

Internet Embedding, Credit Availability and Rural Households' Entrepreneurship——Empirical Analysis Based on Mediating Effect

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Abstract: Promoting family entrepreneurship in rural areas is an important driving force to promote the development of agriculture, rural areas and farmers. How to help rural entrepreneurs obtain key resources and enhance entrepreneurship and innovation ability is an important theoretical and practical issue that needs to be paid attention to at present. Based on the micro survey data of Chinese Household Finance (CHFS) from Southwestern University of Finance and Economics in 2017, this paper empirically analyzes the relationship and mechanism of Internet embedding affecting rural household entrepreneurship through credit availability by using the mediation effect model and instrumental variables, and draws the following conclusions: (1) It is found that Internet use has a significant positive impact on rural households' entrepreneurial decisions through fundamental regression and instrumental variables. (2) Credit availability plays a mediating role in the impact of Internet use on rural household entrepreneurship. (3) Entrepreneurial performance was used for robustness test. In addition, the policy enlightenment of increasing public Internet resources, giving full play to the promotion function of the Internet to finance, improving the demonstration and guiding role of the Internet in entrepreneurship.

1. Introduction

China is the largest agricultural country in the world. The development of agriculture, rural areas and farmers has always been the core issue of China's modernization and the core target of China's rural revitalization strategy. However, there are still some problems in rural areas, such as insufficient production capacity, slow growth rate of farmers' income and unbalanced development of urban-rural dual economic structure. Promoting family entrepreneurship in rural areas is an important driving force for the development of agriculture, rural areas and farmers. Supporting and encouraging rural households to start businesses will help them increase production and income, effectively improve rural productivity and promote rural economic development. The Chinese government has issued a series of relevant policies aimed at entrepreneurship in rural areas in order to improve the enthusiasm of rural families to start their own businesses as well as their entrepreneurial ability and performance. Therefore, how to help rural entrepreneurs to obtain key resources and enhance entrepreneurship and innovation ability is an important theoretical and practical issue that needs attention at present (Rui Zhengyun and Fang Conglong, 2018).

Since the late 1990s, the Internet has developed rapidly in China (Shi Jinchuan and Wang Weiwei, 2017). As of March 2020, China had 904 million Internet users, of which 255 million were in rural areas, accounting for 28.2 percent of the total Internet users, an increase of 33.08 million from the end of 2018. With the proposal and rise of "Broadband China" and other strategies, rural entrepreneurship is combined with Internet technologies such as network media and e-commerce, which reduces the cost of rural families to obtain information and improves their entrepreneurial awareness and entrepreneurial ability (Zhang Cen, 2021). At the same time, due to the "Internet plus" and other digital technologies to promote the development of inclusive finance, as well as the gradual deepening of

rural financial reform, more rural families can access financial services at a lower cost and more widely.

Therefore, the embedding of the Internet has brought opportunities for rural families to start businesses, and enhanced farmers' ability to obtain information and accumulation of social capital. At the same time, it also provides the technical foundation and promotion foundation for the development of rural finance and helps rural entrepreneurial families get more financial resources support. Therefore, the core issue of this paper is whether the development of Internet can improve the entrepreneurial ability and entrepreneurial performance of rural entrepreneurial families by improving their financial availability.

2. Literature review

(I) Internet embedding and entrepreneurial activities

First of all, the Internet is an important factor affecting family entrepreneurship. Existing relevant literature is mainly divided into two types. The first type of literature mainly studies the influence of the use of the Internet on the probability of entrepreneurial choice and entrepreneurial types. As a way and channel for entrepreneurs to obtain information, the Internet is conducive to obtaining more information on market, price and consumption, and promotes the occurrence of individual entrepreneurial behaviors (Shi Jinchuan and Wang Weiwei, 2017). Another type of research focuses on the impact of Internet use on entrepreneurial efficiency and operation. The impact of the Internet on rural entrepreneurship is particularly obvious. First, the Internet has broadened the information channels for farmers to start their own businesses. Compared with other entrepreneurial subjects, rural areas are faced with problems such as remote geographical location, low level of education, relatively insufficient start-up funds and low entrepreneurial skills. The penetration of the Internet will stimulate entrepreneurial vitality in rural areas (Li Xiaowen and Li Jinying, 2021). Second, the Internet facilitates farmers' access to social capital needed for entrepreneurship. Social capital, such as human connections, can play a role in resisting risks for farmers' entrepreneurship. Yang Delin et al. (2017) took enterprises as the research object and demonstrated that social capital plays a partial intermediary role in promoting entrepreneurial performance through the Internet from two dimensions of information and social interaction. Third, the Internet in farmers procurement and sales to increase entrepreneurial performance. Use the Internet to search for the production materials of the relevant products to facilitate farmers to select the appropriate procurement target.

