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Impact of Digital Financial Inclusion on Entrepreneurial Decision-Making

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ABSTRACT

Digital financial inclusion provides the best financial support for economic development in low-income, disadvantaged industries and remote areas. Based on the household questionnaire data of Peking University and China's digital financial inclusion indicators, this research focuses on building a basic model of the impact of digital financial inclusion on entrepreneurial decision-making of Chinese farmers, and divides digital financial inclusion into depth of application and breadth of coverage, using a logistic regression model to explore the effect. The study draws the following conclusions: First, the promotion of digital financial inclusion is conducive to promoting farmers' entrepreneurial decision-making. From the perspective of coverage breadth and application depth, it both has a relatively obvious positive effect. Secondly, without loan from bank, the impact of digital financial inclusion on farmers' entrepreneurial decision-making is significantly positive. Third, increasing government subsidies is conducive to promoting rural people's entrepreneurship.

1. Introduction

Personal factors, family factors, entrepreneurial environment, social capital, working time and new rural cultural factors play an important role in entrepreneurship (Ratnawati,2020; Qin et al.,2020; Beck et al., 2018). However, the study by the Chinese Academy of Social Sciences in 2017 found that some entrepreneurs believe that financial constraints are the greatest factor restricting entrepreneurship. Financial constraints are also one of the important factors that affect Chinese farmers' independent innovation and entrepreneurship, and the most appropriate solution is to develop comprehensive finance (Zhou,2021; Teng et al.,2021). China first proposed "digital comprehensive finance" at the G20 summit in 2016, advocating the use of digital information technology to vigorously develop inclusive digital finance to meet the financial needs of entrepreneurs.

Digital finance refers to relying on all existing digital technologies to meet the needs of the customers (Ozili,2018). Compared with traditional financial services, digital finance is easier to obtain and more durable for the entrepreneurs (Liu,2021; Qiu,2018). In recent years, with the implementation of digital inclusive finance in China, the network is the main service object, such as WeChat, Alipay, etc. As people use electronic payment tools, people's lives have become more and more convenient. At the same time, the popularity of digital financial services is also increasing which can be achieved through technical means (Jiao et al.,2015; Gopalkrishnan,2013; Palich&Bagby,1995), such as expanding the scale of financial services and enriching financial products.

In China's rural areas, there are serious capital constraints and information asymmetry in the entrepreneurial funds of rural residents, and digital inclusive finance can solve this problem well. On the one hand, digital inclusive finance expands the financing channels of farmers through digital technology, solves the traditional problems of high financing threshold and low efficiency, and relieves farmers' loan constraints (Lv,2016). At the same time, using big data technology, digital inclusive finance can provide farmers with a large amount of entrepreneurial information, and can effectively solve various information barriers they encounter in the process of starting a business.

The traditional financial development theory takes the effect of financial depth on financial development as the research object (Forlani&Mullins,2000; Simon,1972). The premise of this theory is that all people are within the financial system and have access to the necessary credit services. However, we know that people at different income levels need different financial services. A reasonable financial system should not only meet the needs of individuals, but also take into account financial services for all

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income levels. However, at present, most of the funds of financial institutions are concentrated in the wealthier people and more developed companies in the city. Rural farmers are often marginalized or excluded from the financial system. They cannot obtain corresponding financial services from traditional financial institutions, such as commercial banks, and also lack venture capital (Leng&Chen,2017). Some scholars believe that the expansion of financial industry does not have much positive effect on the development of enterprises (Lan&Deng,2016; Huang,2017). Therefore, the traditional financial development theories often have certain limitations when discussing the effect of financial development on rural entrepreneurs. Inclusive digital finance can motivate rural entrepreneurs from three levels of credit constraints, information constraints and trust.

