ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

The impact of internet technology adoption on credit constraints of farmers with different income levels

Wanying Huang, Xiaojuan Wang

Economics and Management, Northwest A&F University, Yangling 712100, Shaanxi, China

Abstract: *The lack of rural financial resources and unbalanced supply have seriously inhibited the increase of farmers' production income and living consumption. Based on farmers with different incomes as the research object, this paper analyzes the characteristics of their credit constraint behavior, and uses the Probit model and the Heckman two-stage model to empirically analyze the impact of Internet technology adoption on farmers' digital credit behavior. The conclusions are: Firstly, the empirical results of this paper find that the use of internet technology has an inhibitory effect on the overall credit constraints of farmers, the most effective of which is the acceptance of internet finance. Secondly, in terms of heterogeneity, this paper finds that in farmers with higher household income, the effect of internet finance and Internet use has a greater inhibitory effect on the formation of credit constraints.*

Keywords: *different income; farmers; credit constraints; Probit; Heckman; internet finance*

1. Introduction

From 2004 to 2021, the central document No. 1 focused on the issues of agriculture, rural areas and farmers for 17 consecutive years. Compared with urban finance, rural finance develops slowly. In the past, due to the long-term implementation of financial control policies issued by the state in rural areas, formal financial institutions directly or indirectly transferred rural financial assets and currency surpluses to cities, resulting in a shortage of rural financial resources and increasingly serious supply imbalances, which further restricted farmers' production and income growth. For living consumption [1], for many years, due to the serious asymmetry of information in the rural credit market, a large number of farmers have been excluded from the financial market, and the phenomenon of farmers being constrained by credit is very serious. Due to the different individual qualities of farmers, the credit constraints they face are also different. In fact, there is obvious heterogeneity in the availability of formal credit for farmers with different incomes. Low-income farmers are faced with credit constraints with strong demand and supply [2], while middle-income farmers are faced with severe credit constraints. The income effect of their borrowing is very significant, but there is not enough credit fund support, resulting in low production efficiency [3], the marginal utility of loans to high-income farmers is not as high as that of low- and middle-income farmers, but it has an obvious positive effect. Therefore, it is also very important to solve the problem of quantity rationing for high-income farmers [2]. Existing studies have pointed out that the use of the Internet can greatly improve financial efficiency [4-6], and my country's rural internet finance is entering a period of rapid development, Internet finance can provide more diversified services for farmers [7], and internet technology can reduce farmers' acquisitions. It provides better technical conditions and reduces the information asymmetry in the farmers' credit market. It is of great significance to study the effect of internet technology on farmers' credit constraints.

However, the theoretical analysis of the mechanism between internet technology adoption and farmers' credit constraints is lacking in existing research. The effect of the internet on farmers with different incomes is different. Existing research does not distinguish farmers by income, but mainly focuses on the effect of internet use on economic growth at the macro level. There is little evidence that internet technology restricts farmers' credit from the micro level.

Therefore, on the basis of existing research, this research will focus on the credit constraints of different farmers, and use the ideas and methods of combining theoretical analysis and micro-empirical analysis, innovatively from farmers' understanding and acceptance of internet finance, as well as the internet based on the usage situation, an indicator system is constructed to avoid the endogenous impact of Internet finance, and the impact of internet construction in rural areas of China on farmers' credit

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

constraints and its heterogeneity are systematically and deeply analyzed from the perspective of income level. It has outstanding theoretical and practical significance, and provides theoretical and empirical support for government departments to deploy Internet construction in the next step.

2. Theoretical Analysis and Research Hypotheses

2.1. Theoretical Analysis

The credit constraints of farmers can be divided into three types: no credit constraints, demand-based credit constraints, and supply-based credit constraints. In recent years, the academic circles have relatively perfected the research on the credit constraints of farmers from the perspective of supply and demand. Specifically, the reason why farmers have demand-based credit constraints may be due to high transaction costs [8]. From the perspective of supply, since commercial banks have not fully considered the characteristics of rural credit economic entities, most farmers cannot obtain formal loans because they do not meet relevant standards. Due to the information advantage of formal financial institutions, they are more inclined to lend to non-agricultural households with higher education levels, higher income levels and more cash holdings [9]. Even if most of the high-income farmers are subject to credit rationing due to the risk of greater volatility in agricultural production, their positive marginal income utility cannot be reflected. The credit needs of a large number of farmers cannot be met, and they face severe supply-oriented credit constraints.

