Can Digital Finance Ease Household Credit Constraints?

-- Based on the Perspective of Financial Knowledge

Yuli Yang

Anhui University of Finance and Economics, Bengbu Anhui, 233030, China

2448196278@qq.com

Abstract

In recent years, my country's digital finance field has developed rapidly, and its depth and breadth are constantly expanding. At the same time, my country's consumption rate continues to be sluggish, and households generally have credit constraints. Based on this background, this paper uses the 2017 China Household Finance Survey (CHFS) data to explore the impact of my country's digital financial development on household credit constraints, and financial knowledge here. regulation in the process. Through empirical research, it is found that digital finance can significantly reduce the probability of households facing credit constraints. After further introducing the variable of financial knowledge, it is found that the increase of financial knowledge will enhance the alleviation effect of digital finance on credit constraints. Therefore, in terms of policy formulation, we should continue to promote digital finance, and at the same time strengthen the popularization of financial literacy education, so as to achieve the purpose of alleviating household credit constraints, increasing household credit participation, and increasing household consumption.

Keywords

Digital Finance; Financial Knowledge; Household Credit Constraints.

1. Introduction

Studies have shown that Chinese households face serious credit constraints. Using data from the China Household Finance Survey (CHFS) for 2017, we find that if credit constraints are described by two indicators, "applied and rejected" and "needed but did not apply or applied and rejected," the proportion of households with credit constraints in China is 6.1% and 27%, respectively. The proportion of households with credit constraints in China is 6.1% and 27%, respectively, which is higher than many developed countries. Alleviating household credit constraints and allocating credit resources in an adequate and rational manner is not only beneficial to the development of China's consumer finance market, but also has positive implications for achieving supply-side structural reform and promoting high-quality economic transformation.

The depth and breadth of digital finance have been expanding in recent years. On the one hand, households can participate in the lending market through digital finance with lower costs and more convenient processes, which can alleviate the credit constraints of some households. On the other hand, products and services in digital finance have certain threshold requirements for the level of financial knowledge, computer operation ability and risk tolerance of the participating groups. Residents who do not have the basic ability to use digital finance not only cannot have their own credit constraints alleviated, but may even fall into the scam of financial fraud. With this as the starting point, this paper investigates whether and how financial literacy plays a role in alleviating household credit constraints in the process of digital finance. Does

this effect differ significantly across households and what are the reasons for the differences? By answering these questions, this paper hopes to both enrich and expand the relevant academic research results and provide targeted countermeasure suggestions for alleviating credit constraints, optimizing financial inclusion policies, and promoting the future development of digital finance.

2. Literature Review and Theoretical Hypotheses

（1）Literature review

While access to formal credit has a positive effect on households' ability to smooth consumption, engage in productive activities, and improve economic conditions (Craig McIntosh, 2011), the reality is that many residents are unable to obtain the loans they need, i.e., they face credit constraints, and this problem is particularly pronounced in developing countries (Guirkinger, 2008). Boucher (2008) classifies credit constraints into two types, depending on the cause. One is supply-based credit constraint, which means that the requirements and conditions of loans granted by financial institutions are not satisfied by some borrowers and thus are excluded from the credit market; the other is demand-based credit constraint, which means that the demanders of funds choose to forgo loans due to cognitive biases in the credit market or in consideration of credit costs and credit risks. From the supply side, the reason why actual bank lending is lower than optimal lending is because of moral hazard and adverse selection problems due to information asymmetry (Stiglitz and Weiss, 1981). in a study of rural Ghana, Haruna (2020) finds that high interest rates and collateral are the main causes of credit constraints for rural households. While for the demand side, the overhead of maintaining a bank account and the transaction costs involved in the credit process hinder households' willingness to borrow. Therefore financial institutions should reduce the cost of credit to increase the possibility of households to access credit (Muiruri, E.J, 2012).

