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Can Digital Inclusive Finance better serve the development of the real economy?

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Abstract

For a long time, the development of financial services for the real economy has faced many dilemmas. However, can the digitalization of finance based on the new generation of information and communication technology solve this dilemma? By combining the CGSS2017 data, the digital financial inclusion data (2011-2018) of Peking University and the 2017 provincial statistical yearbooks, we choose to reflect the development of financial digitization by "whether or not to use WeChat payment/Alipay", and conduct an empirical analysis of the overall and heterogeneity of the impact of financial digitization on entrepreneurial activities. The study finds: (1) digital finance can promote entrepreneurial choice and performance in general, but the differential impact on both shows opposite trends; (2) by testing the mechanism, we find that digital finance eases the information constraint faced by entrepreneurs and improves the regional market environment, but leads to a slight decrease in the maximum loan amount received by entrepreneurs. Further analysis of variance across contexts finds: (1) the marginal effects of digital finance on entrepreneurial choice and entrepreneurial performance are higher in both better institutional contexts than in worse institutional contexts; (2) in both cultural and economic contexts, the facilitation effect of digital finance on entrepreneurial choice is significantly higher in better contexts than in worse contexts, but the opposite effect of digital finance on entrepreneurial performance is found, i.e., the marginal effect is higher in the poorer context than in the better context. The study reveals the complexity and multidimensionality of the impact of digital finance on entrepreneurial activity, and the heterogeneity of entrepreneurial choice and performance, reflecting that digital finance is a "double-edged sword" that can create a "digital divide" while promoting entrepreneurial activity the

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problem. The analysis of different contexts suggests that building the institutional environment, creating a cultural climate and ensuring macroeconomic stability are key to digital finance for entrepreneurial activities.

JEL classification numbers: C36, G10, F35, F37.
Keywords: Digital finance, Entrepreneurial activity, Digital divide, Digital financialization, Entrepreneurial performance.

1. Introduction

At present, affected by the complex external environment, such as the sluggish global economic growth, the huge external impact from the new crown epidemic, the rise of international trade protectionism and other factors, such as the slowdown of domestic economic growth and the increasingly severe employment situation, China's socio-economic development presents new features, based on which, during the two sessions in 2020, President Xi emphasized the need to "deepen the supply-side structural reform, give full play to China's mega market advantage and domestic demand potential, and build a new development pattern of domestic and international double circulation to promote each other". Reform, give full play to the advantages of China's mega market and the potential of domestic demand, and build a new development pattern in which the domestic and international cycles promote each other." As far as the domestic cycle is concerned, as China's economic growth shifts from a high-rate stage to a high-quality stage, the next step of socio-economic development also presents the characteristics inherent in conventional catching-up economies, namely, entrepreneurship and innovation gradually become an important internal energy for high-quality development. The importance of entrepreneurial activities in the socio-economy is increasing. President Xi pointed out that "forming a large domestic cycle as the mainstay means that satisfying domestic demand should be the starting and ending point of development, with production, distribution, circulation and consumption relying more on the domestic market. For this cycle to flow smoothly, it is necessary to build a complete domestic demand system, especially the supply system and domestic demand should be more appropriate." Therefore, through entrepreneurial activities to achieve supply-side reform, so that the supply of the domestic market is more suitable for the gradual upgrading of domestic consumption, is not only the realization of the domestic cycle of the title, but also to stimulate the vitality of economic development, to complete the "six stable", "six protection" task of the fundamental internal vitality.

Entrepreneurial activity is essentially a form of "creative destruction"[1] that not only identifies and explores existing market needs and satisfies previously unsatisfied consumer wants, but also represents a "creative" impact from the supply side to the demand side: on the one hand, some of the entrepreneurial activity. On the other hand, some entrepreneurial activities expand a new field of consumption, change consumer behavior and habits, and improve the vitality of the economy from the demand side. In short, entrepreneurship is not only important for innovation and

long-term economic growth of a country [2-3], but also for increasing employment [4-5].

