas. In October 2023, the Central Financial Work Conference further proposed that to accelerate the construction of a strong financial nation, it is necessary to improve the financial system, specifically highlighting the further development of inclusive finance and vigorously preventing and resolving financial risks to promote high-quality financial development.

However, currently, the overall financial awareness of rural residents in our country is weak, with uneven financial skills, and the general financial literacy of rural residents is relatively low, which imposes multiple constraints on the development of rural finance and rural revitalization. Recognizing this challenge, the Chinese government has implemented policies to address it, such as the "Digital Rural Development Strategy Outline" issued by the General Office of the CPC Central Committee and the State Council in 2019. This policy explicitly proposed ten key tasks for implementing the digital rural strategy, aiming to leverage technology to improve rural development. The integration of the Internet into rural areas, as outlined in this strategy, is of high practical significance for improving the financial literacy of rural China. Moreover, according to the 53rd "Statistical Report on Internet Development in China" released by the China Internet Network Information Center, as of December 2023, the Internet penetration rate in rural areas reached 66.5%, with a rural netizen population of 326 million. This marks the integration of the Internet into the lives of the vast majority of rural residents, becoming an increasingly important technical tool for accelerating the dissemination of knowledge and information. As the Internet continues to prolif-

erate in rural areas, it profoundly impacts farmers' production, living, cognition, and even behaviors. As a path to accessing financial information, it also helps improve farmers' financial literacy by expanding their financial knowledge, enhancing their willingness to consume financial services, and improving their financial consumption skills. Therefore, a thorough study on the impact of Internet usage under the rural revitalization strategy in improving farmers' financial literacy is beneficial not only for promoting the high-quality development of the rural financial system but also helps the government formulate more effective rural financial development support policies. It holds significant theoretical and practical implications for the comprehensive implementation of digital rural construction and the building of a strong financial nation.

2. Literature Review and Theoretical Framework

2.1. Progress in Financial Literacy Research

From an academic perspective, research on financial literacy began in the 1990s. As a relatively new field concept, scholars still have not formed a consensus on its description, definition, framework, and measurement methods to this day. The earliest academic study on financial literacy can be traced back to the views of Noctor in 1992. He believed that financial literacy refers to the ability of residents or households to manage and utilize capital in financial markets using financial knowledge, which aids in making rational judgments and decisions that maximize benefits.

In terms of definition, Noctor, in 1992, primarily focused the definition of financial literacy on the objective dimension of financial knowledge. Building on this, Lusardi and Mitchell (2007) noted that financial literacy includes, but is not limited to, the study of financial economics and that an individual should also be able to use this knowledge to identify and understand risks brought about by market uncertainties in order to safeguard their own interests. Some scholars have proposed views that financial literacy should emphasize the practical application of financial tools and economic performance by individuals. A person with high financial literacy is demonstrated by their ability to fully learn and understand various concepts in financial economics across different financial behaviors, apply their knowledge in financial activities, and efficiently allocate funds to gain utility (Servon & Kaester, 2008). Thus, the concept of financial behavior was added to the dimensions of financial knowledge and financial skills.

Overall, as financial literacy continues to expand in both the academic sphere and public policy domain, it has developed conceptual content that encompasses financial knowledge, financial skills, and financial behavior on an objective level. On the subjective level, scholars Zhou and Zhong (2013) proposed that financial literacy mainly manifests through financial awareness, specifically how residents perceive financial products and services and their consciousness in financial activities such as savings and insurance when participating in financial markets. They defined financial literacy through residents' subjective cognition of certain financial products and activities. Beyond financial awareness, the academic com-

munity also includes financial attitudes, encompassing motivations and confidence among residents' various financial behaviors, thereby expanding the definition of financial literacy to a new scope and framework.

2.2. Relationship between Internet Use and Farmers' Financial Literacy

The concept of the Internet encompasses a vast network formed by the connection of numerous smaller networks; it is both a platform and a tool. From the perspective of information transmission, as Liu et al. (2016) contend, the Internet serves as a platform for the dissemination of information, enabling the faster and more rapid spread of knowledge. There are also scholars who hold the same view, noting that the use of the Internet can broaden the channels of information sources, making it more convenient to access information and reducing the costs of obtaining information (Zhang, 2021).

Although direct studies on the relationship between Internet use and the financial literacy of farmers are few, some progress has been made. Su and Kong (2019) found that as the construction of Internet infrastructure in rural areas continues to improve, the use of the Internet among rural households has begun to increase. As the Internet becomes more widespread, the production and living habits of rural households have also changed accordingly, having a positive impact on their participation in the financial markets (Zhou & He, 2020). Other scholars have pointed out that the popularization of the Internet by stimulating the use of financial literacy and digital financial products effectively improves China's financial inclusivity. Their research assessed financial literacy through educational levels, credit card usage, and commercial insurance usage, and evaluated Internet use based on the degree of Internet dependency and the use of third-party payments. The results indicate that promoting the use of digital financial products, financial literacy, and Internet use can effectively enhance the financial inclusivity of Chinese farmers (Shen et al., 2020). In current studies on the impact of financial information sources on financial literacy, some research has found that different sources of financial information have different impacts on the financial literacy of subjects. A preference for obtaining financial information from media, family, and peers has a negative impact on financial literacy, whereas consumers who use the Internet as a source of financial information exhibit higher financial literacy (Sabri & Awec, 2019).

Overall, although there has been positive progress in studies on the Internet and financial literacy among residents both domestically and internationally, there is still room for further development. Firstly, from the perspective of the subject of financial literacy research, most scholars focus on urban residents or households, but there is substantial room for development in studies on the financial literacy of the farmer population. Secondly, most studies prefer to treat financial literacy as an influencing factor, exploring its impact on other economic behaviors of individuals, but give relatively less attention to the factors that affect financial literacy.

Based on this, the marginal contributions of this paper are: firstly, through field surveys, it constructs a systematic index system for assessing the level of Internet use and financial literacy among Chinese residents using primary data and materials, providing a new basis for academic research; secondly, it focuses on farmers, who are crucial in the current process of rural revitalization, and explores in depth the mechanisms through which Internet use affects the financial literacy of farmers, thereby addressing gaps in related research; thirdly, through provincial surveys, it provides a panoramic depiction of Internet use and financial literacy levels among different farmers, which not only helps to fully understand the current situation of Internet use and the overall level of financial literacy among Chinese farmers, but also offers more effective and scientific empirical support for the formulation of more targeted and practical policies.

3. Research Design

3.1. Theoretical Analysis and Research Hypotheses

3.1.1. Theoretical Framework

This article first constructs a framework for assessing the impact of Internet usage on farmers' financial literacy. Based on the literature review presented earlier, under the broad initiative of rural revitalization, Internet usage, as a significant driving force of the information age, provides farmers with more convenient and efficient channels for information acquisition. It also effectively enhances farmers' financial literacy by reducing the cost of information acquisition and improving information processing capabilities. Current research has shown that different purposes of Internet usage have varying degrees of impact on financial literacy (Zhao et al., 2024). Therefore, this article initially divides Internet usage into two aspects for evaluation purposes: usage intensity and usage quality. Usage intensity is assessed comprehensively through factors such as the use of Internet tools, frequency of use, importance placed on the Internet, and acceptance. Usage quality, on the other hand, is evaluated based on different purposes of use and information security capabilities. After assigning scores, various indices, such as the Farmers' Internet Usage Index, Farmers' Internet Usage Intensity Index, and Farmers' Internet Usage Quality Index, are formed to measure their impact on the Financial Literacy Index of farmers.