The credit constraint problem of farm households in China is also prominent under the dualistic social structure of urban-rural division. Based on the rationing mechanism, Liu Xichuan and Cheng Enjiang (2009) argue that farm households suffer from both supply-based and demand-based credit constraints. Wu Yu et al. (2016) found that only 18.1% of Chinese farm households with credit needs have access to formal credit. There are many factors affecting household credit constraints in China; in terms of personal characteristics, households whose head is a party member and has a bachelor's degree or higher are more likely to obtain loans; households whose head is older and more risk-averse are less likely to obtain loans (Liu Huihuang and Wu Wei 2014). In terms of household characteristics, Niu Rong , Zhang Qian, etc. (2019) concluded that the higher the value of land, housing and financial assets of risky farmers, the weaker the credit constraints they are subject to. Liu Xichuan, Chen Lihui, etc. (2014) found that household income is related to credit constraints of farmers, and farmers with medium and higher income levels are more likely to obtain loans from financial institutions while having higher credit needs. From the external environment, Chen Dongping and Ding Liren, etc. (2022) conclude that an increase in the regional rule of law level can enhance the credit availability of farm households based on transaction cost theory. Wu Yu et al .(2018) find that regional bank development can reduce the probability of household credit constraints.

The relationship between digital finance and credit constraints has also been studied. Yin Zhichao and Zhang Haodong (2018) find that Internet finance can reduce credit constraints and increase credit demand when formal finance is out of reach. Pan Shuang et al. (2020), on the other hand, points out that Internet finance can alleviate credit constraints and that risk preferences have a heterogeneous effect on this. In his study, Sun Jiguo and Wang Qian (2020) finds that digital finance can alleviate credit constraints and thus alleviate relative poverty.

A review of the literature shows that the existing literature, when exploring the impact of digital inclusive finance on credit constraints, mostly selects macro-level digital inclusive finance indices and generally concludes that digital finance can alleviate household credit constraints. However, this paper argues that whether digital finance can all play a role in reducing credit constraints for different households needs to be further explored. Although the core concept of digital finance is to provide more rural and low-income groups with equal access to financial services, the "digital divide" and "knowledge divide" in its development process make some groups with less digital and financial literacy However, the "digital divide" and "knowledge divide" in the process of its development may prevent some groups with low digital and financial literacy from enjoying the benefits of digital financial development (Hu Lian,et al., 2021), and the same may be true for credit constraints. Whether the participation of the less financially literate groups in digital finance will alleviate or exacerbate the credit constraint still needs to be further explored. Based on the above this paper analyzes the impact of digital finance on credit constraints and explores its heterogeneity from a micro perspective by using financial literacy as a moderating variable for digital finance to alleviate household credit constraints.

(2) Theoretical hypothesis

Digital inclusive finance is is a combination of new digital and inclusive finance that digitizes, networks, and computerizes traditional finance, and it can alleviate household credit constraints in several ways. First, digital finance can reduce the cost of credit, thereby reducing the need-based constraint of needing but not applying for it. This cost reduction is twofold; on the one hand, digital finance de-intermediates transactions compared to traditional finance, saving the capital investment and operating costs of opening business outlets and hiring a large number of employees, resulting in lower transaction costs in the lending process. On the other hand, the competitive pressure and technological spillover effect brought by digital finance to formal financial institutions can also prompt them to reform and innovate. Formal financial institutions can combine Internet technology with traditional financial business to reduce transaction costs and improve service efficiency (Liu Zhonglu, 2016).

Second, digital finance can solve the challenges of collateral and guarantee in traditional credit and increase credit turnover. According to the People's Bank of China, at the end of 2019, about 400 million people in China were not included in the central bank's credit system, and nearly half of the group that was included had no credit records This lack of credit data makes the lending business of banks and other financial institutions less efficient and dynamic. To address this problem, digital finance can collect and store consumer and financial information of a large number of users through the use of web technologies and integrate it. The integrated information, innovative application models and special risk control tools can then be used to solve the problems of collateral, security and credit in lending. The Internet in the credit sector uses the "mass review" principle to determine the dynamic probability of default based on big data, which can replace the professional and linear credit assessment methods of banks (Xie, Ping, and Zou, Chuanwei, 2012).