First, the development of inclusive finance will help reduce the restrictions on loans for rural entrepreneurs, provide them with loans, and provide entrepreneurial plans for farmers who lack funds and have the ability to start their own businesses (Wang et al.,2018). Most of the startup and development of business plans are borrowed from relatives and friends. This also reflects the role of capital in the development of a company. Rural groups do not need large-scale and centralized financial services like urban groups, but tend to be small-scale and relatively scattered (Song,2017; Wu,2013; Yan,2011). This feature requires banks to invest much more in loans than before, so that financial institutions can really It provides effective and necessary services for those rural residents who want to start a business. Digital financial inclusion provides services to farmers through advanced digital technologies. In addition, the development of inclusive financing is conducive to expanding the coverage and use of finance, and is conducive to rural farmers' financing (Wang et al.,2018). Alleviate their exclusion from the financial system, ease their financial exclusion, ease their credit restrictions, and start entrepreneurship in rural areas.

Second, the development of digital inclusive finance is conducive to reducing information constraints in rural areas, and inclusive digital technology can provide farmers with real-time and efficient entrepreneurial information through modern technology (Hall&Lerner, 2010; Zhang et al.,2013). Using digital technology to promote inclusive development, expand its business scope, and enhance its use, farmers can enjoy more formal financial services in the process. In this way, they can improve their financial knowledge, understand and accept financial products. In addition, farmers who are willing to start a business can also participate in roadshows and promotion activities at the project site, and communicate with the project manager. At the same time, through digital technology, a unified online financial service platform has been built to realize the development of inclusive finance. Through communication with other entrepreneurs, they can better understand entrepreneurship, grasp market opportunities, enhance their understanding and management of risks, and then promote rural entrepreneurship.

Third, the development of inclusive finance will help boost farmers' confidence in society and promote investment in all aspects (Kong,2013; Xie et al.,2018). It is very safe to develop digital inclusive finance and provide more financial services for the people by strengthening the management of financial risks. Therefore, for this type of rural entrepreneurial projects, social investors are very active. This not only enables farmers to obtain more information technology resources in rural areas, but also provides efficient services for farmers in different industries. On the basis of the above theory, the following assumptions are put forward:

Hypothesis 1: Digital financial inclusion can facilitate farmers' entrepreneurial decision-making.

Hypothesis 2: The role of digital financial inclusion in promoting the entrepreneurial behavior of rural entrepreneurial households is achieved by improving the availability of credit funds for rural households.

2. Numerical approach

2.1 Theoretical model

The question of this study is whether digital financial inclusion can have a significant positive impact on farmers' entrepreneurial decisions. Since the research variable is whether rural households have started entrepreneurship, the result is that the farmer has engaged in entrepreneurial behavior or has not yet engaged in entrepreneurial behavior, so entrepreneurship is a binary dummy variable. Therefore, the study uses a logistic regression model to determine whether digital inclusive finance affects rural entrepreneurship. Research. The logistic regression model is set as follows:

$$\mathrm{Entrepreneurship}_i = \beta_0 + \beta_1 \mathrm{index} + \beta_2 Z + \varepsilon \quad (1)$$

Entrepreneurship is the explained variable, indicating whether farmers have engaged in entrepreneurial behavior. If the variable value is 1, it means that rural households have engaged in entrepreneurial behavior, and if the variable value is 0, it means that rural households have not yet engaged in entrepreneurial behavior; Indicates the digital financial inclusion development index, which indicates the development level of digital financial inclusion; Z is a control variable, which indicates the factors that affect farmers' entrepreneurial behavior, such as the age of the entrepreneur, the gender of the entrepreneur, whether the entrepreneur is married, the entrepreneur Health status, entrepreneur's family size, and whether there are major events; ε is a random error term. The data normalization process is as follows:

$$X'_{ij_q} = \frac{X_{ij_q} - \overline{X}_{ij}}{S_{ij}} \quad (2)$$

I represents the evaluation object, j represents the evaluation index; X_{ij} represents the original data; X'_{ij} represents the standardized statistical value of the indicator.

$$\begin{cases} r_{ij} = \overline{X_{ij}} + A = \dfrac{X_{ijq} - \overline{X_{ij}}}{S_{ij}} + A \\ p_{ij} = \dfrac{r_{ij}}{\sum_{q=1}^{11} r_{ij}} = \dfrac{X_{ijq} - \overline{X_{ij}} + A * S_{ij}}{\sum_{q=1}^{11} X_{ijq} - \overline{X_{ij}} + A * S_{ij}} \end{cases} \quad (3)$$

The p_{ij} is calculating the proportion of the jth index in the evaluation system of the ith year., among which $A = \min\left(X'_{ij}\right)$ is the translation value.

$$G_j = -k\sum_{i=1}^{n} P_{ij} \ln P_{ij} \tag{4}$$

G_j is the entropy value of the standardized measure index.