For the evaluation framework of farmers' financial literacy, this article initially draws from the Financial Literacy Survey of the Programme for International Student Assessment (PISA) released by the Organization for Economic Co-operation and Development (OECD). It designs questionnaire items based on three dimensions from understanding to application: Conceptual Understanding (Content), Thinking Processes (Processes), and Contextual Application (Contexts). In conceptual testing, modules include Currency and Transactions, Asset Planning and Management, Risks and Returns, and Financial Environment; in Thinking Processes, modules include Recognition of Financial Information, Analysis of Financial Information and Forms, Evaluation of Financial Events, Understanding and

Application of Financial Knowledge; Contextual Applications are divided into different scenarios such as Education and Work, Family, Personal, Social; and non-cognitive factors like Access to Information and Education, Acquisition and Use of Money and Financial Products. Further, combining the problem levels used by foreign scholars like Lusardi for evaluating the financial literacy of research subjects and micro question modules from the China Family Panel Studies (CFPS) and the China Household Finance Survey (CHFS), the article measures the financial literacy levels of Chinese farmers from three directions: Financial Knowledge, Financial Attitudes, and Financial Behaviors.

3.1.2. Research Hypothesis

1) How the extent of Internet use affects financial literacy

Financial knowledge, as a specific type of knowledge, facilitates increased market participation through the convenience of the Internet, allowing residents to access financial information more easily and thus significantly boosting their market participation (Liang & Guo, 2015). Based on data from the China Household Finance Survey (CHFS), Zhong et al. (2021) found that the Internet has a positive effect on improving household financial literacy, thereby increasing the likelihood of households investing in formal financial products. Current research confirms that the prevalence and use of the Internet enable farmers to access information more quickly and conveniently, significantly enhancing their acquisition of financial information and related knowledge and thereby improving their financial literacy (Gao, 2021). Similarly, some scholars have used the degree of attention to financial information and participation in financial courses as metrics to empirically verify that Internet use increases the attention farmers pay to financial information. They found that the Internet helps to promote farmers' enthusiasm for participating in financial courses, thus indicating that rural Internet development can indeed enhance the dissemination of financial knowledge and improve financial literacy among farmers (Wang et al., 2023). Additionally, the use of the Internet can effectively expand social networks, promoting the broader dissemination of financial knowledge.

Based on the above analysis, this article proposes the following hypotheses:

H1: The degree of Internet usage can significantly improve farmers' financial literacy.

H1a: The frequency of Internet usage can significantly improve farmers' financial literacy.

H1b: The quality of Internet usage can significantly improve farmers' financial literacy.

H2: The degree of Internet usage can significantly improve farmers' financial attitudes.

H2a: The frequency of Internet usage can significantly improve farmers' financial attitudes.

H2b: The quality of Internet usage can significantly improve farmers' financial attitudes.

H3: The degree of Internet usage can significantly improve farmers' financial behavior.

H3a: The frequency of Internet usage can significantly improve farmers' financial behavior.

H3b: The quality of Internet usage can significantly improve farmers' financial behavior.

H4: The degree of Internet usage can significantly improve farmers' financial knowledge.

H4a: The frequency of Internet usage can significantly improve farmers' financial knowledge.

H4b: The quality of Internet usage can significantly improve farmers' financial knowledge.

2) Heterogeneous effects of Internet usage level on financial literacy

In existing research, scholars have discovered that the proliferation of the Internet aids in improving social cognitive abilities, thereby enhancing financial literacy. It has been observed that there is a variance in cognitive abilities across different age groups, with a negative correlation between age and cognitive capability, meaning younger individuals possess stronger cognitive abilities (Kun & Shen, 2022). Consequently, this paper introduces age as a factor to explore its impact on the mechanism by which Internet usage affects financial literacy. Additionally, scholars have noted that social networks have an impact on financial exclusion among residents (Yin et al., 2023). Therefore, Internet usage in different regions can lead to the formation of diverse types of social networks, resulting in regional heterogeneity. Moreover, other researchers have focused on the impact mechanism of the urbanization of rural migrants on their property income under the backdrop of new urbanization. In these studies, the conversion from a rural to a non-agricultural hukou is used as a criterion for urbanization, finding that urbanization of rural migrants can significantly increase property income (Zhang & Zhuang, 2023). Thus, in alignment with this research regarding rural residents with rural hukou, it is also considered appropriate to examine the differential impacts on the mechanism by which Internet usage affects financial literacy by using "whether they are migrant populations" as a metric.

Based on the above analysis, this paper proposes the following hypotheses:

H5: The impact of Internet usage on farmers' financial literacy exhibits age heterogeneity.

H6: The impact of Internet usage on farmers' financial literacy exhibits regional heterogeneity.

H7: The impact of Internet usage on farmers' financial literacy varies depending on their mobility status.

3.2. Definition of Variables

3.2.1. Dependent Variable: Financial Literacy Definition

According to the OECD definition of financial literacy in 2011, financial literacy

is the combination of knowledge, skills, behaviors, and perceptions necessary for residents to make financial choices that are rational and beneficial to improving their well-being.20 After 2022, the OECD, in the context of the PISA 2022 Financial Literacy Assessment, updated its definition of the content of what it means to be financially literate. Replacing motivation and confidence with financial attitudes to expand financial literacy into a broader meaning by incorporating subjective dimensions, the new definition of financial literacy emphasizes the impact of personal preferences on financial behavior and highlights how financial knowledge is used.

We believe that although there are many ways to define the concept of financial literacy so far, all the studies on financial literacy are limited to the scope of PISA 2022, so the author also agrees with the way of defining financial literacy in PISA 2022 and takes it as the meaning of financial literacy in this paper. It includes the objective level of financial knowledge, skills, behavior and the subjective level of financial attitudes and awareness to jointly measure the level of financial literacy.

3.2.2. Core Independent Variable: Internet Use Definition

As for the measurement standard of Internet use, the literature has used the individual Internet access time and frequency to measure the impact of individual Internet use on rural residents' online consumption (Wen, 2022), while other scholars define Internet use through Internet access channels, such as whether farmers own computers and cell phones (He et al., 2023). Currently, a more authoritative standard for measuring Internet use in China is the Statistical Report on the Development of the Internet in China, issued annually by the China Internet Network Information Center (CNNIC) since 1997 in which the two parts of the report, namely, "Internet Application" and "Digital Literacy and Skill Development of Internet Users", are related to individual's Internet use. The two parts of the report, "Internet Application" and "Development of Netizens' Digital Literacy and Skills", are closely related to the assessment of personal Internet use, in which "Internet Application" is divided into four sections, namely, basic application, business transaction, online entertainment and public service, and "Digital Literacy and Skills" includes the learning of citizens in a digital society and the development of digital literacy and skills. The "Digital Literacy and Skills" includes a series of qualities and abilities that citizens in the digital society should have for learning, working and living, such as digital access, use, interaction, sharing, innovation, safety and security, ethics and morality, and so on. To synthesize the above literature, based on a multi-level comparison of existing standards for defining Internet use, the author defines the concept of Internet use as two dimensions: the degree of Internet use and the quality of Internet use; the former can be measured by the degree of Internet use in terms of Internet access time, Internet contact channels, and the degree of information dependence, while the latter assesses the quality of farmers' Internet use in terms of the diversity of Internet applications and safety and security literacy.

3.2.3. Selection of Other Control Variables

It is not difficult to find out through the domestic and international literature that the research on other influences on farmers' financial literacy mainly lies at the level of personal characteristics and environmental factors.