In addition, digital finance can reduce the information asymmetry in the credit process, thus alleviating household credit constraints. Big data has four characteristics: large volume, high application value, wide and diverse sources, and fast growth rate. Therefore, the Internet can significantly reduce information asymmetry by using big data to bond information, which can expand the type and quantity of information exponentially, and make information access easier and more flexible. With the promotion of big data analysis, market information is sufficient and transparent, and the securities market will approach the description of the efficient market hypothesis (Xie, Ping, 2015). Accordingly, the following theoretical hypotheses are proposed in this paper.

Hypothesis 1: The development of digital finance can significantly alleviate the household credit constraint situation.

It is found that improved financial literacy can promote households' more active participation in digital finance and help them to obtain better investment opportunities (Yin, 2019) and even higher returns in digital financial participation. And households with higher financial literacy are able to choose more appropriate digital financial products after measuring their economic status and risk tolerance. Therefore, in the process of digitizing information, these households can get better credit feedback for participating in digital finance compared to those with low financial literacy, and thus are more likely to receive loans. Improved financial literacy also enables fuller and more effective use of information integrated by the Internet and easier access to credit product policies, making the role of digital finance in reducing information asymmetry work better. Accordingly, this paper proposes the following theoretical hypothesis.

Hypothesis 2: Financial knowledge has a significant moderating effect in the process of digital finance to alleviate credit constraints.

The diversity of digital financial industry and innovative products enables many customized and personalized services (Wang, H., 2018), which greatly expands the set of credit transaction possibilities and thus meets the different credit needs of more people, including the credit needs of long-tail users that are beyond the reach of traditional finance, expanding the range of customers of the financial system. At the same time, the network effect and diminishing marginal cost of digital finance will also increase the initiative of households to borrow, allowing residents who suffer from different types of credit constraints to find credit products suitable for them in the credit market. Accordingly, this paper proposes the following theoretical hypothesis.

Hypothesis 3: There are significant differences in the effects of digital finance in different sectors on improving different types of credit constraints.

3. Data and Variables

(1) Data source

The data used in this paper come from the data of the fourth round of China Household Finance Survey (CHFS) conducted nationwide by the Center for Finance and Research of Southwest University of Finance and Economics in 2017; this data is of high quality and has good representativeness, which can provide effective support for the research of this paper.

①.explanatory variable: household credit constraint

First, households with credit needs are screened out by referring to Pan Shuang (2020), and then those who need but have not applied for loans or have been rejected are considered to face credit constraints according to jappelli et al (1990), and "need but have not applied" is defined as demand-based credit constraints, and "application rejected" is defined as demand-based credit constraints. "application denied" is a supply-based credit constraint. The constrained is assigned a value of 1, while the unconstrained is assigned a value of 0.

(2)Explanatory variables

①Digital finance

Referring to previous literature and considering data availability, the three major business models of digital finance, namely payment, financing, and investment (Huang Yiping and Huang Zhuo, 2018), are used to describe digital finance. 2017 CHFS questionnaire involves questions on third-party payment, online lending, and Internet finance, which correspond to the three major businesses. If households participate in at least one of these three services, they can be considered as participating in digital finance and assigned a value of 1, otherwise, 0.

②Financial literacy

Using objective financial literacy levels, there are three financial literacy-related questions in the 2017 CHFS questionnaire: interest rate calculation, inflation understanding, and investment risk judgment. The respondents' financial knowledge levels were calculated based on these three questions using factor analysis.

(3) Control variables

Referring to the existing literature, the following control variables are added in this paper: age and age squared/100, years of education, gender, risk attitude, whether they are party members, whether they are married, number of family members, number of elderly in the family, whether they own a house, whether they are engaged in industrial and commercial business, annual household income, total household assets, whether they are rural households, the level of economic development in their province or city, and controlling for provincial and regional fixed effects. After the final basic treatment of the sample, the number of samples with credit needs was 7718, and the descriptive statistics of the variables are shown in Table 1.