(II) Internet Embedding And Rural Credit Availability

The Internet Has Played An Important Role In Increasing The Availability Of Credit To Farmers. Some Scholars Have Studied The Effect Of Internet Use On The Increase Of Financial Participation And Other Aspects, Mainly Including The Following Relations: First, Internet Use Can Improve The Credit Level Of Farmers And Thus Increase The Financial Availability. The Convenience Of Information Access Increases Farmers' Access To Credit, While The Increase Of Social Capital Reduces The Risk Of Credit Access (Chiles And McMackin, 1996). Second, Internet Use Has Promoted The Development Of Inclusive Finance And Increased The Convenience Of Farmers' Financial Participation. With The Deepening Of Research, Academia Believes That The Development Of Internet And Other Information Technologies Can Promote The Development Of Inclusive Finance (Repkine, 2008). Third, Internet Use Improves Financial Inclusion And Thus Affects Farmers' Access To Finance. The Internet Has A Significant Positive Impact On Financial Inclusion (Ghosh, 2016). Fourthly, Internet Use Reduces Farmers' Financial Exclusion, Thus Increasing Financial Availability. Household Owners' Lack Of Financial Knowledge And Low Trust In Financial Institutions Lead To Financial Exclusion (Sui Yanying And Ma Xiaohe, 2011).

(III) Availability of credit and rural entrepreneurship

Improved credit availability will boost rural entrepreneurship. On the one hand, financial support and a good financial environment will promote entrepreneurial activities (Xiang Zhiluo and Zhang Deyuan, 2020). Financial availability is significantly correlated with farmers' entrepreneurial decisions (Lu Yajuan et al., 2014). In addition, many scholars have demonstrated the relationship between

financial availability and rural entrepreneurship in terms of household heterogeneity. When Yang Jun et al. (2013) and Lu Yajuan et al. (2014) analyzed the impact of financial resources on the heterogeneity analysis of farmers' entrepreneurship, they found that formal financing had a more significant impact on farmers' entrepreneurship. On the other hand, some literatures have studied the mechanism of credit constraint, which is opposite to financial availability, affecting farmers' entrepreneurship. Credit constraints remain widespread in rural China. Low credit availability will form credit constraints and hinder the development of rural entrepreneurship (Xiang Zhiliao and Zhang Deyuan, 2019). Reducing rural credit constraints and improving credit availability are beneficial to the development of farmers' entrepreneurship.

It can be seen from the above literature that although many scholars have conducted many studies on the relationship between the use of the Internet and entrepreneurship. However, there are few studies on whether the Internet can influence rural family entrepreneurship through the intermediary variable of credit availability. Most of them are couples. Based on this, this paper intends to use the micro survey data of Chinese Household Finance (CHFS) from Southwestern University of Finance and Economics in 2017 to verify the relationship between Internet embedding and rural household entrepreneurship through credit availability by means of mediating effect model and instrumental variables.

3. Model construction and variable selection

(I) Model construction

To investigate the interrelationship among Internet embedding, credit availability and rural household entrepreneurship, we set up two sets of models. The first set of models respectively investigated the relationship among Internet use, credit availability and rural household entrepreneurship, as shown in Equation (1).

$$Entrepre_{i,t} = \beta_0 + \beta_1 Internet_{i,t} + \beta_2 Loan_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where I and T represent region and time respectively, and "Entrepre" represents whether the household is self-employed or not. The value is 1 if self-employed and otherwise 0. "Internet" refers to Internet usage, "Loan" refers to credit availability, and "X" refers to control variables, including household characteristics, household head characteristics, regional characteristics, etc.

In order to further study whether Internet use affects rural household entrepreneurship through credit availability, that is, whether credit availability mediates the impact of Internet use on rural household entrepreneurship, we introduce the mediating effect model. This paper uses the stepwise regression test proposed by Baron and Kenny(1986) and validated by Wen Zhonglin and Ye Baojuan (2014) to construct the second group of models to test the mediating effect, as shown in equations (2), (3) and (4).

$$Entrepre_{i,t} = c_0 + c_1 Internet_{i,t} + c_2 X_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$Loan_{i,t} = a_0 + a_1 Internet_{i,t} + a_2 X_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$Entrepre_{i,t} = b_0 + c'_1 Internet_{i,t} + b_1 Cref_{i,t} + b_2 X_{i,t} + \varepsilon_{i,t} \quad (4)$$

(II) Data sources and variable statistics

1. Data sources

The data used in this paper are from the micro survey data of Chinese Household Finance (CHFS) of Southwestern University of Finance and Economics in 2017. The questionnaire covers the economic status of rural households, the personal characteristics of household heads, whether they are engaged in industrial and commercial business projects and the number of business start-ups. Through the questionnaire matching and missing value processing, 12,529 family data were finally used in the empirical study of this paper.