In terms of personal characteristics, existing studies generally agree that individual gender and age can well reflect the degree of personal preference for risk and point out that the probability of being subject to financing constraints is the highest when there are female, spouseless, or older characteristics of the farmer's principal (Gan, 2017). Thus, it can be seen that gender and age have an important impact on personal financial literacy. At the same time, scholars have also pointed out that the degree of education can affect the size of the financing ability by affecting the size of the social network; comprehensively drawing on existing research, the author in the research process, selected gender, age, and degree of education as an indicator of the influence of factors at the individual level.

With regard to environmental factors, a large number of studies have focused on the impact at the household level and at the level of urban-rural differences; for example, at the household level, it has been found that the higher the level of income of a farming household, the easier it is to obtain credit resources. Therefore, for the indicators of the impact of environmental factors, the annual net income of the household and whether or not it is a rural mobile resident can be selected as control variable indicators.

3.3. Structure of the Questionnaire and Assignment of Variables

According to the theoretical framework, the author designed a questionnaire on Internet use and financial literacy specifically for rural residents' characteristics. As shown in **Table 1**, the questionnaire consists of three parts: the first part is the basic information of the respondents, including the respondents' age, gender, cultural level, household income, etc. The second part is the Internet use module, which is mainly related to the dissemination of network information, socialization, network transactions, etc., aiming to accurately understand the degree and quality of Internet use by rural residents. The third part is the financial literacy module, which mainly involves consumption, savings, borrowing, investment, etc., as a way to measure the level of financial literacy of rural residents.

The first module of the survey on the personal information of the respondents includes the screening of farmers' identity; in order to effectively filter out the special circumstances, the author has taken the design of "whether it is a rural household registration" a question to define the identity of the farmers of the research object.

In the second module measuring the extent of farmers' Internet use, the author used a 5-point Likert scale and subjective and objective questions to determine the frequency of use and the quality of use of multiple aspects of farmers' Internet use.

The third module is a survey of farmers' financial literacy, which takes the three panels of financial attitudes, financial behaviors, and financial knowledge from

the theoretical framework to design questions, and still uses a combination of multiple questions, including a 5-point Likert scale and subjective choices.

Table 1. Content of the questionnaire and method of assigning values.

		Question	Assignments and Interpretations
Personal Information		Sex of respondents (Gender)	1: Male 2: Female
		Age of respondents (Age)	1 point: below 18 2 points: 18 - 29
			3 points: 30 - 39 4 points: 40 - 49
			5 points: 50 - 59 6 points: 60 and above
		Educational attainment (Edu)	0 points: no schooling 1 point: elementary school
			2 points: middle school 3 points: high school/junior college
			4 points: Bachelor's degree/college and above
		Rural household registration [1]	1 point: Yes 0 points: No
		Whether or not the population is mobile (flow)	1 point: Yes 0 points: No
		Annual net household income (Income)	1 point: 10,000 and less
			2 points: 10,000 to 30,000
			3 points: 30,000 to 60,000
			4 points: 60,000 and above
Internet usage aggregate level OIUL	The Internet utilization IUL	How many tools do you have in your home that allow you to access the Internet?	None; cell phone; tablet; computer;
		How long do you play on your cell phone each day?	1 point: 0 - 1h 2 points: 1 - 3h 3 points: 3 - 5h 4 points: more than 5h
		Where is the main source of news? (Multiple choice)	1 point: from an acquaintance
			2 points: newspapers and magazines
			2 points: radio broadcasting
			2 points: Television
			3 points: computer/cell phone
		Do you usually learn information online (scale)	1: Never
			2: Very little
			3: General
			4: Frequently
			5: Almost all
		Satisfaction with the network (scale)	1: Very dissatisfied
			2: Somewhat unsatisfactory
			3: Nothing affects
			4: More satisfactory

Continued

			5: Particularly satisfied
		How easy the Internet has made your life (scale)	1: Causing a great deal of inconvenience
			2: Inconvenience
			3: No impact
			4: Bringing a small amount of convenience
			5: Bringing great convenience
	The Internet Quality of use IUQ	Do you play games	1 point: Yes 2 points: No
		Degree of video brushing (scale)	1: Never
			2: Occasionally
			3: Sometimes
			4: Frequently
			5: Daily
		Have you ever sold anything online	1 point: sold 2 points: no
		Degree of online shopping (scale)	1: Never
			2: Very little
			3: General
			4: Frequently
			5: Online shopping only
		Whether to use WeChat/QQ	1 point: with 2 points: without
		Whether or not you've sent a circle of friends	1 point: No 2 points: Issued 0 points: don't know what a circle of friends is
		Different news reports choose which platform to believe	1 point: short video
			2 points: CCTV
			0 points: not following the news
		[URGENT NOTICE] There is unusual activity on your bank account..... Please click http://www.8yiwe.pk/ now. What will you do?	0 points: click on the URL
			1 point: Worried but not acting
			0 points: can't read
			2 points: Seek advice from others
			3 points: Consider it a scam
Financial literacy FL	Financial attitude finAtt	How well do you feel you know how to save, pay, invest, etc. (scale)	1: Hardly
			2: Minor knowledge
			3: General
			4: More
			5: Very knowledgeable
		What information has been focused on (Multiple choice)	Points by number: bank savings, loans, insurance, investments, financial disputes, etc.

Continued

	Degree of attention to daily expenses (scale)	1: Never 2: Very little 3: Occasionally 4: Frequently 5: Almost daily
	Number of concerns about bank interest rates per year (scale)	1: Never 2: Focus on a few times 3: General 4: Multiple times 5: Very concerned
	Interested in saving money at a higher interest rate? (scale)	1: Not at all 2: Not so much 3: General 4: More Wanted 5: Very interested
Financial behavior finBvr	Do you know how to withdraw money from a bank machine	1 point: Know 0 points: Don't know
	Where would you put the money (multiple choice)	1 point: own home 2 points: Banks 3 points: WeChat or Alipay 4 points: Other financial products
	Frequency of dealing with banks (including mobile banking) (scale)	1: Very little 2: Occasionally 3: General frequency 4: Frequently 5: Frequent
	Have you ever borrowed money to build a house, go to the doctor, etc.?	1 point: borrowed 2 points: did not borrow
	Willingness to repay money on time after borrowing (scale)	1, 2, 3, 4, 5
	Whether you have encountered someone who borrowed money and did not pay it back on time [2]	1 point: encountered 0 points: never lent it to anyone 2 points: everyone else pays on time
Financial literacy finKnow	Bank interest rate of 4% per annum, $100 for a one-year term deposit	0 points: will not 0 points: $100 1 point: $104 0 points: above $104
	Bank interest rate of 4% per annum, $100 for a three-year fixed term	2 cents: more than $112 1 cent: $112

Continued

	0 points: less than $112
	0 points: Don't know
Due to inflation, pork prices may	1 point: price reduction 2 points: price increase 0 points: no effect 0 points: don't know
Do you agree that "the higher the return, the higher the risk"?	2 points: Recognized 1 point: Not recognized 0 points: not clear
What would you do if you received counterfeit money	1: Continued use of uncertainty
	2: Tearing up
	3: Self-retention
	4: To the bank or public security
Supermarkets don't take cash, just WeChat or Alipay, do you agree with that	2 points: Doesn't matter
	1 point: Disagree
	2 points: Agree
What kind of insurance do you have?	Score based on the number of insurance types

***Note: (1) This question is used as a judgment question on whether the questionnaire is valid or not; (2) This question aids in assigning points to the borrowing question; if the score of this question is 1 and the score of the borrowing question is greater than 3, one point will be deducted from the borrowing question; if the score of this question is 2 and the score of the borrowing question is less than 3, one point will be added, and the rest of the cases will not be dealt with.