Table 1. Descriptive statistics of variables

Name of variable	Observed Value	Average	Standard Deviation (SD)	Min.	Max.
Credit constraint	7718	0.41	0.49	0	1
Digital Finance	7718	0.36	0.48	0	1
Financial Knowledge	7718	0.18	0.60	-0.71	0.98
Gender	7718	0.84	0.37	0	1
Age	7718	54.33	11.92	22	99
Age squared / 100	7718	30.93	13.37	4.84	98.01
Number of years of education	7718	9.07	3.94	0	21
Marriage Status	7718	0.98	0.14	0	1
party	7718	0.07	0.26	0	1
Risk Attitudes	7718	4.03	1.19	1	5
House	7718	0.88	0.32	0	1
Family Size	7718	3.90	1.80	1	20
Number of elderly in the family	7718	0.50	0.83	0	4
Industrial and commercial operations	7718	0.20	0.40	0	1
Annual income	7718	10.59	1.69	0	15.42
Total Assets	7718	12.63	1.86	3.81	17.22
Rural / Town	7718	0.40	0.49	0	1
GDP of the province/municipality	7718	11.02	0.66	10.26	13.78

4. Empirical Analysis

(1) Model Setting

This paper focuses on the impact of digital finance on household credit constraints and constructs a Probit model as follows:

$$\text{Prob}(C_i = 1|X_i) = a_i M_i + \beta X_i + \varepsilon_i \tag{1}$$

In model (1): C_i as explanatory variables, referring to household credit constraints; M_i as as dummy variables representing digital finance, which take the value of 1 when households use digital finance and 0 otherwise; and X_i as as control variables.

To investigate whether financial literacy has a moderating role in the process of digital finance to alleviate credit constraints, a cross-sectional regression model is constructed as follows.

$$\text{Prob}(C_i = 1|X_i) = a_i M_i + \beta N_i + \gamma M_i * N_i + \delta X_i + \varepsilon_i \tag{2}$$

where is N_i financial knowledge, $M_i * N_i$ is the interaction term between digital finance and financial knowledge, and X_i is defined in line with model (1).

(2) Impact of digital finance on household credit constraints

Table 2. Impact of digital finance on household credit constraints

	Credit constraint		Supply-based constraints		Demand-based constraint	
	Probit	Ivprobit	Probit	Ivprobit	Probit	Ivprobit
	(1)	(2)	(3)	(4)	(5)	(6)
Credit constraint	-0.0430*** (0.0144)	-0.0387*** (0.1068)	-0.0233** (0.0102)	-0.0209** (0.0824)	-0.0272** (0.0136)	-0.0242** (0.1091)
Digital Finance	0.0204 (0.0144)	0.0180 (0.0150)	0.0292*** (0.0112)	0.0280** (0.0824)	-0.0009 (0.0149)	-0.0027 (0.0152)
Financial Knowledge	-0.0028 (0.0035)	-0.0032 (0.0049)	0.0084*** (0.0026)	0.0082** (0.0115)	-0.0078** (0.0033)	-0.0080* (0.0048)
Gender	0.0022 (0.0033)	0.0025 (0.0040)	-0.0075*** (0.0024)	-0.0074*** (0.0033)	0.0063* (0.0031)	0.0065* (0.0038)
Age	-0.0087*** (0.0016)	-0.0083*** (0.0024)	-0.0044*** (0.0011)	-0.0042*** (0.0015)	-0.0062*** (0.0016)	-0.0059*** (0.0022)
Age squared / 100	-0.0525 (0.0399)	-0.0541 (0.0412)	-0.0414 (0.0268)	-0.0428 (0.0271)	-0.0168 (0.0384)	-0.0182 (0.0399)
Number of years of education	-0.0674*** (0.0210)	-0.0662*** (0.0209)	-0.0122 (0.0167)	-0.0116 (0.0168)	-0.0651*** (0.0213)	-0.0642*** (0.0212)
Marriage Status	0.0010 (0.0046)	-0.0011 (0.0063)	-0.0105*** (0.0034)	-0.0104** (0.0048)	0.0084* (0.0046)	0.0085 (0.0063)
party	-0.0071 (0.0201)	-0.0103 (0.0209)	0.0101 (0.0148)	0.0081 (0.0156)	-0.0167 (0.0170)	-0.0190 (0.0182)
Risk Attitudes	0.0072** (0.0034)	0.0066* (0.0034)	-0.0014 (0.0024)	-0.0017 (0.0076)	0.0124*** (0.0032)	0.0119*** (0.0032)
House	-0.0025 (0.0104)	-0.0019 (0.0104)	0.0085 (0.0077)	0.0088 (0.0076)	-0.0054 (0.0095)	-0.0049 (0.0095)
Family Size	0.0407*** (0.0149)	0.0399** (0.0169)	0.0400*** (0.0096)	0.0394*** (0.0119)	0.0121 (0.0137)	0.0116 (0.0159)
Number of elderly in the family	-0.0144*** (0.0039)	-0.0140*** (0.0049)	-0.0039 (0.0024)	-0.0037 (0.0031)	-0.0139*** (0.0035)	-0.0137** (0.0045)
Industrial and commercial operations	-0.0485*** (0.0043)	-0.0472*** (0.0079)	-0.0112*** (0.0027)	-0.0106*** (0.0045)	-0.0427*** (0.0038)	-0.0417*** (0.0074)
Annual income	-0.0143 (0.0147)	-0.0277 (0.0214)	0.0323*** (0.0098)	-0.0253 (0.0154)	-0.0442*** (0.0147)	-0.0535** (0.0207)
Total Assets	0.0702 (0.0577)	0.0759 (0.0600)	-0.1256*** (0.0430)	-0.1224*** (0.0433)	0.1668** (0.0682)	0.1707** (0.0697)
N	7716	7716	7716	7716	7716	7716
Wald chi2	743.29***	929.42***	324.19***	373.00***	678.08***	758.12***
Pseudo R2	0.0743		0.0619		0.0708	
Wald Test		6.57***		3.34*		3.38*
First stage F value		269.53		269.53		269.53