At the same time, our country also shows the unique characteristics of the times that are also different from those of the developed countries first, namely the product of the digital economy, the background of the times. In recent years, along with the development of a new generation of information and communication technology, the trend of financial digitization has become increasingly obvious, and digital finance has been able to develop rapidly, providing an opportunity to crack the problem of difficult financing for residents' entrepreneurship. However, there are still major differences about the relationship between digital finance and entrepreneurship: one view is that digital finance can be able to alleviate the information asymmetry between entrepreneurs and financial institutions through digital technology, allowing financial institutions to obtain more information about borrowing subjects, reducing the transaction costs of entrepreneurs and financial institutions, thus reducing the credit constraints of entrepreneurs and promoting entrepreneurship [6-10]. Another view is that the problem of unbalanced supplementation of financial technology development always exists, and the lack of knowledge and skills of digital technology and uneven diffusion of digital technology and other factors may cause some disadvantaged groups to lack the ability to use Internet tools and low financial literacy, and the formation of "tool exclusion" by the "knowledge divide The "knowledge divide" and the "digital divide" will lead to a minimal or even insignificant role of digital finance [11-13]. So, can digital finance really promote entrepreneurial activity? How will digital finance affect entrepreneurial activity? In view of this, this paper chooses to measure the development of digital finance by "whether or not to use WeChat Pay/Paypal", and then analyzes how digital finance plays a role in entrepreneurial activities.

2. Literature review and theoretical analysis

2.1 Influencing factors of entrepreneurial activities

Referring to the summary of Dongmei Zhou et al.[14], the influencing factors of entrepreneurial activities can be divided into four areas: (1) entrepreneurial antecedents, the study of entrepreneurial antecedents focuses on the characteristics of entrepreneurial subjects, the nature of entrepreneurial opportunities, and the interaction between entrepreneurial subjects and the environment to identify, evaluate, and utilize opportunities, in this area, entrepreneurs and entrepreneurial organizations have received the most attention and research; (2) entrepreneurial implementation, entrepreneurial implementation is the entrepreneurial process of all actions and strategies taken, including both the exploration of entrepreneurial resources, entrepreneurial decision making, entrepreneurial financing, entrepreneurial strategy, and innovation, as well as the study of entrepreneurial learning and entrepreneurial networks, in which entrepreneurial financing and entrepreneurial human strategy are the most concerned issues in the field of

entrepreneurial implementation; (3) entrepreneurial outcomes, entrepreneurial outcomes are the effects of entrepreneurial activities on individuals, organizations, and society, in which firm entrepreneurial outcomes, which are the effects of entrepreneurial activities on individuals, organizations, and society, with firm-level research occupying the absolute majority and entrepreneurial performance research being the most important concern of scholars; (4) entrepreneurial contexts, which are all institutional, cultural, and economic-related environmental factors involved in the process of entrepreneurship development, all of which directly or indirectly affect the development of entrepreneurial activities, with institutional contexts being the most important concern of scholars.

Based on the existing studies and combined with the life cycle theory, the research scope of entrepreneurial activities is summarized according to the chronological development of entrepreneurial activities: (1) Before the start of entrepreneurial activities, the entrepreneur's (or entrepreneurial team's) endowment is one of the key factors that scholars focus on, including human capital factors [15-17], social capital factors [18-21] and economic factors such as initial wealth [22-24]; among the external factors, credit environment [25-29], regional Among the external factors, credit environment [30-31], culture, etc. are also important factors affecting entrepreneurship. (2) In the process of entrepreneurship, related studies focus on two levels: one is to analyze the decision of entrepreneurs on the system and strategy of startups with individuals as the object of study [32], and the other is to analyze the innovation activities of startups with startups as the object [33]; among the external factors of the entrepreneurial process, the financing constraints of startups [34], the perfection of the market system [35], and the regional cultural environment [36] are also the key issues studied by scholars. (3) After the entrepreneurial activity has stabilized, the evaluation of entrepreneurial performance is the most important concern of scholars [37-38].