4. Preliminary Statistical Analysis

4.1. Reliability and Validity Tests

Reliability analysis is mainly used to measure the reliability and stability of the survey results, to measure the internal consistency of the survey results, so as to determine whether the questionnaire data are true, whether the respondents fill out the questionnaire carefully and the authenticity of the answers, which is generally tested using the Cronbach (reliability) coefficient (Malkewitz et al., 2022). The author used Cronbach's coefficient to test the reliability of the Internet use and financial literacy module, and the results obtained are shown in **Table 2**; from the results, the Cronbach's coefficient of the whole questionnaire is 0.847, the Cronbach's coefficient of the Internet use module is 0.786, and the Cronbach's coefficient of the financial literacy module is 0.769, which is greater than 0.75, so it can be seen that the internal consistency and the reliability are good, and it is supported to carry out further analysis.

Table 2. Table of results of the reliability test.

Sports event	Full questionnaire	Financial Literacy Module	Internet usage module
item count	32	18	14
sample size	625	625	625
Cronbach factor	0.847	0.769	0.786

In addition to the reliability test, the author further adopts KMO and Bartlett's test for validity test. After testing the full questionnaire, Internet use module and financial literacy module, respectively, the validity results obtained are shown in Table 3, which show that the KMO value of the total questionnaire is 0.896, the KMO value of the Internet use module is 0.877, and the KMO value of the financial literacy module is 0.851, which is greater than 0.85, indicating that the validity of the data is very good. It shows that the validity of the data is very good.

Table 3. Test results of KMO and Bartlett's test of sphericity.

Sports event	Full questionnaire	Financial literacy	Internet literacy
KMO value	0.896	0.851	0.877
Approximate chi-square	4804.190	2100.553	1898.058
p-value	0.000	0.000	0.000

4.2. CRITIC Empowerment

The CRITIC method is an objective weighting evaluation method that emphasizes the importance of considering both the strength of the contrast between the criteria and the conflict between the criteria when determining the weights. By incorporating these factors, CRITIC helps to ensure that those criteria with higher variability and greater discriminatory power are assigned higher weights. This is particularly useful when dealing with complex decision-making scenarios where some criteria may be more influential than others. To ensure the comprehensiveness of the analysis, the author uses this method to assign weights to Internet use, financial literacy and its subordinate indicators, respectively and sum them up to get the financial literacy score of the explanatory variable and the level of Internet use of the explanatory variable for the subsequent regression analysis. Table 4 demonstrates the weights of the indicators at each level of Internet use and financial literacy calculated by the CRITIC method.

4.3. Analysis of Data Sources and Group Profiles

The study is of greater significance given that the rural areas of China's eastern coastal provinces and municipalities are already more developed, while the rural areas of the central and western provinces and municipalities are relatively underdeveloped and exhibit low levels of financial literacy among farmers. Accordingly, three provinces and municipalities from the central and western regions of China were selected at random: Henan, Hunan, and Chongqing. Between December 2023 and March 2024, the author and research team conducted site visits to these three provinces and municipalities, where they conducted random sampling of nearly 40 villages and towns. This resulted in the collection of 645 questionnaires through field surveys, including 639 questionnaires with complete information. Therefore, this field survey focuses on the study of rural residents' Internet use and financial literacy, so it distinguishes again by whether it is a rural

Table 4. Results of assigning weights to each secondary indicator of Internet use and financial literacy.

Primary indicators	Secondary indicators	Indicators	Indicator weights
Internet usage	Level of Internet use (36.58%)	What electronic devices are in the home	5.92%
		How long do you play on your cell phone each day?	7.37%
		Where do you get your news from?	5.15%
		Do you usually get your information online?	5.6%
		Satisfaction with the network	6.62%
		How easy the Internet can make your life	5.92%
	Quality of Internet use (63.42%)	Whether to play games	11.83%
		Degree of video brushing	6.37%
		Have you ever sold anything online	11.3%
		Degree of online shopping	5.58%
		Whether to use WeChat/QQ	5.55%
		Did you send it to your friends?	5.4%
		Which platform do you choose to believe for different news reports	7.67%
		Judgment of unknown information	9.7%
Financial literacy	Financial attitude (37.10%)	How well do you feel you know how to save, pay, invest, etc.	6.15%
		What areas of information have you focused on	9.79%
		Do you pay attention to how much you earn and how much you spend?	3.69%
		How many times per year do you pay attention to bank interest rates	11.37%
		Would you like to learn about products/saving options that earn more than time deposits?	6.10%
	Financial behavior (16.47%)	Do you know how to withdraw money from bank machines	2.74%
		Where would you put your money?	2.01%
		Frequency of dealing with banks (including mobile banking)	1.67%
		Have you ever borrowed money before to build a house, buy a home, buy a car, or go to the doctor?	8.36%
		If you borrowed money, would you pay it back on time?	1.69%
	Financial literacy (46.43%)	The problem of bank simple interest	7.19%
		The problem of bank compounding	7.22%
		Inflation	5.74%
		Do you agree that “the higher the return, the higher the risk”?	4.24%
		What would you do with counterfeit money?	2.09%
		Supermarkets don’t take cash, just WeChat or Alipay. Agree or not	9.26%
		What kind of insurance do you have?	10.70%

household, excludes non-rural respondents, and eliminates the non-reasonable questionnaires again, which is the most effective questionnaire. Finally, 625 valid questionnaires were obtained, with a total validity rate of 96.9%. The basic information of the questionnaires was counted, and the following group portrait characteristics can be obtained:

First, the demographic characteristics of rural groups: balanced gender distribution, with a predominance of young and middle-aged and older groups.

In the basic information of the sample, the proportion of men and women is more balanced, with 317 male respondents and 308 female respondents; the ratio of the two is about 1:1, which helps to examine the influence of gender on rural residents' Internet use and financial literacy. Meanwhile, in the age structure of the sample, there are 41 respondents under the age of 18, 224 respondents between the ages of 18 and 30, 197 respondents between the ages of 30 and 50, and 163 respondents over the age of 50, most of whom are in their youth and middle-aged years, and at the same time, the aging degree is high, which is in line with the age structure of the contemporary rural population in China, and the sample is characterized by its universality.

Second, the educational characteristics of rural residents: the overall literacy level is trending upwards, but nearly half of them still have junior high school education or less.

In terms of educational distribution, there are 112 people with elementary school education or below, 161 people with junior high school education, 119 people with high school/secondary education, and 233 people with college/undergraduate education or above, with junior high school education or below accounting for more than 40% of the total, about 43.68%, and higher education accounting for 37.28%. It can be seen that with the development of the times and the support of the national rural revitalization policy, the average educational level of rural residents has been improved, but compared with towns, the cultural quality level of rural residents is still on the low side as a whole.

Third, the characteristics of the rural population's place of residence: there are more permanent residents in rural areas, and the structural composition of permanent and out-of-town residents varies greatly.

Among the samples obtained, there are 362 permanent residents and 263 non-residents in rural areas, and the majority of permanent residents are middle-aged and old-aged groups with low education, while rural residents who go out to migrate are mainly young and middle-aged groups with high education, mainly because middle-aged and old-aged groups have lost the ability to go out to work due to age, physical fitness, illness, etc., while the young and middle-aged groups go out to go to school and work, and so on, and there is a serious loss of the rural labor force population. The loss of the rural labor force is serious.