Note: ***, **, * denote significant at the 1%, 5%, and 10% confidence levels, respectively, and marginal utilities are reported in the table. Cluster heteroskedasticity robust standard errors at the district/county level are in parentheses, and all regressions control for provincial fixed effects, as below.

Table 2 reports the estimated results of the impact of household participation in digital finance on credit constraints, supply-based and demand-based constraints, respectively. Column (1) shows that the use of digital finance can reduce the probability of a household being subject to credit constraints by 4.3%. In addition party members, higher years of education, more assets, and higher annual income put less pressure on households to face credit constraints; while households engaged in commercial and industrial operations and with larger populations are

more likely to be subject to credit constraints. The regression results in columns (3) and (5), on the other hand, suggest that digital finance can alleviate both supply-based and demand-based constraints. Digital finance increases people's willingness to participate in the credit market by improving service efficiency, reducing transaction costs, lowering information asymmetry, and providing more personalized services, which positively affects demand-based credit constraints; while financial institutions can also provide more credit services by reducing costs, optimizing credit structure, and reducing reliance on traditional collateral through digital finance, thus alleviating supply-based constraints.

Second, for supply-based constraints, households with male heads, engaged in industrial and commercial operations, and rural areas have a higher probability of being constrained, and households with higher years of education, risk preference, stronger assets, and better economic development in their province or city have a lower probability of suffering from supply-based constraints; for demand-based constraints, the marginal effects of years of education, household head as a party member, annual household income, and total assets are negative for them, and for rural households, the marginal effects of risk attitude, household size, and provincial and municipal GDP have significantly positive marginal effects.

Both variables of digital finance and financial knowledge in the probit model may have endogeneity problems that affect the estimation results. In this paper, we refer to Yin Zhichao (2020) to select the average level of financial literacy and the average digital financial participation of households other than the sample within the sample's neighborhood/village as the instrumental variables of financial literacy and digital finance. These two variables satisfy the exogeneity and correlation conditions and are appropriate as instrumental variables. Columns (2), (4) and (6) report the results of the Ivprobit estimation using instrumental variables. The coefficient of digital finance is significantly negative in each of these two columns, proving that the probit estimation results are not incorrect, i.e., digital finance can alleviate credit constraints, either supply-based or demand-based.