2.2 The relationship between digital finance and entrepreneurial activities

Digital finance, in a broad sense, refers to the use of digital technology by Internet technology companies and traditional financial institutions to achieve financing, payment, investment and other new financial business models [39]. The biggest advantage of digital finance is to support the development of financial inclusion, as the traditional financial sector has structural problems such as "stage mismatch", "domain mismatch" and "attribute mismatch" [40-42]. The development of digital finance will make up for the shortcomings of traditional finance and reach out to groups that traditional financial services cannot [43]. Before the emergence of digital finance, entrepreneurs, especially those in rural areas, would face serious credit constraints due to financial exclusion [44-46], when entrepreneurs would often use social networks [47-48] and clan system [49-50] to alleviate their credit constraints through private lending or shadow banking channels, but this form of informal finance is always difficult to avoid regulatory problems and moral hazard. However, this form of informal finance is always difficult to avoid regulatory

problems and moral hazards, and there is also the problem of shadow interest rates [51-54].

Digital finance not only helps to alleviate credit constraints and provides new solutions and possibilities to address the financial exclusion of "formal channels are difficult and informal channels are dangerous", but also plays a role in the broader dimension of economic activities [55]. So, how will digital finance contribute to entrepreneurial activity? In view of this, this paper will first analyze the mechanism by which digital finance works. This paper argues that digital finance may work through three mechanisms.

2.2.1 Alleviating information constraints

Established studies point out that digital finance relies on innovative technologies such as information technology, big data technology and cloud computing to reduce the cost of financial transactions, alleviate the information asymmetry between mitigating borrowers and financial institutions, expand the scope of financial services, and expand the reach of borrower [56-57]. Meanwhile, Gorgeous Xie et al. [6] point out that electronic payment makes money electronic, which greatly reduces the cost of financial transactions, thus giving rise to many new entrepreneurial opportunities such as e-commerce and online/offline integration (O2O). Therefore, this paper argues that digital finance may alleviate the information constraint.

2.2.2 Impact on the maximum loan amount

The ability of online lending to connect the demand and supply sides of funds that may be geographically distant, relying on online virtual communities breaks through the geographic limitations of the social networks on which traditional private lending relies and greatly expands the network reach of private lending [54], but on the other hand, the study by Wu Yu et al.[10] points out that digital finance crowds out private lending and reduces the amount of credit available from private sources. Combining these two factors, this paper argues that the effect of digital finance on the maximum loan amount depends on whether the increase in the amount of credit it brings exceeds the degree of crowding out of private lending, so that digital finance may both increase and decrease the maximum loan amount.

2.2.3 Improve the market environment

Since digital finance relies on technologies such as big data and cloud computing, the cost of credit rating and risk assessment of online lending platforms can be declining, allowing online lending to have lower interest rates than before [58], and at the same time, digital finance development has to some extent promoted financial product innovation, broadened the channels for households to participate in financial markets, increased their financial participation, and promoted the development of financial markets in the region the digital finance may therefore improve the regional market environment.

This paper argues that digital finance will have an impact on different segments of entrepreneurial activity through these three mechanisms, specifically through the following processes.

2.2.4 Impact before the start-up is carried out

According to the analysis of digital finance mechanisms, it can be seen that digital finance can alleviate information constraints and promote the development of e-commerce models such as (O2O). Thus digital finance can facilitate the identification of entrepreneurial opportunities, and at the same time, digital finance can increase the maximum loan amount, allowing entrepreneurs to obtain more loans, thus alleviating the credit constraints faced by entrepreneurship, in addition, digital can improve the market environment and promote regional market development, thus increasing the probability of entrepreneurship by influencing the external environment. Therefore, this paper begins with hypothesis H1.

H1: Digital finance can facilitate entrepreneurial activity by influencing the factors that precede the launch of a venture through a variety of mechanisms.

2.2.5 Impact in the entrepreneurial process

According to the mechanism of digital finance, as it can promote entrepreneurship by alleviating information constraints, which is essentially the identification and exploitation of opportunities by entrepreneurs, the availability of more entrepreneurial opportunities may lead entrepreneurs to adopt more aggressive strategies or "make quick money" initiatives [59]; at the same time, as the development of digital finance can At the same time, as the development of digital finance can increase the maximum loan amount and improve the market environment, it is bound to alleviate the financial difficulties faced by enterprises, especially micro and small enterprises, and thus boost their R&D investment and thus innovation.