Fourth, the overall characteristics of rural residents' Internet use are as follows: the overall level of Internet use is at a medium level, and individual differences are large and influenced by various factors.

Based on the quartiles of the Internet Usage Index, we categorized the level of Internet usage among the respondent groups into the following four bands.

Tranche 1: Good level of Internet usage, i.e. corresponding to an Internet index of more than 75.7508, totaling 156 persons.

Tranche 2: Average level of Internet use, i.e., the corresponding Internet literacy index is between 63.6425 and 75.7508, totaling 155 people.

Tranche 3: Poor level of Internet use, i.e., the corresponding Internet literacy index is between 51.7554 and 63.6425, totaling 158 people.

Tranche 4: Very poor level of Internet use, i.e., the corresponding Internet literacy index does not exceed 51.7554, totaling 156 people.

In summary, it can be found that there are 268 people who have scored below 60 points for the level of Internet use among rural residents, and 357 people have scored above 60 points.

Similarly, the distributional characteristics of financial literacy among rural residents can be plotted: the overall level of financial literacy is poor, with large individual differences. We can also categorize the financial literacy scores of the interviewed groups into the following four grades.

Tranche 1: Better financial literacy, i.e., corresponding to a financial literacy index of more than 0.5063, totaling 156 persons.

Tranche 2: Average financial literacy, i.e., corresponding to an index of financial literacy between 0.4434 and 0.5063, totaling 156 persons.

Tranche 3: Poor financial literacy, i.e., corresponding to an index of financial literacy between 0.3676 and 0.4434, totaling 157 persons.

Tranche 4: very poor financial literacy, i.e., corresponding to a financial literacy index of no more than 0.3676, totaling 156 persons.

It can be seen that 455 of the rural residents scored below 50 in financial literacy and 170 scored above 50.

5. Empirical Analysis

In the next step, the author uses a multiple regression model to empirically test the relationship between Internet use and financial literacy, and in the process of analysis, the author fully considers the influence of control variables such as gender, age and education on ensure the accuracy and reliability of the regression results. At the same time, the preliminary test is implemented through the scatter plot and VIF coefficients, and it is found that there is a linear relationship between Internet use and financial literacy, and there is no multicollinearity problem between the control variables and the core variables, which is in line with the requirements of the multivariate OLS regression. For this reason, the specific form of the model is set as:

$$Y_j = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon \quad (1)$$

where Y_j represents the dependent variable, i.e., the overall financial literacy index, with three secondary indicators, financial attitudes, financial behaviors, and

financial knowledge. β_0 to β_i are the regression coefficients, and X_i represents the independent variable, i.e., the total Internet use index, with the following sub-indicators of Internet use degree and Internet use quality, and ε is the error term, which captures the unexplained part of the model. The OLS regression method allows us to estimate the values of the regression coefficients and thus quantify the extent to which Internet use affects farmers' financial literacy.

5.1. Baseline Regression

Without considering the heterogeneity of gender, region and population mobility, the author first establishes a baseline regression model with Internet use score and each component factor as core variables, financial literacy and each component factor as dependent variables, and incorporates control variables in a multivariate OLS regression, and the results of the model estimation are shown in Table 5 and Table 6 as follows.

Based on the coefficient estimates in the model, we can draw the following conclusions:

Table 5. Benchmark OLS regression results of Internet use affecting farmers' financial literacy.

Variables	(1) finLit	(2) finLit	(3) finLit
OIUL	0.162*** (5.208)		
IUL		0.127*** (4.321)	
IUQ			0.110*** (4.385)
Gender	0.001 (0.137)	0.004 (0.487)	0.000 (−0.029)
Age	−0.004** (−2.321)	−0.007** (−2.152)	−0.006 (−1.630)
Edu	0.004*** (3.317)	0.005*** (3.696)	0.005*** (3.829)
Flow	0.001 (0.049)	0.000 (0.019)	0.001 (0.145)
Income	0.015*** (3.767)	0.016*** (3.947)	0.017*** (4.309)
Const	0.236*** (6.597)	0.259*** (5.529)	0.269*** (5.844)
R^2	0.250	0.240	0.241
F	29.704***	28.162***	28.263***
n	625	625	625

Note: ***p < 0.01, **p < 0.05, *p < 0.1, t-statistics in parentheses, same below.

Table 6. Benchmark OLS regression results of Internet use affecting farmers' financial literacy (continued).

Variables	(4) finAtt	(5) finAtt	(6) finAtt	(7) finBvr	(8) finBvr	(9) finBvr	(10) finKnow	(11) finKnow	(12) finKnow
OIUL	0.270*** (5.274)			0.163* (1.822)			0.153*** (3.288)		
IUL		0.197*** (4.055)			0.171** (2.037)			0.113** (2.590)	
IUQ			0.190*** (4.602)			0.095 (1.325)			0.106*** (2.830)
Gender	0.010 (0.765)	0.014 (1.087)	0.008 (0.587)	−0.042* (−1.895)	−0.039* (−1.728)	−0.043* (−1.939)	0.008 (0.666)	0.010 (0.874)	0.006 (0.558)
Age	0.010*** (2.997)	0.012** (2.144)	0.016*** (2.681)	−0.044*** (−4.323)	−0.046*** (−4.664)	−0.046*** (−4.551)	−0.009** (−1.745)	−.012** (−2.381)	−0.010** (−1.970)
Edu	0.001 (0.370)	0.002 (0.833)	0.002 (0.824)	0.005 (1.336)	0.005 (1.340)	0.006 (1.578)	0.008*** (3.974)	0.008*** (4.269)	0.008*** (4.318)
Flow	0.006 (0.425)	0.005 (0.318)	0.006 (0.447)	−0.010 (−0.400)	−0.011 (−0.442)	−0.010 (−0.396)	0.007 (0.557)	0.006 (0.491)	0.007 (0.570)
Income	0.033*** (5.274)	0.035*** (5.295)	0.037*** (5.581)	−0.008 (−1.822)	−0.008 (−0.723)	−0.005 (−0.439)	0.015** (2.469)	0.016*** (2.631)	0.017*** (2.812)
Const	0.030 (5.026)	0.018 (0.231)	0.020 (0.264)	0.439*** (3.233)	0.435*** (3.247)	0.482*** (3.656)	0.268*** (3.805)	0.294*** (4.209)	0.298*** (4.348)
R^2	0.140	0.125	0.132	0.117	0.119	0.115	0.205	0.200	0.202
F	14.556***	12.747***	13.500***	11.867***	12.000***	11.615***	23.009***	22.285***	22.514***
n	625	625	625	625	625	625	625	625	625

First, From model (1) to model (3), it can be seen that the effects of farmers' Internet use and each of the constituent factors on financial literacy are significant at the 1% level, and Internet use and each of the constituent factors show positive incentives for financial literacy and each of the constituent factors, i.e., along with the use of the Internet, the level of total financial literacy of the farmers is also improved. It is observed from the coefficients that the marginal contribution of the degree of use is slightly larger than the quality of use. Further analysis of the path of farmers' Internet use for financial literacy improvement from model (4) to model (12) shows that the effects of the total Internet use index and the constituent factors on financial attitudes and financial knowledge are significant at the 1% level, while the effects on financial behaviors are less significant than those of the other two constituent factors, suggesting that the Internet use and the constituent factors mainly affect the financial attitudes and financial knowledge of farmers by influencing their financial attitudes and financial knowledge to affect farmers' total financial literacy, and all of them show positive incentives.