2.2 Sample selection and data sources

The data of the explanatory variables are the digital financial inclusion development indicators (2011-2018), from the Institute of Digital Finance of Peking University, while the data of the control variables and explained variables are from the household questionnaire data of Peking University. The software used in the empirical analysis is stata16.

(1) Explained variables. It is the Farmers' Entrepreneurial Decision-making (FED). Whether someone is engaged in self-employment is regarded as the standard for starting a business (Xu&Xiao,2017). The selected variable comes from the personal questionnaire data in the Peking University Family Questionnaire Survey, that is, "whether someone is engaged in self-employment", and based on this as a result, they were divided into two groups. Those who answered "yes" were classified as entrepreneurs, and those who answered "no" were classified as non-entrepreneurs.

(2) Explanatory variables. Digital Financial Inclusion Indicators (DFII) were analyzed using data from Ant Technology (Xie et al., 2018). This index contains data from 8 years from 2011 to 2020 and is widely used in China. Digital financial inclusion indicators are divided into breadth and depth (zhang et al.,2013). The meaning of coverage breadth is how many people covered, the proportion of users, etc. the meaning of use depth is the frequency of use, such as the per capital payment amount in the payment business, the per capital loan in the credit business number, the number of insured persons in the insurance business, etc.

(3) Control variables

Size-Whether the size of the family population will affect entrepreneurship is still inconclusive. If rural households have a larger population, larger households can better drive farmers' entrepreneurial decisions. However, due to the large number of rural households, their burden is heavier, the living pressure is higher, and high credit financing will hinder entrepreneurship.

Age-In terms of DFI, younger people are better able to understand new concepts and keep pace with policy than older people. But on the contrary, young people may choose not to start a business for the time being due to insufficient practical experience. Therefore, we set it as a control variable to further explore its impact on farmers' entrepreneurial behavior.

Gender-Most men are more resistant to pressure than women, and they are more willing to try when they have the idea of starting a business than they are more willing to challenge and do risky things, but girls are more serious and careful in doing things , including gender as a control variable to explore its effect.

Marriage-In rural areas, some people will want to get married first, and then start a business after stabilizing their relationship. These people will be more willing to start a business after they have established a career, but some people feel that they are alone and have no constraints, so they can go without distractions. Start business. This variable will also be explored.

Health-Healthy people have enough energy to deal with entrepreneurship. Health status affects people's enthusiasm for entrepreneurship, so it is one of the control variables.

Events-Whether there are major events in the family, such as funeral, child birth, etc., it will have an impact on rural people's entrepreneurship decision.

3. Results

3.1 Descriptive statistical analysis of variables

Descriptive statistical analysis of variables is shown in Tab 1, Fig1 and Fig2. The variable observation value is 20390, and the mean value of the explained variable of entrepreneurial decision-making is 0.115, indicating that only a small number of people in rural areas choose to start a business; the mean value of gender is 0.481, indicating that the number of women heads of rural households is slightly higher than the number of men. The mean value of marriage is 1.858, indicating that most of the household heads are married; the mean value of family size is 4.217, so the mean number of rural family members is four.

Tab. 1. Descriptive statistical analysis of variables (Observations are 20390).