2.2.6 Impact after entrepreneurial stabilization

From the impact of digital finance in the first two segments of entrepreneurial activity, we can see that digital finance has a positive contribution to different factors in each segment of entrepreneurial activity through three mechanisms, while entrepreneurial performance is the result of the action of the previous series of factors, therefore, this paper argues that digital finance must eventually lead to an increase in entrepreneurial performance and psychological satisfaction of entrepreneurs, based on this, this paper proposes hypothesis H2.

H2: Digital finance can positively contribute to many of the factors involved in entrepreneurial activity, and thus digital finance improves entrepreneurial performance.

3. Variable definition and descriptive statistics

3.1 Data processing

The data sources of this paper include China General Social Survey (CGSS) 2017 data, Peking University Digital Inclusive Finance Index (2011-2018) [60] and the 2017 statistical yearbook of each province, and the descriptive statistics of each variable are shown in Table 1.

Dependent variable: "Entrepreneurial choice" and "entrepreneurial performance" are used as explanatory variables in this paper. In general, entrepreneurship includes survival entrepreneurship, which is an entrepreneurial activity undertaken for survival purposes with no other options, and development entrepreneurship, which is a proactive entrepreneurial activity undertaken in pursuit of greater financial growth [61]. However, due to the amount of available data, this paper chooses not to subdivide the type of entrepreneurship, which is denoted as 1 if entrepreneurial and 0 if not. Entrepreneurial performance is the logarithm of the entrepreneur's annual income.

Independent variables: In this paper, "whether to use WeChat Pay" and "whether to use Alipay" are selected as the usage of digital finance. If they are used, they are recorded as 1, if not, they are recorded as 0. WeChat Pay and Alipay, as the representatives of digital finance, reflect the usage of digital finance in WeChat Pay and Alipay, as representatives of digital finance, reflect the overall use of digital finance. Theoretically, according to the existing research on the impact of digital finance on entrepreneurship [6], the digital finance index (Beihang University Digital Inclusion Index) should be chosen as the core explanatory variable, but this paper chooses to reflect the use of digital finance by "whether or not to use WeChat Pay/Alipay" for the following two reasons: (1) this paper studies the impact of digital finance on entrepreneurial activities in a more general sense, rather than the aspect of financial inclusion alone, so a more comprehensive indicator is needed to proxy digital finance; (2) most entrepreneurs are small and medium-sized entrepreneurs, and the capital flow of their business is largely realized through Alipay and WeChat.

Control variables: At the level of individual characteristics, this paper selects several control variables such as gender, age, health status, education level and political identity; at the provincial level, the control variables selected in this paper include the level of economic development (LnGDP) and industrial structure (ratio of tertiary industry to secondary industry) and the financial inclusion index.

3.2 Descriptive statistics

As can be seen in Table 1, in terms of information related to entrepreneurial activity, only 20% of the sample chose to start a business, while the average level of entrepreneurial performance was 11.57 units after taking the logarithm of the entrepreneur's income. As far as the use of digital finance is concerned. Only 41% of the sample has used digital finance, indicating that digital finance (using WeChat and Alipay) is not as popular as it is perceived by urban residents on a daily basis.

In terms of personal characteristics, 47% of the sample are male, the average age of the respondents is 51 years old, the majority of them are in good health, while most of them have an education level between elementary school and college, and only 11% are party members. At the city level, the mean value of the logarithm of GDP (billion yuan) for each province is 10.31 units, and the mean value of the ratio of the tertiary sector to the secondary sector is 1.53, indicating that the contribution of the tertiary sector to the economy is about 50% higher than that of the secondary sector, while the mean value of the financial inclusion index is 282.1.