2.2. Mechanism of Action

Internet technology embodies three very important trends, namely, the digitization of information, the improvement of computing power, and the development of communication technology [10]. The penetration of internet technology in the field of rural production has been well received, the industry in the field of rural internet finance supported by the state has become increasingly diversified, and the Internet and mobile communications have gradually been integrated [7]. Using the Internet, farmers can improve their understanding of financial institutions, making financial services more accessible, and the use of the internet can make financial institutions more convenient and intuitive to understand the credit status of farmers, reducing information asymmetry in the rural credit market. Therefore, this paper pays special attention to the influence of internet usage, understanding and acceptance of internet finance on farmers' information search, financial understanding, and credit constraints.

(1) Internet use, information symmetry and farmers' credit

In past researches, [12] founds that the vast majority of rural financial institutions only handle deposit business, and some institutions do not even handle loan business. After using the Internet, commercial banks can use the traces of farmers' internet use to Using cloud computing big data and other methods, and using a new credit rating method such as "sesame credit", a more convenient and more accurate way is used to comprehensively assess the credit status of users, and formulate a more reasonable credit rating [11]. Therefore, the impact of the use of the internet on the rural credit market is analyzed from two perspectives. On the one hand, the traces of farmers' internet usage can be real-time formed into user portraits by big data cloud computing, which greatly saves the cost of financial institutions' household surveys to obtain information, and a more scientific rating system not only reduces the problem of adverse selection before lending. It also reduces the moral hazard problem of farmers after taking out loans; on the other hand, before the popularization of the Internet, it was difficult for farmers to obtain loan-related information from their daily lives. Obtaining relevant knowledge [12], and after the popularization of the internet, it covers the dominant customer group of traditional commercial banks, and covers the disadvantaged groups that they actively exclude, farmers can obtain financial knowledge from webpage information, and reduce the cost of farmers to obtain information, Therefore, theoretically speaking, supervised lenders are more likely to form self-discipline, and farmers who obtain loan information will reduce the degree of their information bias and ease their credit constraints to a certain extent.

(2) Internet use, financial understanding and farmer credit

[13] founds that farmers do not trust financial institutions, and poor financial knowledge is an important reason for their financial exclusion. Due to the generally low level of education received by farmers, relatively narrow sources of information, and relatively simple financial instruments, farmers are more inclined to use social capital for private lending. In addition, most farmers are risk-averse, and

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

the agricultural risks are relatively high, but only a small number of them purchase insurance for risk control. Most farmers have a deviated understanding of financial instruments and have strong psychological rejection. The narrowing of the digital divide will make policymakers less likely to think that credit decisions are wrong, so they will be more confident in risk diversification, thereby increasing risk appetite, and more willing to use credit to enhance their income effects and improve their lives [14].

3. Data, Variables and Models

(1) Data sources

The data used in this article comes from the micro-household survey data in November 2021. The survey adopted stratified random sampling method to select 2 towns, 6 villages, including Tangyu Town and Zaolin Town, Meixian County, Shaanxi Province, and Wugong County in the western region. Seven villages including Sangzhen and Liujiayuan, as well as Zhouzhi and Liquan were used as research sites. A total of 561 household questionnaires were collected through random household surveys. After removing the samples with outliers and missing values, 517 valid questionnaires were obtained, and the sample efficiency rate was 92.15%. Considering that digital credit behavior requires basic civil capacity and digital finance is a novelty, this paper excludes samples under the age of 18 and older than 70.

(2) Variable description

a. Explained variable: credit constraints of farmers

In the questionnaire design of this paper, referring to the design of Li Qinghai, it is judged whether the farmers are subject to credit constraints based on "there is a demand for loans but did not apply to the formal institution" and "the application for a loan from a formal institution was rejected". Failure to apply to formal finance is considered a "demand-based constraint", and farmers apply for a loan, but are rejected as a "supply-based constraint" by the institution.