2. Variable selection and descriptive analysis

(1) Explained variables

Entrepre selects the data of whether or not your family is engaged in self-employed industry and commerce. The question of this variable in the questionnaire is: "Are your family currently engaged in industrial and commercial production and operation, including self-employed, leasing, transportation, online shop and business operation?" The answer to this question indicates whether households make entrepreneurial decisions, with 12.09% of rural households participating in industrial and commercial production and operation.

(2) Explanatory variables

Internet use (Internet), referring to Zhang Jingna and Zhang Xuekai (2020), we use Internet use as an explanatory variable to measure household Internet use. From the three aspects of Internet use, Internet procurement and types of mobile phones, this paper uses the Internet to measure whether or not to use the Internet. By asking household respondents (mostly heads of households) "Have you ever used the Internet? (Respondents are considered to have used the Internet if they have been on the Internet or use some apps.) Get an answer ". 25.60% of the farmers in the sample had used the Internet.

(3) Intermediary variables

Loan is measured by the availability of bank/credit union loans and is asked in the questionnaire "Has your family received a Loan from a bank/credit union to date?" Among them, the proportion of farmers who have received loans from banks or credit cooperatives is 17.42%.

(4) Control variables

The control variables added in this paper mainly include the characteristic variables of household head, including gender, age, educational level, marital status, physical condition, and whether the household head is a member of the Communist Party of China or a probationary member. At the household level, variables include household size, per capita household income, total household assets, social contacts, number of cars, and medical expenses. In terms of the characteristics of head of household, male head of household was significantly more than female head of household. In terms of education level, it can be seen that most rural people have education background below high school. Only 3.76% of rural people have education background between high school and bachelor's degree, and only 0.03% of rural people have graduate degree, which indicates that the education level of rural people is generally low. In terms of marital status, 87.23% of rural people were married, but there were a few separated, divorced, widowed and remarried people. In terms of physical condition, the health level of rural people is generally good, and most of them are above average. Only 7.231% of the total number of CPC members or probationary members in the countryside, indicating that only a very small number of people in the countryside are party members. At the family level, the average size of rural families is about 4 people. Per capita household income is calculated by dividing total household income by the number of households and taking the logarithm. Total household assets and medical expenses are taken as logarithms, respectively. Human connection is measured by the cash or non-cash income households receive from non-family members. The specific definition and descriptive statistical analysis of each variable are shown in Table 2.

Table 2 Definition and descriptive statistical analysis of each variable

Variable Name	Definition and description	Mean	Standard deviation	Minimum	Maximum
Explained variable					
Entrepre	Whether the entrepreneur is engaged in self-supporting industry and commerce, yes =1, no =0	0.121	0.326	0	1
Explanatory variable					

Internet	Yes =1, No =0	0.2 56	0.436	0	1
Intervening variable					
Loan	Whether to obtain bank/credit union loans, yes =1, no =0	0.1 74	0.379	0	1
Control variables					
Gender	Male =1, female =0	1.1 2	0.329	1	2
Age	Age of the head of the household	56. 83 4	12.427	4	117
Education Level	No schooling =1, primary school =2, junior high school =3, Senior high school =4, technical secondary school/vocational high school =5, Junior College/vocational high school =6, Undergraduate =7, Master =8, Doctor =9	2.5 75	1.050	1	9
Marital Status	Unmarried =1, Married =2, Cohabitation =3, Separated =4, Divorced =5, Widowed =6, Remarried =7	2.3 86	1.206	1	7
Physical condition	very good =5, good =4, fair =3, bad =2, very bad =1	2.8 16	1.065	1	5
Political status	Party member or probationary Party member, yes =1, no =0	0.0 72	0.259	0	1
Social	The logarithm of cash or non-cash income from non-family members	5.4 03 6	3.9539	0	10.7 144
Family size	Total family population	3.8 16	1.821	1	20
Per capita household income	The per capita household income is logarithmic	8.5 80	2.064	- 3.53 5	13.9 35
Total household assets per capita	The logarithm of per capita total assets of households	10. 57 0	1.791	- 1.38 6	16.5 24
Number of cars	Number of cars owned by households	0.1 98	0.452	0	5
Online shopping	Yes =1, No =0	0.2 46	0.431	0	1
Medical expenditure	The logarithm of household expenditure on medical care	6.3 12 3	3.4543	0	14.2 21