Table 1: Descriptive statistics of variables

Variable Name	Sample size	Variable Description	Average value	Standard deviation	Data source
Business Choice	4767	0=not started, 1=started	0.20	0.402	CGSS2017
Entrepreneurial Performance	966	Continuous Variables	11.57	1.705	CGSS2017
Digital Financial Use	12582	0=unused, 1=used	0.41	0.492	CGSS2017
Gender	12582	0=Female, 1=Male	0.47	0.499	CGSS2017
Age	12582	Continuous Variables	51.01	16.864	CGSS2017
Education level	12561	0=not in school, 1=elementary school or literacy; 2=junior high school, 3=high school or vocational high school; 4=secondary school, technical school, college; 5=bachelor's degree; 6=graduate and above	2.25	1.515	CGSS2017
Party membership	12582	0=non-party member; 1=party member	0.11	0.315	CGSS2017
Health Level	10277	0=unhealthy; 1=normal and healthy	0.94	0.233	CGSS2017
LnGDP (billion yuan)	12582	Continuous Variables	10.31	0.528	Statistical Yearbook by Province
Tertiary Industry / Secondary Industry	12582	Continuous Variables	1.53	0.921	Statistical Yearbook by Province
Financial Inclusion Index	12582	Continuous Variables	282.10	27.737	BYU Inclusive Finance Index

3.3 Econometric model

$$P(Entre = 1) = \alpha_0 + \alpha_1 df + \alpha_2 X_i + \varepsilon_1 \quad (1)$$

In this paper, we choose to estimate the impact of digital finance on entrepreneurial choice with a Probit model, where Entre represents entrepreneurial choice, df represents digital finance usage, Xi is the control variable, α0 is the constant term, αi is the corresponding coefficient, and ε1 is the disturbance term.

$$lgIncome = \beta_0 + \beta_1 df + \beta_2 X_i + \varepsilon_2 \quad (2)$$

In this paper, we choose to estimate the impact of digital finance on entrepreneurial performance by OLS regression, where lgIncome represents the logarithm of the annual income of entrepreneurs, df represents digital finance usage, Xi is the control variable, β0 is the constant term, βi is the corresponding coefficient, and ε2 is the disturbance term.

4. Empirical results, endogeneity test and mechanism analysis

4.1 Regression results

Table 2 reports the regression results of digital finance on entrepreneurial choice. As can be seen from the model (1) in Table 2, the effect of digital finance use on entrepreneurship is significant at the 1% level and has a marginal effect of 9.6%, so the first hypothesis of this paper, H1, holds that digital finance does promote entrepreneurial choice. Among the personal characteristics variables, there is a significant promotion effect of age on entrepreneurial choice, but there is a significant negative effect of education level and party membership on entrepreneurship, where the marginal effect of education level is -4.7%, indicating that the higher the education level, the lower the probability of entrepreneurship for individuals, and the marginal effect of party membership is -9.8%, indicating that the probability of entrepreneurship is lower for party members compared to non-party members Among the control variables at the provincial level, the regional economic status has a significant effect on entrepreneurial choice, with a marginal effect of 3.6%, while the financial inclusion index has a significant negative effect, but its marginal effect is extremely weak, at -0.2%.

Models (2) to (4) report the regression results by region, and to save space, only the digital finance regression results are described. In terms of the differences between regions, the marginal effect of digital finance shows an inverted U-shaped trend from east to west, and both remain significant. In the eastern region, the marginal effect of digital finance is 9.7%, while in the central region, the marginal effect of digital finance is as high as 12.8%, while in the western region, the marginal effect of digital amount is only 6.8%.

Models (5) and (6) then report the regression results between urban and rural areas. To save space, only the results of the digital finance regressions are described. From

the results, the effect of digital finance on entrepreneurial choice is significant for both urban and rural residents, and the marginal effect of digital finance on entrepreneurial choice is 3.7% for urban residents, while for rural residents, the marginal effect of digital finance on entrepreneurial choice is as high as 18.4%, indicating that digital finance is more effective in helping rural residents to start their own businesses.