Variables	Mean	S.D.	Min	Max
FED	0.115	0.319	0.000	1.000
DFII	296.451	24.725	263.120	377.730
breadth	278.458	21.251	249.820	353.870
depth	281.865	38.306	225.270	400.400
size	4.217	2.269	2.000	8.000
age	45.707	16.686	16.000	95.000
gender	0.481	0.500	0.000	1.000
marriage	0.858	0.349	0.000	1.000
health	2.987	1.259	1.000	5.000
events	0.172	0.377	0.000	1.000

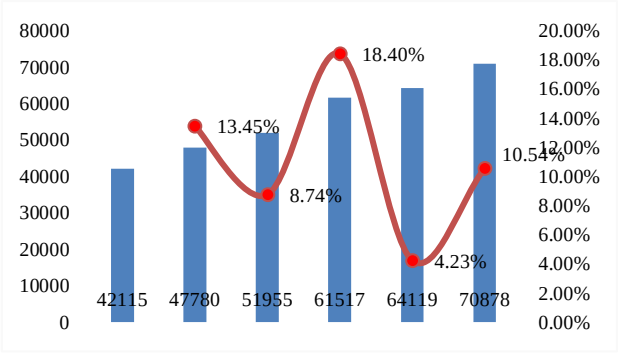

Fig. 1. The scale of digital financial inclusion and its growth in China (Unit: 100 million yuan)

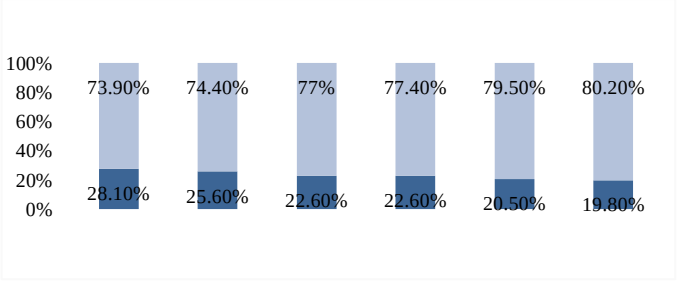

Fig. 2. The comparative data of entrepreneurship and non-entrepreneurship in China

3.2 Benchmark regression analysis

The regression results of the logistic model list the impact of each variable on farmers' entrepreneurial decision-making in Table 2. Model1 is added to the total Digital Financial Inclusion Indicators (DFII), model2 is added to the coverage breadth of digital financial inclusion, and model (3) is added to the use depth of digital financial inclusion. From the comparison of the results in the three columns, it can be proved that the significance and size of the total index, coverage breadth and use depth are all verified, and the coverage breadth is the most significant.

From the perspective of control variables, it is verified that the personal characteristics of Chinese farmers also have a significant impact on FED. Among them, marriage, major events, and family size have a significant positive impact on entrepreneurship decision-making. Families with a spouse are more inclined to start a business than those without a spouse. Age has a significant negative effect in this benchmark regression result, young people are more willing to start a business than the elderly. The gender and health of farmers have no significant impact on entrepreneurship, indicating that entrepreneurship is not divided between men and women, gender does not affect entrepreneurship, and health status does not have a great impact on entrepreneurship.

Tab. 2. Results of benchmark regression analysis.

Variables	Model1	Model2	Model3
FED	FED	FED	FED
DFII	0.0039***		
	(4.5044)		
breadth		0.0036***	
		(3.4913)	
depth			0.0028***
			(4.8889)
size	0.1089***	0.1082***	0.0028***
	(11.2243)	(11.1524)	(4.8889)
age	-0.0184***	-0.0183***	0.1091***
	(-10.6429)	(-10.6067)	(11.2516)
gender	0.0469	0.0465	-0.0184***
	(1.0440)	(1.0366)	(-10.6650)
marriage	0.4467***	0.4466***	0.0473
	(5.8005)	(5.7992)	(1.0531)
health	0.0218	0.0217	0.4464***
	(1.1351)	(1.1315)	(5.7965)
	0.3208***	0.3217***	0.0220
	(5.9752)	(5.9916)	(1.1465)
Constant	-3.8714***	-3.6944***	0.3211***
	(-12.7636)	(-11.3641)	(5.9800)
Samples	20390	20390	20390

Note: ***, ** and * represent significance at the 1%, 5% and 10% significance levels, respectively, with t values in parentheses.