4. Analysis of empirical results

(1) Fundamental regression and endogeneity test

Table 3 Basic regression and endogenous treatment

	Model one	Model two
Explained variable	Entrepre	Entrepre
Internet	0.1860*** (0.0524)	0.1402*** (0.0379)
Loan	0.2770*** (0.0352)	0.150** (0.0711)
Gender	0.1305*** (0.0324)	0.0777* (0.0428)
Age	-0.0298*** (0.00185)	-0.0131*** (0.00293)
Education Level	-0.0248*** (0.0016)	-0.0322 (0.0301)
Marital Status	0.0508*** (0.0177)	0.0204 (0.0258)
Physical condition	0.0127*** (0.00211)	0.0747*** (0.0280)
Political status	-0.211*** (0.0616)	-0.0108* (0.0067)
Social	0.0444 (0.0391)	0.0475 (0.0555)
Family size	0.0706*** (0.0130)	-0.0126 (0.0160)
Per capita household income	0.0312* (0.0163)	0.0867*** (0.0220)
Total household assets per capita	0.0164*** (0.00124)	0.0231*** (0.00185)
Number of cars	0.0914*** (0.00474)	0.103*** (0.00746)
Online shopping	0.0427*** (0.00526)	0.0756*** (0.00769)
Medical expenditure	-0.0373*** (0.00122)	-0.0298* (0.0171)
Constant	0.150*** (0.0226)	0.168*** (0.0379)
Province dummy variable	Yes	Yes

Note: Standard error values in brackets, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Model 1 in Table 3 is based regression, which reports the test results of the impact of Internet use, credit availability and control variables on entrepreneurship; Model 2 is endogeneity test, which reports the regression results under the use of instrumental variables. In order to solve the endogeneity problem that may exist in the model, this paper uses the phone type as a tool variable to try to deal with the endogeneity problem. The variable of mobile phone type includes three options: no mobile phone, non-smart phone and smart phone. According to the Statistical Survey on The Development of Internet in China (2021), it can be found that about 99.6% of Internet users with Internet use experience use mobile phones as electronic carriers of Internet. Desktop, laptop and tablet computers are all around 25% to 35%. Therefore, whether rural families use the Internet or not is closely related to the type of mobile phone, but the type of mobile phone does not have a direct impact on family entrepreneurial decisions and entrepreneurs' business performance. Therefore, the instrumental variable is feasible in theory.

The results show that Internet use has a positive impact on entrepreneurship at a significant level of 1%, indicating that the statistical result that Internet use has a positive and significant impact on entrepreneurship of rural families is basically credible.

(2) Mediation effect test

Table 4 Mediation effect test results

	Model three	Model four	Model five
Explained variable	Entrepre	Loan	Entrepre
Internet	0.245*** (0.0553)	0.273*** (0.0491)	0.1860*** (0.0524)
Loan			0.2770*** (0.0352)
Control variables	Yes	Yes	Yes
Province dummy variable	Yes	Yes	Yes
Constant	0.236*** (0.0358)	0.258*** (0.0504)	0.150*** (0.0226)

Note: Standard error values in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table 4 shows the test results of the mediating effect of Internet use on rural household entrepreneurship through credit availability. The results in Model 3 show that Internet use has a positive impact on entrepreneurship and is significant at the significance level of 1%. In addition, the results of Model 4 reflect that the impact of Internet use on credit availability is positive and significant at the significance level of 1%. The data in Model 5 show that the impact of Internet use on entrepreneurship is positive and significant at the significance level of 1%, and the impact of credit availability on entrepreneurship is positive and significant at the significance level of 1%. Model at the same time understanding the Internet use of entrepreneurship regression coefficient absolute value is lower than that of the three models, model 4 Internet use for *the* regression coefficients and the model of credit availability understanding credit availability on the product of the regression coefficient of entrepreneurial symbol is positive, and the impact on the business model 3 Internet use in the regression coefficient of symbols, This indicates that credit availability has a mediating effect on the impact of Internet use on entrepreneurship, and this effect accounts for 30.87% of the total effect of Internet use on entrepreneurship ($0.273 \times 0.277 / 0.245$).