Table 2: Regression results of entrepreneurial choice Probit

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	**Overall**	**Eastern Region**	**Central Region**	**Western Region**	**City Account**	**Rural household registration**
Digital Financial Use	0..096***	0.097***	0.128***	0.068*	0.037*	0.184***
	(0.016)	(0.017)	(0.039)	(0.041)	(0.019)	(0.028)
Gender	0.009	0.029*	-0.020**	-0.024	0.045***	-0.057**
	(0.014)	(0.016)	(0.033)	(0.0432)	(0.016)	(0.024)
Age	0.003***	0.003***	0.004**	0.004**	0.003***	0.005***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Education level	-0.047***	-0.032***	-0.063***	-0.056***	-0.036***	-0.041***
	(0.006)	(0.007)	(0.015)	(0.015)	(0.007)	(0.012)
Party membership	-0.098***	-0.059***	-0.208***	-0.104**	-0.088***	-0.096**
	(0.018)	(0.020)	(0.045)	(0.047)	(0.017)	(0.046)
Health	-0.013	0.066	0.039	0.005	0.080*	-0.035
	(0.053)	(0.071)	(0.117)	(0.088)	(0.047)	(0.086)
LnGDP	0.036**	0.071***	0.112*	0.058	0.033*	0.028
	(0.015)	(0.018)	(0.067)	(0.042)	(0.017)	(0.026)
Industry Structure	-0.002	0.001	0.056	0.050	-0.018	0.020
	(0.011)	(0.011)	(0.162)	(0.039)	(0.013)	(0.020)
Financial Inclusion Index	-0.002***	0.000	-0.001	-0.002	-0.001***	-0.002***
	(0.000)	(0.000)	(0.002)	(0.002)	(0.000)	(0.001)
Note: Standard errors are in parentheses. *, **, *** represent significant at the 10%, 5%, % levels are significant.						

Table 3 reports the results of the OLS regression of digital finance on entrepreneurial performance. As can be seen from the model (1) in Table 3, the effect of the use of digital finance on entrepreneurial performance is significant at the 1% level with a marginal effect of 0.599, i.e., the use of digital finance is able to increase the logarithm of entrepreneurial income by 0.599 units, thus the second hypothesis of this paper, H2, that digital finance does increase entrepreneurial performance. Among the individual characteristic variables, only the education level has a significant effect with a marginal effect of 0.102, i.e., for each step up in education level, entrepreneurial performance increases by 0.102 units; among the provincial level control variables, only the financial inclusion index has a significant effect though with a marginal effect of 0.015, i.e., for each point up in the financial inclusion index, entrepreneurial performance increases by 0.0 .15 units.

Models (2) to (4) report the regression results by region, and to save space, only the

digital finance regression results are described. In terms of the differences between regions, the marginal effect of digital finance shows a positive U-shaped trend from east to west, but is significant only in the eastern and western regions. In the eastern region, the marginal effect of digital finance is 0.945 units, which means that the use of digital finance increases entrepreneurial performance by 0.945 units, while in the central region, the marginal effect of digital finance is not significant, and in the western region, the marginal effect of digital amount is 0.736, which indicates that the use of digital finance increases entrepreneurial performance by 0.736 units. Models (5) and (6) then report the regression results between urban and rural areas. From the results, the effect of digital finance on entrepreneurial choice is significant for both urban and rural residents, and to save space, only the results of the digital finance regressions are described. For urban residents, the marginal effect of digital finance on entrepreneurial performance is 0.753, while for rural residents, the marginal effect of digital finance on entrepreneurial choice is 0.438, indicating that the use of digital finance is more effective in improving the entrepreneurial performance of urban residents compared to rural residents.

Table 3: OLS regression results of entrepreneurial performance

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	**Overall**	**Eastern Region**	**Central Region**	**Western Region**	**City Account**	**Rural household registration**
Digital Financial Use	0.599***	0.945***	0.138	0.736**	0.753***	0.438*
	(0.167)	(0.273)	(0.297)	(0.302)	(0.250)	(0.229)
Gender	0.005	-0.108	0.089	0.239	0.116	-0.017
	(0.132)	(0.199)	(0.248)	(0.229)	(0.200)	(0.179)
Age	0.004	0.018	-0.017	0.006	0.007	-0.005
	(0.007)	(0.011)	(0.012)	(0.013)	(0.011)	(0.010)
Education level	0.102*	0.223***	-0.122	-0.033	0.084	-0.014
	(0.058)	(0.079)	(0.113)	(0.117)	(0.086)	(0.093)
Party membership	0.173	0.275	0.249	-0.121	-0.026	0.501
	(0.286)	(0.361)	(0.795)	(0.493)	(0.355)	(0.501)
Health	0.483	0.189	-0.757	1.200**	0.908	0.315
	(0.489)	(1.592)	(0.952)	(0.570)	(1.212)	(0.539)
LnGDP	-0.144	-0.059	-0.726	-0.256	-0.125	-0.137
	(0.141)	(0.227)	(0.493)	(0.284)	(0.205)	(0.200)
Industry Structure	-0.013	0.0226	2.044*	-0.455*	-0.026	0.042
	(0.113)	(0.136)	(1.216)	(0.267)	(0.171)	(0.155)
Financial Inclusion Index	0.015***	0.015***	-0.017	-0.001	0.017***	0.011**
	(0.004)	(0.005)	(0.015)	(0.0126)	(0.06)	(0.00)
Constants	7.608***	5.895*	22.900***	12.370***	6.294***	9.359***
	(1.306)	(3.308)	(4.458)	(3.964)	(2.005)	(1.853)
Note: Standard errors are in parentheses. *, **, *** represent significant at the 10%, 5%, % levels are significant.						