3.3 robustness check

(1) Robustness analysis. In this study, we will select similar indicators instead to further test whether the benchmark regression results are robust. Model 2 in Table 3 uses an index representing the coverage of digital financial inclusion in my country to test whether the coverage and breadth of digital financial inclusion can affect farmers' entrepreneurial decisions. The regression results show that the estimated coefficient of the coverage index is 0.0018, and significant at the 1% level, indicating that the coverage of digital financial inclusion has effectively promoted farmers' entrepreneurial behavior. Model 3 uses an index representing the use and effect of digital financial inclusion to test whether the application and promotion depth of digital financial inclusion can have an impact on farmers' entrepreneurial decisions. The results show that the depth of use index and entrepreneurial variables are significant at the 1% level. A positive correlation, with a regression coefficient of 0.0153, indicates that the extensive and deep use of digital financial inclusion has promoted enterprise innovation in rural areas. After replacing the original estimated model with the probit model and re-regressing, the results are still the same as before, indicating that the results are robust to a certain extent in Tab. 3..

Tab. 3. Results of benchmark regression analysis.

Variables	Model1	Model2	Model3
FED	FED	FED	FED
DFII	0.0021***		
	(4.4322)		
breadth		0.0018***	
		(3.3868)	
depth			0.0153***
			(4.8523)
size	0.0603***	0.0598***	0.0605***
	(11.4273)	(11.3425)	(11.4707)
age	-0.0100***	-0.0100***	-0.0100***
	(-11.0170)	(-10.9815)	(-11.0409)
gender	0.0232	0.0231	0.0234
	(0.9808)	(0.9781)	(0.9873)
marriage	0.2432***	0.2434***	0.2426***
	(5.9702)	(5.9763)	(5.9573)
health	0.0124	0.0124	0.0126
	(1.2307)	(1.2290)	(1.2420)
events	0.1737***	0.1747***	0.1735***
	(5.9452)	(5.9806)	(5.9348)
Constant	-2.1771***	-2.0749***	-1.9782***
	(-13.5145)	(-12.0306)	(-16.7893)
Samples	20390	20390	20390

Note: ***, ** and * represent significance at the 1%, 5% and 10% significance levels, respectively, with t values in parentheses.

(2) Heterogeneity analysis. Since different local governments currently have different policies to help farmers start their own businesses, digital inclusive finance will have different effects under the influence of different local governments' supports, and there are great differences in the impact on farmers' enthusiasm for entrepreneurship in China. In addition, the individual financial status of farmers in China will also affect their entrepreneurial decisions. In order to examine the impact of relevant government policies and personal financial status on farmers' entrepreneurial behavior, this study will analyze the heterogeneity from two aspects: government subsidies and whether there are loans which may borrowed from bank or other agencies or individuals.

Tab. 4. Results of heterogeneity analysis (Government Subsidies).

Variables	Model1	Model2
FED	FED(Without subsidies)	FED(With subsidies)
DFII	0.0007	0.0037**
	(0.6361)	(2.2350)
size	0.0964***	0.1491***
	(7.4644)	(10.0021)
age	-0.0198***	-0.0125***
	(-8.4352)	(-4.8354)
gender	0.0436	0.0578
	(0.7180)	(0.8611)
marriage	0.4373***	0.3244***
	(4.2405)	(2.7737)
health	0.0082	0.0294
	(0.3083)	(1.0534)
events	0.2571***	0.4359***
	(3.3675)	(5.7010)
Constant	-2.4893***	-4.3076***
	(-6.3666)	(-8.0784)
Samples	9383	11007

Note: ***, ** and * represent significance at the 1%, 5% and 10% significance levels, respectively, with t values in parentheses.

In the sample with subsidies form the government, the impact of DFII on farmers' entrepreneurial decision-making is significantly positive which is shown in Tab.4., and in the sample without government subsidies, the impact of DFII on farmers' entrepreneurial decision-making is not significant. It shows that government subsidies can effectively promote the enthusiasm of farmers to start a business. At present, many farmers have enthusiasm for starting a business, but due to various deficiencies and consideration, they dare not start a business. The government subsidies have given them certain support and confidence, attracting more farmers who are interested in starting a business to join and entrepreneur.