Table 3. The moderating effect of financial literacy on the two constraints

	Credit constraint		Supply-based constraint		Demand-based constraint	
	Probit	IvProbit	Probit	IvProbit	Probit	IvProbit
	(1)	(2)	(3)	(4)	(5)	(6)
Digital Finance	-0.0262	-0.0212***	-0.0174	-0.0151	-0.0144	−0.0105***
	(0.0163)	(0.4084)	(0.0548)	(0.3424)	(0.0453)	(0.3729)
Financial Knowledge	-0.0052	-0.0020	-0.0141	-0.0115	-0.0007	−0.0004**
	(0.0130)	(0.1931)	(0.0422)	(0.0094)	(0.0363)	(0.1729)
Digital Finance* Financial Knowledge	-0.0460**	-0.0392***	-0.0116	-0.0094	-0.0367*	-0.0308***
	(0.0210)	(0.2789)	(0.0725)	(0.4362)	(0.0582)	(0.2283)
N	7716	7716	7716	7716	7716	7716
Wald chi2	764.12***	2682.41***	327.38***	501.86***	704.43***	2591.63***
Pseudo R2	0.0750		0.0628		0.0713	
First stage F value	240.80/183.93/182.16		240.80/183.93/182.16		240.80/183.93/182.16	

(3) Analysis of the moderating effect of financial literacy

Table 3 reports the estimation results after adding the interaction term. The significant coefficient of the interaction term in column (1) indicates that the relaxation effect of digital finance on credit constraints is increasing with the increase of financial knowledge. While the moderating effect of financial literacy can be found by columns (4) and (6) mainly for demand-based constraints and insignificant for supply-based constraints. It may be that China's financial

and credit markets are not perfect and digital finance is not yet able to fully integrate users' information. When other conditions are similar, there is no significant difference between users with different levels of financial knowledge in using digital finance to reduce the probability of being rejected for a loan. However, for demand-based, the improvement of financial literacy and the use of digital finance by households can more substantially increase the willingness to borrow and confidence and repayment ability, so there is a significant improvement in demand-based credit constraints.

5. Heterogeneity Analysis

(1) Impact of different types of digital finance business on credit constraints

Table 4 shows that both payment and investment businesses in digital finance make credit constraints significantly lower. Moreover, for the supply type, there is little difference in the alleviation effect of the two types of business; for the demand type, the alleviation effect of investment business is more obvious. The reasons may be as follows:Unlike the widespread use of third-party payments, the main customers of investment business are mostly long-tail groups (Luo, Fangke, 2017), and the significant increase in self-efficacy they receive during the engagement process (Xu, Xiaoyang, 2017), and thus the desire and confidence to apply for credit is stronger. As for the supply-based constraint, the difference in the impact of users' use of payment or investment business on financial institutions' cost investment and assessment of credit is not significant, so the difference in the coefficient of supply-based constraint is small.

Table 4. Impact of different business models of digital finance on credit constraints

	Credit constraint	Supply-based constraints	Demand-based	Credit constraint	Supply-based constraints	Demand-based
	Probit	Probit	Probit	Probit	Probit	Probit
	(1)	(2)	(3)	(4)	(5)	(6)
Payment	-0.0429*** (0.0141)	-0.0229** (0.0101)	-0.0282** (0.0135)			
Investment				-0.0670*** (0.0236)	-0.0300** (0.0169)	-0.0547** (0.0235)
wald chi2	743.76***	324.18***	679.03***	749.05***	303.84***	678.08***
R2	0.0742	0.0615	0.0711	0.0743	0.0618	0.0708

Note: The sample of financing operations is too small and not reported.

(2) Impact of digital finance on credit constraints of rural and urban households

Table 5 shows the impact of digital finance use on credit constraints for rural and urban households, respectively. The results in column (1) show that rural households' participation in digital finance increases the probability that the household is subject to credit constraints. Rural households are relatively less educated, have less financial information, and blindly participate in digital finance, which may affect the household's financial status and credit history as well as its ability to repay debts later, thus leading to increased credit constraints. In addition digital finance has a substitution effect with traditional financial services, and after using digital finance, farmers may resort to credit needs as well, thus reducing the desire to apply for formal credit. For urban households, on the other hand, digital finance has a significant mitigating effect on credit constraints.