The regression results of digital finance on entrepreneurial choice and entrepreneurial performance show that digital finance shows significant effects in all aspects of entrepreneurial activity, but while it works, it plays a very different role in the entrepreneurial choice and entrepreneurial performance across regions and groups: for entrepreneurial choice, it shows an inverted U-shaped trend in the eastern, central and western regions, while it has a greater effect on rural residents' However, when the explanatory variable becomes entrepreneurial performance, its marginal effects are reversed. This paper argues that the opposite marginal effects of digital finance on entrepreneurial choice and entrepreneurial performance reflect the fact that studies have pointed out [13] that, on the one hand, digital finance brings "digital opportunities" that increase the amount of credit available to disadvantaged groups, improve their identification of entrepreneurial opportunities, and promote their choice of entrepreneurship; but on the other hand, digital finance brings "digital opportunities" that improve the identification of entrepreneurial opportunities and promote their choice of entrepreneurship. On the other hand, digital finance also creates a "digital divide" in which economically developed regions and groups with higher capacity are better able to take advantage of digital finance due to their financial literacy and ability to accept and use new tools, thus widening the gap in entrepreneurial performance.

4.2 Endogeneity test

Since digital finance is emerging, it is possible that many residents have already engaged in entrepreneurial activities before it emerged, which leads to endogeneity problems such as possible reverse causality. Therefore, in this paper, we refer to Guangsu Zhou and Fan [62] and use the instrumental variable Probit model and IV-2SLS model to address this issue.

The instrumental variable selected in this paper is "whether or not you have been online in the last six months", which takes the value of 1 if you are online and 0 if you are not. This variable is chosen as an instrumental variable for digital finance use for two main reasons: first, Internet access is a prerequisite for digital finance use and the two are well correlated; second, Internet access and entrepreneurial activity are not directly correlated and thus satisfy the exogeneity condition; Second, there is no direct correlation between Internet access and entrepreneurial activity, thus satisfying the condition of exogeneity of the instrumental variable.

The results of the Probit regressions on the instrumental variables selected for entrepreneurship are shown in Tables 4 and 5, and the control variables are selected consistent with the previous section. Table 4 model (1) reports the test results for the overall sample, while models (2) to (4) report the test results by region, and Table 5 reports the test results by urban and rural areas. As can be seen from the regression results in Table 4, after overcoming the potential endogeneity with instrumental variables, the use of digital finance still shows a significant contribution to entrepreneurial choice in the overall sample, and the effect on different regions remains largely consistent with the main test. However, in Table

5, although digital finance has a greater facilitative effect on entrepreneurial choice for rural households than for urban households, it can be seen that after overcoming the potential endogeneity, the use of digital finance has a negative effect on entrepreneurial choice for urban residents.

Table 4: IV-probit test results

	(1)		(2)		(3)		(4)	
Variables	**Overall**		**Eastern Region**		**Central Region**		**Western Region**	
Digital Financial Use	0.104***		0.128**		0.195**		0.002	
	(0.214)		(0.061)		(0.094)		(0.110)	
Internet access or not		0.495***		0.495***		0.499***		0.477***
		(0.018)		(0.027)		(0.034)		(0.038)
Control variables	yes		yes		yes		yes	
Note: Standard errors are in parentheses. *, **, *** represent significant at the 10%, 5%, % levels are significant.								