Second, the estimation results of the coefficients of the control variables analyzed in all models show that the coefficients of the control variables effectively

influence financial literacy and the composition of the factors. For models (1) to (3), in the path of the influence of Internet use and each component factor on the total level of financial literacy, gender, education, population mobility, and annual household income are positively incentivized, while age is negatively affecting the explanatory variables, i.e., the older the age, the lower the level of financial literacy, and the estimation of these parameters are in line with the expected assumptions.

For model (4) to model (12) in the path of the influence of Internet use and each of the constituent factors on each of the constituent factors of financial literacy, in terms of financial attitudes, age shows a positive incentive effect, i.e., the higher the age, the higher the score of financial attitudes, which may be due to the fact that the young farmers' group is widely used in the process of using the Internet tools to a large extent to affect the interest in and attention to the financial information; and for financial behaviors, the rest of the individual variables, except for educational qualifications, have a negative effect, i.e., it is only the increase in educational qualifications that makes the farmers behave more positively in terms of financial behaviors. Moreover, we find that gender produces a significant difference in this group, with rural women being significantly weaker than men in terms of financial behavior, probably because the male group of farmers is the main participant in financial activities in the countryside. For financial knowledge, age shows a negative effect, and the remaining four control variables are positively incentivized, i.e., the higher the age of the farmer group, the worse the level of financial knowledge.

Overall, the initial regression analysis of the research questions through the benchmark regression basically reveals the direction of influence and the mechanism of action between Internet use as well as other control variables and the level of financial literacy, which provides the basis for subsequent robustness tests and discussions.

5.2. Robustness Tests

In the previous section, the author empirically analyzed and verified the main findings. In order to confirm the reliability of the parameter test further, it is necessary to implement the robustness test. The author implements the robustness test in the following ways: first, by changing the strategy of the weight calculation method, the financial literacy index will be replaced by the entropy topics method to re-calculate the implementation of parameter estimation; secondly, on the basis of the original weight calculation method of the sample, the total index of financial literacy truncation processing, reduce the sample size to re-implement the estimation, so as to prove the accuracy of the model.

1) Changing the Empowerment

In order to avoid the chance caused by the single assignment method of constructing the financial literacy score, under the premise of keeping the assignment method of the total Internet use score and the two first-level indicator scores unchanged, the author replaces the calculation method of the weights of the total

financial literacy score and the three first-level indicator scores of the previous article from the critic weighting method to the entropy weighting this method, so as to calculate the brand-new weights, and to put the individual variables at the level of dependent variable The individual variables were controlled so as to be reintroduced into the regression test. If the parameter estimation and prediction accuracy of the model did not change significantly after the weight calculation method was changed, the model was shown to be robust. The results of the parameter reestimation of the multivariate OLS regression using SPSSAU are shown in Table 7 and Table 8. The results demonstrate that the estimated coefficients of the Internet usage index and its dimensions are statistically significant at the 1% level, irrespective of whether the measure employs the CRITIC method or the entropy weight TOPSIS method.

2) Tail cutting method

In addition to changing the assignment method, the author synchronized the robustness test using MATLAB software to truncate the total financial literacy index in the original data series, specifically, i.e., to make extreme value exclusion

Table 7. Robustness regression results of Internet use affecting farmers' financial literacy (changing the empowerment method).

Variables	(1) finLit	(2) finLit	(3) finLit
Factor	0.281*** (6.489)		
Factor 1		0.216*** (5.261)	
Factor2			0.193*** (5.511)
Gender	−0.005 (−0.444)	0.000 (−0.011)	−0.007 (−0.647)
Age	−0.011** (−2.230)	−0.016*** (−3.373)	−0.013*** (−2.664)
Edu	0.010*** (5.733)	0.011*** (6.208)	0.011*** (6.353)
Flow	0.005 (0.412)	0.003 (0.279)	0.005 (0.436)
Income	0.019*** (3.394)	0.021*** (3.641)	0.022*** (4.033)
Const	0.193*** (2.933)	0.235*** (3.587)	0.248*** (3.857)
R^2	0.385	0.371	0.374
F	55.741***	52.601***	53.187***
n	625	625	625

Table 8. Robustness regression results of Internet use affecting farmers' financial literacy (changing the empowerment method).

Variables	(4) finAtt	(5) finAtt	(6) finAtt	(7) finBvr	(8) finBvr	(9) finBvr	(10) finKnow	(11) finKnow	(12) finKnow
OIUL	0.333*** (5.960)			0.304*** (5.163)			0.249*** (3.632)		
IUL		0.236*** (4.443)			0.253*** (4.562)			0.187*** (2.906)	
IUQ			0.238*** (5.264)			0.202*** (4.258)			0.171*** (3.114)
Gender	0.008 (0.544)	0.013 (0.899)	0.005 (0.341)	−0.025* (−1.700)	−0.019 (−1.318)	−0.027* (−1.846)	0.003 (0.161)	0.007 (0.396)	0.001 (0.043)
Age	0.014** (2.136)	0.007 (1.101)	0.011* (1.797)	−0.023*** (−3.420)	−0.028*** (−4.314)	−0.026*** (−3.817)	−0.013* (−1.656)	−0.018** (−2.338)	−0.015* (−1.906)
Edu	0.000 (0.214)	0.002 (0.769)	0.002 (0.708)	0.007*** (2.719)	0.007*** (3.027)	0.008*** (3.241)	0.017*** (5.881)	0.017*** (6.199)	0.018*** (6.280)
Flow	0.015 (0.968)	0.013 (0.842)	0.016 (0.991)	−0.014 (−0.855)	−0.016 (−0.958)	−0.014 (0.830)	0.013 (0.669)	0.011 (0.595)	0.013 (0.683)
Income	0.038*** (5.218)	0.040*** (5.519)	0.042*** (5.797)	0.009 (1.247)	0.011 (1.373)	0.013* (1.779)	0.017** (1.973)	0.019** (2.142)	0.020** (2.343)
Const	−0.028 (−0.327)	0.036 (0.419)	0.032 (0.388)	0.313*** (3.506)	0.347*** (3.916)	0.377*** (4.325)	0.209** (2.014)	0.249** (2.421)	0.258** (2.552)
R^2	0.173	0.152	0.163	0.239	0.232	0.228	0.270	0.264	0.266
F	18.586***	16.008***	17.310***	27.925***	26.875***	26.392***	32.953 ****	32.043***	32.282***
n	625	625	625	625	625	625	625	625	625

at the 5% and 95% percentile, and finally obtained 563 sub-samples. Then, the author used the truncated data to reconstruct the model, using the total Internet use score and each secondary factor of the Internet use score as the independent variables, and the total financial literacy score and the secondary factors as the dependent variables, respectively, to conduct the multivariate OLS regression again and to observe the changes in the model parameters and the prediction results. The estimation results are shown in Table 9 and Table 10. The results of the Internet Use Index test on the Financial Literacy Index for farmers yielded insignificant changes and passed the 5% significance test.

Based on analyzing the results of the above two robustness tests, the following conclusions can be drawn:

First, all core variables are significant and statistically significant at the 5% significance level. The coefficients of the core variables do not differ much from the benchmark regression, and it can be judged that the parameter estimates of the core variables are characterized by robustness. Further examination reveals that the total index of Internet use has the most obvious influence on financial literacy and the secondary factors of financial literacy, and the influence of each

Table 9. Robustness regression results of Internet use affecting farmers' financial literacy (truncated tail method).