(3) Stability test

Table 5 Stability test

	Model six	Model seven	Model eight
Explained variable	Entrepreneurial performance	Loan	Entrepreneurial performance
Internet	0.184** (0.0710)	0.273*** (0.0491)	0.159*** (0.0353)
Loan			0.198** (0.0836)
Control variables	Yes	Yes	Yes
Province dummy variable	Yes	Yes	Yes
Constant	0.155*** (0.0367)	0.245*** (0.0540)	0.214*** (0.0397)

Note: Standard error values in brackets, *** p<0.01, ** p<0.05, * p<0.1

Table 5 for Internet use by credit availability affect the stability of the rural family business inspection results, based on the stability test is the entrepreneurial performance as explained variable, and the logarithmic processing, the variable in the questions in the questionnaire is "last year, your

home after-tax income obtained from these projects in which of the following?" The results show that both Internet use and credit availability have a significant positive impact on entrepreneurial performance, and the results of models iv to VI are similar to those of the mediating effect test, proving that credit availability has a mediating effect on the impact of Internet use on entrepreneurial performance. And accounted for 29.38% ($0.273 \times 0.198 / 0.184$) of the total effect of Internet use on entrepreneurial performance, which was smaller than the test result of entrepreneurship as an explained variable, indicating that entrepreneurship is more closely related to Internet use. Therefore, the main research conclusions of this paper are relatively robust.

5. Conclusions and policy implications

Based on the micro survey data of Chinese Household Finance (CHFS) from Southwestern University of Finance and Economics in 2017, this paper empirically analyzes the relationship and mechanism of Internet embedding affecting rural household entrepreneurship through credit availability by using the mediation effect model and instrumental variables, and draws the following conclusions: First of all, we found that Internet use had a significant positive impact on entrepreneurial decisions of rural households by means of fundamental regression, and the results were consistent by using instrumental variables to deal with endogeneity problems. Secondly, credit availability plays a mediating role in the impact of Internet use on rural household entrepreneurship, and this effect accounts for 30.87% of the total effect of Internet use on entrepreneurship. Finally, the robustness test is conducted with entrepreneurial performance as the explained variable, and credit availability still has a mediating effect on the impact of Internet use on entrepreneurial performance, accounting for 29.38% of the total effect. It further shows that the embedding of the Internet promotes the choice and performance of rural households to start their own businesses, and the availability of credit plays an extremely important intermediary role between the two.

Based on the above conclusions, the following policy implications are proposed: First, continue to promote the popularization of the Internet in rural areas. The use of the Internet reduces the cost of acquiring information and the cost of risk, promotes the decision-making of farmers and improves the performance of entrepreneurship. Therefore, the popularization rate of the Internet in rural areas should be further improved, and public Internet resources should be added. Under the influence of the rural revitalization policy, we will upgrade the level of network infrastructure construction, accelerate the deployment of 5G technology in the network, and reduce the cost of using the network. Second, give play to the role of the Internet in rural financial development and inclusive finance. Internet application for farmers in rural financial products and financial services provide a more convenient channels, reduce the farmers' credit constraints and financial exclusion, so should further expand the role of the Internet on the rural financial development, can make use of live, short video, Internet platforms such as electricity, popularization of relevant financial knowledge to farmers, Farmers can also use the Internet to obtain information related to finance and credit, strengthen the connection between financial institutions and farmers, so as to promote the development of inclusive finance in rural areas. Third, we should further enhance the exemplary and guiding role of the Internet in entrepreneurship. With the advantages of convenience and speed of Internet, farmers should be strongly encouraged to use Internet platform to learn entrepreneurial knowledge and pay attention to entrepreneurial dynamics, so as to reduce the risks of rural family entrepreneurship, better guarantee the quality of family entrepreneurship, and improve the operating efficiency and performance of entrepreneurship. Fourth, improve farmers' financial literacy and Internet skills. Promoting farmers' learning of financial knowledge and Internet knowledge is conducive to farmers' better understanding of finance, improving their credit participation and participation ability, and increasing the benefits of the impact of the Internet on farmers' credit availability. Fifth, provide policy support and New Deal subsidies for rural entrepreneurship. The government should improve the existing institutional environment related to entrepreneurship, encourage and support mass entrepreneurship, increase farmers' enthusiasm for entrepreneurship, and accelerate the implementation of subsidies and welfare and tax reduction policies for entrepreneurship.

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