b. Core explanatory variables

Since the use of internet finance has already represented the willingness of farmers to apply for credit, it will affect the judgment of farmers' credit constraints. Therefore, at the research level, this paper divides the adoption of Internet technology into three levels for research, namely, internet finance. understand, accept, own and use network communication equipment. According to the introduction of three internet financial formats in the "guiding opinions on promoting the healthy development of internet finance" jointly issued by the people's bank of China and other ten ministries and commissions, as well as the construction of internet participation indicators by reference scholars, this article expresses whether farmers have adopted it from three aspects. In terms of understanding internet finance, that is, whether you understand internet insurance, whether you understand internet financial management, whether you understand online lending, and whether you understand internet payment. In general, whether farmers understand internet finance, the degree of understanding of Internet finance is divided according to the number of questions answered, and the four questions are assigned the same weight, and the comprehensive score is "1~5", of which all the answers are "don't understand" is 1. In terms of accepting Internet finance, after the researchers popularized the knowledge of Internet finance, they were assigned points according to whether they were willing to participate in Internet financial management, whether they were willing to participate in online lending, and whether they were willing to participate in Internet payment.

c. Control variables

This paper refers to the existing literature to introduce characteristics including household head level and family level characteristics to reduce estimation bias.

(1) The household head-level characteristics include: age, age squared, gender, political affiliation, years of education, health status and other demographic characteristics. Among them, the control variable of age is to control the non-linear effect of household head on borrowing behavior as age increases; in terms of gender, it is generally believed that men are more likely than women to engage in large-scale production and need funds, and are more likely to be constrained by credit. From the above point of view, household heads with political affiliation and high education years are more likely to use loans to improve asset allocation in theory; the impact of household head health on credit constraints is uncertain, and a low level of household head health may lead to inability to engage in agricultural

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

production and reduce the possibility of credit, but it may be rejected by institutions because of poor health, if the health level is high, they will have more ideas to expand the scale of agriculture, and they will be more willing to lend.

(2) Family-level characteristics include family labor endowment, average age of family members, and family labor endowment, which represents the ability to engage in agricultural production. If the average age is too old, it means that the family is aging and may not be able to engage in large-scale agricultural production, thereby reducing the possibility of applying for credit. If the average age is too young, the family may have too few laborers, and there is no need to expand production. The higher endowment of family farmland, on the one hand, is more likely to carry out large-scale operations, which is conducive to large-scale production, thereby increasing the possibility of credit.

(3) Descriptive statistical analysis of the characteristics of sample farmers

Table 1: Descriptive statistical analysis

Symbol	Name	Illustrate	Minimum	Maximum	Mean	Standard deviation
Sex	Gender	Male=1, Female=2	1.00	2.00	1.44	0.50
Age	Age	Age at time of interview	21.00	74.00	50.50	10.96
Politics status	Social statu	Mass = 1, League member = 2, Party member = 3	1.00	3.00	1.20	0.60
Health	Health status	1=very poor; 2=very poor; 3=average; 4=moderately healthy; 5=healthy	1.00	5.00	3.84	0.98
Education	Education level	1=not enrolled; 2=primary; 3=junior high school; 4=high school, technical secondary school; 5=college; 6=undergraduate and above	1.00	6.00	3.03	1.17
Num_family	Family size	The number of family	1.00	10.00	5.45	1.46
Average_family age	Family age structure	Average family age	20.00	62.00	34.41	6.31
Average_income	Household income	Average annual household income (yuan)	7500.00	446666.00	31448.16	22681.52
Deposit	Cash deposits	Household cash deposits (yuan)	0.00	300000.00	19647.87	26078.51
Borrowing	Borrowing ideas	With borrowing needs = 1, no borrowing needs = 0	0.00	1.00	0.38	0.486
Supply	Supply-based credit constraints	Is it subject to supply-type credit constraints, yes=1, no=0	0.00	1.00	0.13	0.34
Demand	Demand-based credit constraints	Is it subject to demand-based credit constraints, yes=1, no=0	0.00	1.00	0.17	0.38
Learn	Knowledge of the Internet	Each question gets 1 point for understanding, and 0 point for not understanding, and all the answers are given as "1".	1.00	5.00	3.83	1.09
Accept	Acceptance of the Internet	Each question is scored 1 point for willingness, and 0 point for unwillingness.	1.00	5.00	3.13	1.03
Use	The use of network communication equipment	Internet hours per day	0.00	9.00	4.39	1.92

The individual characteristics and family characteristics of the sample farmers as shown in table 1, the ratio of males and females is not much different, the average age is 50 years old, the average education level is junior high school, the average annual family income is in the lower middle income level, and the farmers are healthy. The average situation is average, and a small number of farmers have party membership. The characteristics of credit behavior are: 38% of the farmers have credit demand, and most of them are subject to credit constraints. The demand-based credit constraints account for 17% of the total farmers, and the supply-based constraints account for 13%. In terms of internet usage, there are more people who understand the internet financial industry, with an average

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

value of 3.83. But the people who are willing to accept internet finance are less than those who understand internet finance, with an average value of 3.13. The average time farmers spend using connected devices is 4.39 hours, and most farmers spend their time using Douyin and Kuaishou during the slack season.