Tab. 5. Results of heterogeneity analysis (loans).

Variables	Model1	Model2
FED	FED(Without loans)	FED(With loans)
DFII	0.0029***	0.0127***
	(2.9434)	(6.4539)
size	0.0936***	0.1829***
	(8.7884)	(7.0624)
age	-0.0178***	-0.0123***
	(-9.3639)	(-2.8045)
gender	0.0425	0.0268
	(0.8591)	(0.2427)
marriage	0.3812***	0.6467***
	(4.5150)	(3.3690)
health	0.0214	0.0570
	(1.0177)	(1.1673)
events	0.3664***	0.0838
	(6.2024)	(0.6381)
Constant	-3.4846***	-6.9550***
	(-10.3358)	(-9.6596)
Samples	18114	2276

Note: ***, ** and * represent significance at the 1%, 5% and 10% significance levels, respectively, with t values in parentheses.

In the two groups of samples, the impact of DFII on farmers' entrepreneurial decision-making is significantly positive in Tab.5., but positive effect of without loan from bank is greater than the group of with loan. Farmers with unpaid loans are more economically stressed than those without unpaid loans. Farmers with loans have living pressures, economic pressures, etc., which will make them have more concerns when considering starting a business. On the contrary, farmers who have no loans have relatively little economic pressure and are more inclined to start businesses.

The statistics in Fig3 and Fig4 show the existence of different government subsidies and loans for entrepreneurial farmers in China.

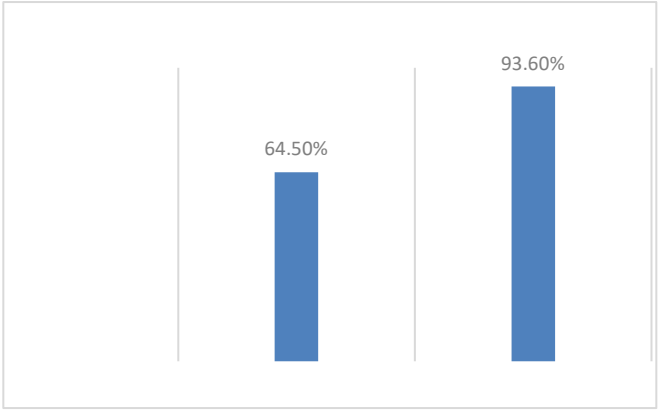

Fig. 3. Comparison of startups without and with government subsidies in China

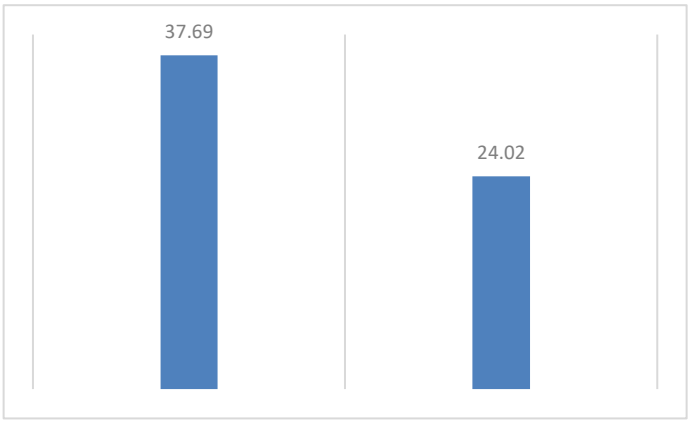

Fig. 3. Comparison of startups without Loans and with Loans in China

As can be seen from Fig3, the proportion of entrepreneurship with government subsidies is higher than that without government subsidies. Fig4 shows that the proportion of starting a business without a loan is higher than that of a business with a loan.