Variables	(1) finLit	(2) finLit	(3) finLit
OIUL	0.091***		
	(4.647)		
IUL		0.075***	
		(3.155)	
IUQ			0.059***
			(2.883)
Gender	0.008	0.010	0.008
	(1.323)	(1.554)	(1.210)
Age	−0.003	−0.004	−0.004
	(−1.067)	(−1.605)	(−1.342)
Edu	0.004***	0.004***	0.004***
	(3.761)	(4.008)	(4.153)
Flow	0.007	0.006	0.007
	(0.967)	(0.911)	(1.021)
Income	0.008**	0.008**	0.009***
	(2.395)	(2.486)	(2.765)
Const	0.307***	0.317***	0.327***
	(8.262)	(8.630)	(9.063)
R^2	0.210	0.206	0.204
F	21.247***	20.759***	20.467***
n	563	563	563

Table 10. Robustness regression results (truncated-tailed) of Internet use affecting farmers' financial literacy (attached).

Variables	(4) finAtt	(5) finAtt	(6) finAtt	(7) finBvr	(8) finBvr	(9) finBvr	(10) finKnow	(11) finKnow	(12) finKnow
OIUL	0.216***			0.171*			0.078*		
	(4.403)			(1.899)			(1.750)		
IUL		0.157***			0.174**			0.077*	
		(3.414)			(2.032)			(1.939)	
IUQ			0.156***			0.215***			0.071*
			(3.882)			(3.399)			(2.009)
Gender	0.013	0.016	0.011	−0.059**	−0.055**	−0.058**			
	(1.013)	(1.283)	(0.887)	(−2.505)	(−2.273)	(−2.466)			
Age	0.017***	0.011**	0.014***				−0.009*	−0.010*	−0.009
	(3.222)	(2.374)	(2.826)				(−1.872)	(−2.007)	(−1.770)
Edu				0.013***	0.013***		0.007***	0.009***	0.009***
				(3.806)	(3.775)		(4.081)	(4.944)	(5.038)
Flow					0.018	0.043*			
					(0.670)	(1.725)			

Continued

Income	0.026*** (3.962)	0.028*** (4.293)	0.029*** (4.525)	−0.019* (−1.524)	−0.019* (−1.581)		0.012** (2.040)		
Const	0.029 (0.702)	0.068* (1.700)	0.072** (1.980)	0.434*** (8.995)	0.416*** (8.165)	0.496*** (12.527)	0.341*** (8.728)	0.354*** (9.206)	0.360*** (9.877)
R^2	0.094	0.082	0.081	0.072	0.073	0.044	0.162	0.160	0.161
F	14.482***	12.420***	13.330***	10.813***	10.954***	8.567***	26.951***	33.632***	26.717***
n	563	563	563	563	563	563	563	563	563

secondary index of Internet use on each secondary factor of financial literacy is significantly different, among which the degree of Internet use still has a greater positive driving force than the quality of Internet use on each index of financial literacy, which is, in general, consistent with the results of the parameter estimation of the benchmark regression.

Second, the test results of the control variables show that only the gender variable has a slight negative effect on the total financial literacy score after changing the empowerment method, but the direction of the influence on the secondary factor of financial literacy is still consistent with the results of the benchmark regression. Comparison with the benchmark regression reveals that age, annual household income and education have a significant effect on Internet use to improve financial literacy, and farmers who are young and have a certain degree of education and have the ability to improve household income tend to have higher financial literacy, which is basically the same as the benchmark regression prediction results.

In conclusion, observing the specific degree of influence of each variable on financial literacy and secondary factors, the signs of the coefficients of the vast majority of variables are consistent with the baseline regression, although the robustness test model shows some bias in coefficient estimation compared with the baseline regression model. The parameter estimates and predictive accuracy of the model after changing the assignment method and the truncated-tail method have only minor changes, and the robustness test basically confirms the validity and accuracy of the model regression results.

5.3. Heterogeneity Analysis

A large amount of data in the previous section fully confirms that farmers' use of the Internet can positively enhance their financial literacy, but due to the differences in individual gender, the geographic region to which the survey respondents belong, and the mobility between urban and rural areas, there are also heterogeneous differences in the promotion of Internet use on the enhancement of financial literacy, so the author further analyzes the heterogeneity of the influences on farmers' financial literacy under the specific factors.

5.3.1. Consider Age Heterogeneity

From the theoretical analysis, it can be seen that the age of the farmers' group is

an important factor in the process of Internet literacy affecting financial literacy; the current Internet technology is formed in a short period of time, the farmers' group of different ages have different time and degree of contact with the Internet, and their reaction to the large amount of information brought by the Internet is also different, so it is necessary to take the age as a consideration for the substantial impact of age in the process of Internet literacy affecting financial literacy. The author classifies the group under 40 years old in the sample as young adults, and classifies the group over 40 years old as old age to implement the grouping heterogeneity test.

Table 11. Regression results of Internet use affecting farmers' financial literacy under different age groupings.

Variables	finLit		finLit		finLit	
	The prime of one's life	Autumn of one's years	The prime of one's life	Autumn of one's years	The prime of one's life	Autumn of one's years
OIUL	0.124*** (3.594)	0.379*** (9.027)				
IUL			0.103*** (3.074)	0.325*** (7.944)		
IUQ					0.087*** (3.099)	0.293*** (7.790)
Control variable	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled
Const	0.375*** (15.343)	0.196*** (8.673)	0.386*** (15.457)	0.204*** (8.290)	0.403*** (20.486)	0.252*** (13.144)
R^2	0.035	0.237	0.026	0.194	0.026	0.188
F	12.920***	81.487***	9.448***	63.114***	9.601***	60.678***
n	361	264	361	264	361	264

The results of the parameter estimation in Table 11 lead to the following conclusions:

The different age groups of farmers showed a significant positive effect on the use of the Internet and its constituent factors, and this effect was confirmed at the 1% level of significance. In a cross-sectional comparison, the older age group showed a more pronounced effect of Internet use on the improvement of financial literacy among farmers than the young adults group, and this difference was statistically significant, thus confirming the existence of heterogeneity.

5.3.2. Considering Geographical Heterogeneity

Since there is a difference in the degree of Internet penetration and the level of financial development in rural areas of different provinces, and that difference is also a key factor affecting the improvement of farmers' financial literacy, the author further divided the original sample into three parts according to the survey area, namely Henan, Hunan and Chongqing, for the analysis of geographic heterogeneity.

The empirical results in Table 12 show that, first, the core variables under each

Table 12. Regression results of the impact of Internet use on farmers' financial literacy under different geographic subgroups.

Variables	finLit			finLit			finLit		
	Hunan	Chongqing	Henan	Hunan	Chongqing	Henan	Hunan	Chongqing	Henan
OIUL	0.183*** (3.742)	0.235*** (4.703)	0.354*** (11.337)						
IUL				0.178*** (3.712)	0.261*** (5.242)	0.305*** (9.031)			
IUQ							0.127*** (3.069)	0.167*** (3.756)	0.291*** (10.620)
Containment variant	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled
Cons	0.328*** (9.977)	0.280*** (9.189)	0.211*** (10.604)	0.323*** (9.435)	0.256*** (7.999)	0.225*** (9.732)	0.368*** (13.642)	0.323*** (12.157)	0.259*** (15.320)
R^2	0.068	0.174	0.285	0.067	0.207	0.202	0.047	0.118	0.259
F	14.002***	22.115***	128.518***	13.777***	27.476***	81.554***	9.417***	14.106***	112.782***
Sample size	193	107	325	193	107	325	193	107	325

geographical sample explain the level of financial literacy at the 1% significance level, and the observation of the estimated coefficients reveals that geographical differences have a significant differential impact on the improvement of financial literacy, in which the effect of Internet use on the improvement of financial literacy for the rural farmers in Henan is greater, followed by Chongqing, and Hunan is the smallest.