Table 5. Impact of digital finance on credit constraints of urban and rural households

	Rural		Town	
	Probit	Ivprobit	Probit	Ivprobit
	(1)	(2)	(3)	(4)
Digital Finance	0.0664** (0.0279)	-0.0644 (0.4403)	-0.06*** (0.0167)	-0.0661*** (0.1351)
wald chi2	190.21***	363.37***	673.42***	948.48***
Pseudo R2	0.0475		0.0967	
N	3120	3120	4596	4596
Wald Test		1.40		5.92**
First stage F value		37.91		148.08

6. Robustness Tests

In order to verify the reliability of the above model, the following robustness tests are conducted.

(1) Robustness test 1: Excluding the upper and lower 1% samples

The regression results after excluding the top and bottom 1% of the total household assets are as follows. Column (2) of Table 6 yields that participation in digital finance is associated with a 3.5% decrease in the likelihood of households suffering from credit constraints.

Table 6. Robustness test 1: Excluding the top and bottom 1% of the sample

	Robustness test 1	
	Probit	Ivprobit
	(1)	(2)
Digital Finance	-0.0393*** (0.0145)	-0.0353*** (0.0069)
N	7,562	7,562
wald chi2	734.67***	906.27***
R2	0.0728	
Wald Test		5.93***
First stage F value		257.22

(2) Robustness test 2: Year of replacement of explanatory variables

Based on the possible reverse causality of the regression results on the effect of digital financial participation on credit constraints reported above, the original explanatory variables are replaced with variables based on 2019 data to eliminate this negative effect. In addition, the presence or absence of credit cards is used to measure credit constraints due to the absence of the question related to "why not borrow from banks" in the 2019 questionnaire (Ganli, 2018). Table 7 shows that the use of digital finance reduces the probability of households facing credit constraints by 10.46%.

All the above robustness tests are consistent with the findings above, indicating that the study's findings are robust to the idea that household participation in digital finance can relax credit constraints.

Table 7. Robustness test 2: Year of replacement of explanatory variables

	Robustness test 2	
	Probit	Ivprobit
	(1)	(2)
Digital Finance	-0.1046*** (0.0263)	-0.1031*** (0.1555)
N	869	869
wald chi2	223.31***	887.45***
R2	0.2820	
Wald Test		4.04**
First stage F value		9.02

7. Conclusion and Policy Recommendations

Based on the 2017 CHFS data, this paper analyzes the impact of digital finance on household credit constraints and the moderating role played by financial literacy in this impact process. The empirical study finds that (i) digital finance can alleviate household credit constraints, and this alleviation effect is significant for both supply-based constraints and demand-based constraints. (ii) Financial literacy can enhance the positive impact of digital finance on credit constraints, although this moderating effect is mainly for demand-based constraints. (③For different business models of digital finance, the relaxation effect of investment business on credit constraints is more pronounced compared to payment business, especially for demand-based credit constraints. ④Digital finance can significantly reduce the probability of credit constraints for urban households but lead to more severe credit constraints for rural households.

Currently, digital finance is in a booming period of development. To better exert the positive impact of digital finance in easing household credit constraints and boosting credit demand, this paper puts forward the following policy recommendations: ① Continue to implement the concept of inclusive finance and promote the further development of digital finance, while continuing to deepen reforms in the field of digital finance. ② Increase the supervision of Internet finance business, improve information transparency, and build a solid risk prevention and control wall. ③ Focus on the construction of digital finance in rural areas and strive to reduce the "digital divide" and "knowledge divide" in order to give full play to the long-tail advantage of digital finance and practice (4) The state should increase the number of financial literacy training programs. ④ The country should pay more attention to financial literacy education and promote the development of financial literacy education. In order to improve residents' financial literacy and change their mindset, they can participate in the credit market more rationally and actively.

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