(4) Selection and determination of empirical models

I. Research on demand-based credit constraints

According to the analysis of theory and status quo, it can be considered that the internet technology at the current stage can play a role through the information effect, which is embodied in reducing transaction costs, weakening credit risks, reducing cognitive bias, and overcoming the problem of information bias, so as to promote the transformation of farmers' potential credit demand into actual credit demand, reduce the demand constraints of farmers' credit, and exert its inclusive effect.

Since the demand-based credit constraint of farmers is a binary dummy variable, this paper builds an ordered probit model with reference to the literature, and substitutes the data of farmers into the model according to the income level to explore. The corresponding model is represented as follows:

$$\mathrm{Pro}(\mathrm{demand}=1)=\mathrm{G}(\alpha+\beta\mathrm{learn}+\rho\mathrm{accept}+\lambda\mathrm{use}+\gamma\mathrm{X}+\sigma) \quad (1)$$

Among them, the explained variable demand indicates that farmers are constrained by demand-based credit, the core explanatory variable learn indicates farmers' understanding of internet finance, the core explanatory variable accept indicates farmers' acceptance of internet finance, and the core explanatory variable use indicates farmers' awareness of network equipment, duration of use. X is the set of control variables, and σ is the random error term.

II. Research on supply-type credit constraints

The occurrence of supply-type credit constraints for farmers needs to go through two stages: the first stage is that farmers must first generate credit behaviors, and the second stage is that the loan needs of farmers who generate credit behaviors are not met. Since not all farmers have lending behaviors, the data we observe are only the data of farmers who have borrowed and borrowed. In actual analysis, if these samples are excluded and the ordinary least squares method is used for estimation analysis, it will lead to sample selection bias.

In the empirical research, the Heckman model is adopted to eliminate the sample selection bias by referring to a variety of literatures.

In the first stage, the Probit selection model is established. Used to estimate the probability of occurrence of variables with selection bias and to calculate the inverse mills ratio.

In the second stage, the IMR estimated in the first stage is put into the regression model in the second stage, along with other variables, using the selected sample observations. The self-selection problem has been corrected by the selection model in the first stage and reflected by the IMR in the second stage.

In the first stage, the following selection equation model can be constructed:

$$\Pr(Y_{1i}=1)=\phi(\gamma\mathrm{Z_{it}})=\beta_0+\beta_1\sum X_i+\mu_i \quad (2)$$

In the second stage, the farmers who have borrowed and borrowed were screened out, the inverse mills ratio was introduced to overcome the selectivity bias of the sample, and a new equation was established to examine the credit supply constraints of farmers. The new equation expression is:

$$\mathrm{Y_{2i}}=\beta\mathrm{learn}+\rho\mathrm{accept}+\gamma\mathrm{use}+\mathrm{w}\lambda_\mathrm{i}+\gamma\mathrm{X}+\mu_\mathrm{i} \quad (3)$$

Among them, the explanatory variable Y_{1i}represents whether the farmers have borrowing behavior. Y_{2i} indicates that the farmers are constrained by supply-type credit, the core explanatory variable learn indicates the farmers' understanding of Internet finance, and the core explanatory variable accept indicates the farmers' acceptance of Internet finance In this case, the core explanatory variable use represents the length of time farmers use the network equipment, X is the set of control variables, and μ_i is the random error term.