3.4 suggestions

Firstly, it is feasible to build a network platform for farmers' entrepreneurship. At present, China's rural digital infrastructure is still in its infancy. In order for inclusive development to penetrate into rural areas, it is necessary to strengthen supporting facilities in rural areas. For example, it is necessary to accelerate the construction and update of broadband networks, expand the coverage of mobile Internet in rural areas, promote the application of advanced digital technologies such as big data and 5G communications, and develop corresponding terminal equipment according to the characteristics of inclusive finance, thereby increasing its popularity. sex. Under the guidance of the government, establish a platform through inclusive technology to let entrepreneurs know the threshold and requirements of financing, so that they can disclose their investment plans and investor information, so that they can know the development and risks of their entrepreneurial projects, to provide them with funds. Publicize the progress of project construction, enhance the society's awareness of project construction, and guide investment companies and investors to conduct venture capital; let people from all walks of life know whether the farmers' entrepreneurial plans have received financial support, and who can use this platform for their financing services before making the investment. An online trading platform composed of "farmer entrepreneurs" has been established, which can allow both parties to obtain the information they want in the shortest time, reduce the delay of information and reduce the waste of information, thus providing farmers with more funds, thereby promoting local economic development.

Secondly, it is important to improve a policy system to support farmers' entrepreneurship. The government should use digital technology to build a new inclusive financing platform with farmers as the main body, improve the financing mechanism, list them as support objects, and provide financing support for them. While setting up a venture fund, you can also enjoy certain preferential policies to encourage local leading companies to use their brand influence to promote their own business plans, thereby reducing investment. The venture capital established by the state should classify rural enterprises, and set corresponding thresholds, interest rates, loan amounts, etc. according to their characteristics, so as to provide corresponding financial support for each rural company. It

is not enough to rely on the state's entrepreneurial fund alone. It also requires the cooperation of local enterprises and the park, plus the support of the state's funds, enterprises and entrepreneurial parks, in order to improve the visibility and credibility of the enterprise, and at the same time attract more people. Capital enters into entrepreneurship, which better solves the problem of shortage of funds for entrepreneurial projects in rural areas.

Finally, it is helpful to improve the quality of government work and improve farmers' satisfaction with cadres. The government should strengthen the publicity of digital inclusive finance, and put more energy into it, vigorously promote the advantages of "digital inclusive finance", go to the countryside to answer the questions of rural entrepreneurs, and change their inherent "inclusive" concept, let them gradually accept the concept of "digital inclusiveness", understand the relevant policies of "inclusiveness" and the "rural revitalization" supported by the state, so that they can obtain corresponding financing with the help of "inclusive" "digital". In the process of publicity, through the communication and understanding with farmers entrepreneurs, collect the difficulties faced by farmers entrepreneurs, concentrate the problems, seek more professional and more suitable financial services, and promote the development of farmers' entrepreneurship. By cooperating with financial organizations such as commercial banks, we will popularize the knowledge of digital finance, entrepreneurship and entrepreneurship among farmers, and popularize knowledge of entrepreneurial loans, finance, and Internet finance. The basic courses of digital financial knowledge and entrepreneurship are introduced into basic education, through the cultivation of the financial quality and entrepreneurial spirit of low-income farmers, and through the inclusive network platform for business management

4. Summary

Based on China's digital financial inclusion indicators and the data from the National Household Survey of Peking University, in this paper we explore the impact of digital financial inclusion on Chinese farmers' entrepreneurial decision-making. Also, the effect of government subsidies and whether there is a loan on digital financial inclusion is also analyzed. The results of this study show that the development of digital financial inclusion can effectively improve farmers' self-employment behavior. The depth and coverage of digital financial inclusion have a positive and significant impact on promoting farmers' entrepreneurship decisions. Among them, the positive effect of coverage breadth is greater than that of use depth. At the same time, whether farmers are willing to start a business and their enthusiasm for starting a business are closely related to whether they are married, age, and family members. In addition, government subsidies and whether to repay loans will increase the positive impact of digital financial inclusion on farmers' entrepreneurial decisions. Therefore, when developing digital inclusive finance, it is necessary to focus on the government's perspective, formulate relevant policies, improve the quality of government services, and increase farmers' trust in government, so as to promote farmers' entrepreneurship.

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