5.3.3. Consider Whether Farmers Are Mobile and Heterogeneous

From a practical point of view, financial literacy as an acquired ability, whether farmers are mobile in the countryside will have a differential impact on their literacy improvement, so the author then divided the total sample into two subsamples of rural residents and mobile residents, in order to analyze the different responses or degree of influence that may exist between the rural resident and mobile on the role of Internet use in improving financial literacy. The results are shown in Table 13.

A cross-sectional comparison of the coefficients in the regression results for the resident and mobile groups reveals that Internet use significantly increases financial literacy for farmers who are permanent residents in rural areas, while the effect is relatively weaker for the rural mobile population. This may be due to the fact that Internet penetration in rural areas has been increasing over the years, and that rural permanent residents have benefited more from this policy change, thus making financial literacy levels significantly affected.

6. Research Findings and Policy Recommendations

6.1. Main Findings

The article takes rural residents of Henan, Hunan and Chongqing provinces as

Table 13. Regression results on the impact of Internet use on farmers' financial literacy under whether or not they are mobile population subgroups.

Variables	finLit		finLit		finLit	
	Eternalism	Liquid	Eternalism	Liquid	Eternalism	Liquid
OIUL	0.313*** (10.375)	0.207*** (5.170)				
IUL			0.276*** (8.920)	0.197*** (4.719)		
IUQ					0.247*** (9.280)	0.152*** (4.510)
Control variable	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled	Uncontrolled
Const	0.232*** (12.745)	0.318*** (11.409)	0.240*** (11.983)	0.317*** (10.310)	0.277*** (17.889)	0.360*** (15.758)
n	362	263	362	263	362	263
R^2	0.230	0.093	0.181	0.079	0.193	0.072
F	107.638***	26.734***	79.561***	22.270***	86.126***	20.336***

the research object, and utilizes rich and detailed first-hand survey data to examine in detail the impact of the Internet on farmers' financial literacy, completes the empirical analysis through the construction of multiple OLS regression model, and summarizes the results and conclusions involved as follows:

First, the study has unearthed a significant correlation between Internet use and the enhancement of farmers' financial literacy. This improvement is attributed to the positive influence of Internet use on farmers' financial attitudes, behaviors, and knowledge. Notably, both the level and quality of Internet usage were found to contribute to this advancement. Specifically, for the studied group of farmers, the extent of their Internet usage was notably associated with an increase in their financial literacy. Additionally, the study revealed that the primary means by which Internet exposure affected financial attitudes was by broadening farmers' knowledge and understanding of financial matters.

Second, the overall Internet usage level of the interviewed farmers is medium, but their financial literacy score is low. Age negatively correlates with financial literacy, while education level and annual net household income positively correlate with it. Improved Internet literacy promotes financial literacy among both permanent and mobile residents, with a more significant effect on permanent residents.

Third, heterogeneity analysis revealed that although younger farmers have better overall Internet use, older farmers experience a stronger marginal effect of Internet use on their financial literacy improvement. Geographic heterogeneity also exists, with the marginal effect of Internet use being the largest in rural Henan, followed by Chongqing, and the smallest in rural Hunan.

6.2. Policy Recommendations

Combined with the above research, this paper makes the following policy recom-

mendations:

First, the construction of rural Internet infrastructure should be strengthened to increase network penetration and lay a material foundation for the improvement of Internet literacy. The current insufficient construction of rural hardware and software digital infrastructure has hindered the improvement of farmers' Internet literacy. First, in terms of hardware, rural network signal coverage is insufficient, and the number and layout of new infrastructures, such as rural 5G base stations, fiber optic broadband, and Internet of Things facilities, urgently need to be improved. Second, software construction for rural areas is insufficient, rural data integration and sharing is inadequate, and there is a lack of a number of distinctive digital platforms and software that are close to rural life. Therefore, firstly, hardware infrastructure construction related to rural digitization needs to be strengthened, including improving broadband coverage, increasing the number of Internet port accesses, and building new rural 5G base stations. Moreover, it is necessary to build a basic information-sharing platform, including a big data center and a comprehensive agricultural service platform, establish a data-sharing mechanism, expand data access, and continuously improve the level of data access and sharing in rural areas, so as to promote the improvement of farmers' Internet literacy through a more digitized life.

Secondly, attention is being paid to the development of the rural education system, to informatization education and training, and to improving the education level of farmers. Studies have shown that an increase in the education level of farmers will significantly improve their own financial literacy, but surveys have shown that the education level in rural areas of China is still relatively low, especially since the education and training in informatization are weak. For this reason, it is recommended that the government and education departments first set up a special fund for the development of informatization education courses suitable for farmers, covering basic cell phone and computer operation, Internet applications, and financial popularization platforms, to ensure that the courses are close to the actual needs of farmers. In addition, in order to address the problems of insufficient construction of rural schools and aging teacher structure, we should implement the "Young Teachers Going to Rural Areas Program" and provide preferential policies, such as housing subsidies and talent subsidies, to attract and retain young teachers, and to balance the resources of education in urban and rural areas. It should also increase financial support for compulsory education in rural areas to at least meet or exceed the national average, gradually improve hardware facilities in rural schools, and ensure that every school has access to the Internet. Through these concrete and actionable measures, not only can the cultural level and financial literacy of farmers be effectively raised, but a solid foundation can also be laid for the long-term development of rural finance and the implementation of the rural revitalization strategy.

Third, financial literacy and education should be strengthened, the financial regulatory system improved, and farmers' money bags guarded. The Henan vil-

lage bank mine incident has exposed the urgency of financial risk prevention and financial fraud prevention in rural areas, and improving farmers' financial literacy is the basis for preventing financial risks. Rural areas should deepen the popularization of financial knowledge, especially for young people and the elderly, by organizing financial knowledge lectures, preparing financial knowledge manuals, using new media platforms and other ways to raise farmers' awareness of financial fraud and financial risks. It is recommended that the government increase supervision of rural financial institutions, improve the regulatory system, ensure that financial institutions operate in compliance, crack down on financial institutions suspected of financial fraud and irregularities, and maintain the stability and security of the rural financial market.

Fourthly, the rural social security system should be improved, and farmers' social welfare benefits should be enhanced. During the survey, it was found that the majority of the rural resident population consisted of women raising children at home and men who had lost the ability to work outside the home because of old age or illness, and that this demographic composition constrained the development of rural finance to a certain extent. Therefore, the provision of suitable jobs for this group of people will not only turn demographic pressure into a resource dividend and raise the per capita income of rural residents, but will also help to promote the vigorous development of the rural economy as a whole. First, for rural women, special training programs should be set up to upgrade their employment skills, such as handicrafts and agricultural product processing, to encourage them to participate in rural economic development. Second, for men who are unable to go out to work due to old age or illness, the rural pension service system should be improved, and medical and rehabilitation services should be provided to reduce their family burden. At the same time, they should explore the development of light manual labour positions suitable for them, such as rural environment maintenance and public facilities management, so that they can also give full play to their spare time and realize their self-worth in the countryside. These measures will help to meet the needs of rural development and promote the synergistic development of rural finance and the rural economy.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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