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

4. Analysis of Empirical Results

(1) Basic results of the Probit model

Table 2 shows the marginal effect results of the degree of internet technology adoption on farmers' demand-based credit constraints. In row (1), the impact of the understanding of internet finance on farmers' demand-based credit constraints is generally significant at the 1% level. The marginal effect of internet finance understanding is -0.049, which means that if other conditions remain unchanged, farmers' understanding of internet finance increases by one standard deviation on average, and the probability of farmers generating demand-based credit constraints decreases by 4.9%. From the results of row (2) and row (3), the coefficient of acceptance of Internet finance and the coefficient of use time of network equipment are both significantly negative, which also indicates that the overall internet technology adoption of farmers at the level of 1%. It has a significant inhibitory effect on the demand-based credit constraints of farmers. From the results of the control variables, male farmers are less constrained by demand-based credit because men have more decision-making power in household finance than women. They have a deeper understanding and are more willing to be active in the financial market. The older the farmer, the more stable the source of household income, and the less demand for projects such as expanding production, so they are more inclined to use their own assets for production, and the less likely they are to have a demand for credit. The poorer the health of farmers, the higher the possibility that their own funds cannot cover the funds needed for medical treatment, and the more likely they will have loan demand, but the greater the possibility of demand-based credit constraints due to cognitive biases caused by their own diseases. Farmers who are politically party members tend to have complex and diverse social networks, have more opportunities to obtain financial information, and are more likely to have advantages than the masses in terms of bank loans. The higher the education level of farmers, the higher the possibility of understanding financial knowledge and the lower the possibility of demand-based credit constraints. On the whole, the lower the household income, the lower the risk tolerance of farmers, the more risk-free activities their risk preference is, and the more unwilling to bear the additional fixed cost losses that the credit business may bring, resulting in the less likely the need for credit is. In this paper, families with per capita household income in the top 40% of the sample are defined as low-income families, those in the middle 40% are defined as middle-income families, and those in the bottom 20% are defined as high-income families. Table 4 also shows the heterogeneity of households with different incomes. It can be seen in columns (1), (2) and (3) that from low-income families to high-income families, the higher the income of the family, the more the acceptance and understanding of Internet finance and the use of network equipment can inhibit demand-based credit constraint. This shows that, in general, farmers' willingness to internet finance has a greater inhibitory effect on demand-oriented credit constraints for middle- and high-income farmers, and highlights the role of correct participation in internet finance in improving the financial welfare of rural middle- and high-income families. The reason may be that middle-and high-income farmers have larger farms and greater willingness to expand their production scale. The use of the internet can greatly improve their information bias and cognitive bias, thereby reducing demand-based credit constraints.

Table 2: Probit model results

Variable	Overall	Low income	Medium income	High income
Knowledge of internet finance	-0.049***(0.07)	-0.0225***(0.13)	-0.0257***(0.16)	-0.0599***(0.3)
Acceptance of internet finance	-0.091***(0.08)	-0.02***(0.17)	-0.083***(0.12)	-0.097***(0.37)
Network device usage time	-0.054***(0.04)	-0.027***(0.08)	-0.084***(0.08)	-0.085***(0.12)
Gender	0.138*(0.14)	0.088**(0.23)	0.0323*(0.21)	-0.0643**(0.61)
Age	-0.009**(0.01)	-0.012**(0.02)	0.004***(0.01)	-0.0101**(0.05)
Political status	-0.006(0.12)	-0.022*(0.23)	-0.0133(0.21)	0.0183**(0.36)
State of health	-0.052*(0.08)	-0.0916**(0.14)	0.022**(0.14)	-0.028*(0.29)
Education	-0.002**(0.07)	-0.0275**(0.17)	-0.032***(0.1)	-0.0352**(0.3)
Family size	0.063***(0.05)	0.027***(0.08)	-0.138**(0.11)	0.0347(0.28)
Family age structure	-0.009**(0.01)	-0.009***(0.02)	-0.004***(0.02)	-0.0005**(0.05)
Annual per capita household income	0.085***(0.18)	——	——	——
Household savings	-0.006***(0.03)	0.091**(0.05)	-0.081***(0.06)	-0.0155***(0.07)
Constant term	0.615*(1.92)	0.024*(1.38)	0.207**(1.62)	0.8767**(1.455)
Observations	517	517	517	517

(2) Robustness test

In this paper, the method of replacing the estimation model and transforming the index construction

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

system is used to test the robustness. The test results show that the empirical analysis results are reliable.

a. Replacement estimation model

Using the logit model that is also applicable to 0 and 1 variables for regression, the estimated results in column (1) of table 3 are obtained. The estimated coefficients of the three core variables are still significantly negative at the 1% level, and the empirical results are reliable.

b. Transformation index construction system

The principal component analysis method is used to replace the original equal weighting method to construct Internet technical indicators, and then the Probit model is regressed to obtain the estimated results in column (2) of table 3. The estimated coefficient of the new Internet technical indicators is -0.098, which is significant at the 1% level, indicating the reliability of the benchmark regression results.

Table 3: Robustness test

Variable	(1)logit	（2） probit
Knowledge of internet finance	-0.082***(0.129)	
Acceptance of internet finance	-0.016***(0.146)	
Network device usage time	-0.098***(0.076)	
Internet technical indicators (New)		-0.143***(0.055)
control variable	control	control
Observations	517	517

(3) Heckman two-stage model estimation results

Table 4: Heckman two-stage model estimation results

	Selection equation				Response equation			
Variable	Overall	Low Income	Middle Income	Middle Income	Overall	Low Income	Middle Income	Middle Income
Gender	1.904*	0.582***	0.003**	0.123**	-0.146***	-0.422***	-0.010 *	-0.065*
Age	0.025**	-0.006***	0.112**	-0.016***	-0.001**	0.002***	-0.009***	0.006**
Political status	-0.424**	0.223**	-2.200**	-0.192**	0.026**	-0.166**	0.195***	0.035*
State of health	-0.488**	-0.179**	0.360**	-0.241**	0.033***	0.158	-0.036***	0.076**
Education	0.763**	0.445**	-0.909***	-0.085**	-0.054**	-0.368**	0.078**	0.045***
Family size	0.977***	0.112**	-2.225**	0.104**	-0.072***	-0.051**	0.179**	0.043**
Family age structure	0.145**	-0.018***	0.326**	0.048***	-0.011**	0.016*	-0.021***	-0.016**
Family age structure	3.510**	-0.290***	1.989**	-0.299***	-0.253***	0.079***	-0.993**	0.298**
Household savings	0.186**	-0.001**	0.841**	0.251**	-0.014	-0.001***	-0.067**	-0.085**
Knowledge of Internet Finance	-0.059***	-0.073***	0.040***	-0.099***	-	-	-	-
Acceptance of Internet Finance	-0.016***	0.044***	0.013***	-0.172***	-	-	-	-
Network device usage time	-0.039***	-0.097***	-0.028***	-0.058***	-	-	-	-
Constant term	-28.751*	4.233**	-11.815*	6.591*	3.091*	-0.553**	9.984*	-3.317*

Using the eviews11 software to obtain the results for analysis (see table 4), it was found that the inverse mills ratio of the two-stage Heckman was not significant, indicating that the model had no selection bias.

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

Table 4 shows the marginal effect results of the impact of internet technology adoption on farmers' supply-type credit constraints. It can be seen that the use of internet finance and the use of the internet have an overall inhibitory effect on farmers' credit constraints, and the overall inhibitory effect on high-income groups is more obvious, which is also in line with the conclusions of Ma Han and Hu Ridong group, the application of internet technology has increased the possibility of their supply-oriented credit constraints. The possible reason is that the use of the Internet has increased their ideas for expanding agriculture and thus generated demand for funds, but the use of the internet has improved the bank's credit rating, thereby increasing the difficulty of lending to middle-income farmers. For low-income farmers, the use of internet technology has improved their demand for small and micro business loans and reduced their supply-oriented credit constraints.

5. Conclusions and Policy Recommendations

Using the data of the micro-household survey in November 2021, this paper selects all parts of Shaanxi Province in the western region by stratified random sampling, and examines the demand and supply-type credit of farmers with different incomes on internet usage and the understanding and acceptance of internet finance. The empirical results show that internet use and internet finance can have heterogeneous effects on farmers with different incomes, and generally can significantly inhibit the credit constraints of farmers. The model remains robust. In the heterogeneity analysis, we found that compared with low-income households, the understanding and acceptance of internet finance and the use of the internet have a better effect on alleviating the demand-based credit constraints of high-income farmers. The reason for the acceptance of internet finance may be that high-income farmers have a better acceptance of financial instruments after being exposed to internet finance, and the use of internet finance can greatly reduce their transaction costs and credit risks. The degree of understanding and acceptance of internet finance and the degree of internet use have a significant inhibitory effect on the supply-type credit constraints of low-income and high-income farmers, but they can promote the supply-type credit constraints of middle-income farmers.

Based on the above conclusions, this paper puts forward relevant policy recommendations from the following two aspects:

Firstly, the empirical results of this paper find that the use of internet technology has an inhibitory effect on the overall credit constraints of farmers, and the most effective one is the acceptance of internet finance. Therefore, while popularizing the internet and internet finance, the government should simultaneously develop regular lectures and household access measures for village cadres help farmers reduce their resistance to internet finance, learn how to use Internet finance correctly, improve farmers' trust in internet finance and tolerance of internet technology, and actively strengthen internet construction , especially to allow low-income groups to carry out credit behaviors from different channels to increase their income effects.

Secondly, in the heterogeneity analysis, this paper finds that in farmers with higher family income, the effect of internet finance and internet use has a greater inhibitory effect on the formation of credit constraints, indicating that the internet has been developed so far, and it has become more suitable for rural development. When the task is basically completed, high-income groups who are willing to expand production need to develop credit business in various forms. The marginal utility generated by their group is more significant, and the effect of improving financial welfare is also greater. Therefore, it is necessary to invest in rural areas. More financial resources, especially areas with stronger income effects, will radiate to surrounding areas in the form of expanded reproduction, drive rural production, improve financial availability in these areas, and improve the development of an inclusive financial system. At the same time, it is also necessary to actively help low- and middle-income farmers to improve their information construction, help them understand the knowledge of Internet finance, improve their acceptance of Internet finance, and truly make the Internet an effective tool for them to improve their quality of life.

References

[1] Yu Quansheng, Zhou Yahong. The strength of credit constraints and the loss of farmers' well-being: An empirical analysis based on the cross-sectional data of China's rural financial survey [J]. China Rural Economy, 2014(03): 36-47.
[2] Ma Han, Hu Ridong. Discussion on the relationship between credit constraints and income of

ISSN 2616-5902 Vol. 4, Issue 8: 85-93, DOI: 10.25236/AJBM.2022.040813

different types of farmers in my country [J]. Journal of Harbin University of Commerce (Social Science Edition), 2016(05):113-122.

[3] Wang Wencheng, Zhou Jinyu. Analysis of the income effect of borrowing for different income groups in rural areas——Based on the data of the rural household survey in northeastern rural areas[J].China Rural Economy, 2012(05):77-84.

[4] Wang Guogang. The Road to reform of China's financial system [J]. Financial Market Research, 2014(09): 4-12.

[5] Qi Bin, Wu Xiaoqiu. Innovation and supervision of internet finance [J]. Internet World, 2014(09): 10-13.

[6] Zhang Xiaopu, Zhu Taihui. Reflection on the relationship between the financial system and the real economy [J]. International Finance Research, 2014(03): 43-54.

[7] Wang Weiqing, Zhang Lezhu, Wang Jiannan. My country's rural Internet finance business model, development difficulties and coping strategies [J]. Agricultural Economy, 2020(11): 109-110.

[8] Wang Ruonan, Yang Huilian, Han Xudong, Zheng Fengtian. Cooperative credit constraints: Demand or supply?—Analysis based on bivariate Pr3obit model [J]. Agricultural Modernization Research, 2019, 40(05): 774-784.

[9] Liu Limin, Li Zhizhen, Zhang Lingxia, Chen Canjun, Wang Yongqiang, Liu Fang. Research on the influencing factors of poor farmers' credit demands and channel selection - A comparative analysis of different groups of farmers based on multiple variables [J]. Western Finance, 2018(02):14-21.

[10] Xie Ping, Zou Chuanwei, Liu Haier. Basic theory of internet finance [J]. Financial Research, 2015(08): 1-12.

[11] Yang Mingwan, Zhang Lezhu. How internet financial participation affects farmers' formal lending behavior?——An Empirical Study Based on CHFS Data [J]. Journal of Yunnan University of Finance and Economics, 2021, 37(02): 4253.

[12] Su Fang, Fang Lei. Regional differences in financial exclusion in China's rural areas: Insufficient supply or insufficient demand? - A comparative analysis of banking, Insurance and internet finance [J]. Management World, 2016(09): 70-83.

[13] Sui Yanying, Ma Xiaohe. Analysis of the influencing factors of the financial exclusion of farmers and herdsmen in the west - Based on the survey data of 338 farmers and herdsmen in 7 banners (counties) in inner mongolia autonomous region [J]. China Rural Observation, 2011(03): 57-60.

[14] Chen Xiaojie, He Guangwen, Chen Yang. Digital divide and farmers' digital credit behavior: based on the survey data of rural inclusive finance in underdeveloped areas in 2019 [J]. Finance and Economics Series 2022.