Table 5: IV-probit test results

	(1)		(2)	
Variables	**City Account**		**Rural household registration**	
Digital Financial Use	-0.169**		0.477**	
	(0.079)		(0.026)	
Internet access or not		0.501***		0.306***
		(0.028)		(0.068)
Control variables	yes		yes	
Note: Standard errors are in parentheses. *, **, *** represent significant at the 10%, 5%, % levels are significant.				

The results of the IV-2SLS regressions on entrepreneurial performance are shown in Tables 6 and 7, and the choice of control variables is consistent with the previous section. Table 6 model (1) reports the test results for the overall sample, while models (2) to (4) report the results by region, and Table 7 reports the results by urban and rural areas. The regression results in Table 6 show that after overcoming the potential endogeneity with instrumental variables, the use of digital finance still shows a significant contribution to entrepreneurial performance in general, but only for the eastern region in the inter-regional context. And in Table 7, after overcoming the potential endogeneity, the use of digital finance has a significant contribution to entrepreneurial performance only for urban residents.

Table 6: IV-2SLS test results

	(1)		(2)		(3)		(4)	
Variables	**Overall**		**Eastern Region**		**Central Region**		**Western Region**	
Digital Financial Use	0.838***		1.393**		0.085		0.141	
	(0.372)		(0.710)		(0.540)		(0.727)	
Internet access or not		0.541***		0.486***		0.613***		0.448***
		(0.039)		(0.078)		(0.056)		(0.070)
Control variables	yes		yes		yes		yes	
Note: Standard errors are in parentheses. *, **, *** represent significant at the 10%, 5%, % levels are significant.								

Table 7: IV-2SLS test results

	(1)		(2)	
Variables	**City Account**		**Rural household registration**	
Digital Financial Use	1.501**		0.335	
	(0.604)		(0.467)	
Internet access or not		0.542***		0.538***
		(0.064)		(0.059)
Control variables	yes		yes	
Note: Standard errors are in parentheses. *, **, *** represent significant at the 10%, 5%, % levels are significant.				

4.3 Mechanism analysis

In the review and analysis of the literature, this paper summarizes the mechanisms through which digital finance works, i.e., alleviating information constraints, influencing the maximum loan amount, and improving the market environment, so are these three mechanisms effective? Based on the links of the role of digital finance on entrepreneurial activities and the availability of data, this paper chooses to test these three mechanisms with entrepreneurial choice as the explanatory variable.

4.3.1 A test of the mechanism to alleviate information constraints

In the CGSS2017 data, there is a question about whether the respondents think that "one of the advantages of the Internet is that more people have access to information", and this paper first divides the sample into two groups, one group chooses "agree with this view", which is recorded as the information. The other group chose "don't agree or don't care", which was recorded as the group without information constraints. This paper argues that the answers to this question reflect the respondents' degree of information constraint, and the greater the information constraint, the more they agree with the information revolution brought about by the Internet. According to the idea of quasi-natural experiment, digital finance can be regarded as a quasi-natural experiment, and the average processing effect of digital finance will be significant for the group with larger information constraint,

while the effect of digital finance should be smaller or insignificant for the group with smaller information constraint. Based on this, this paper chooses to use nearest neighbor matching and logit regression for PSM (propensity score matching) tests. The PSM test results are shown in Table 8 and Table 9. Table 8 reports the test results for the information constraint group and Table 9 reports the test results for the no information constraint group, the relevant common support hypothesis and the balanced test traits are good and are omitted from the report to save space. It is evident from the results that the average treatment effect of the information constraint group is significant at the 10% level and the average treatment effect is 0.138. Meanwhile, the average treatment effect of digital finance use in the no information constraint group is not significant, according to which this paper can conclude that digital finance can indeed promote entrepreneurial activities by alleviating information constraints.

Table 8: Information constraint group PSM results

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Business Choice	**Unmatched**	0.199	0.183	0.016	0.028	0.57
	ATT	0.210	0.072	0.138	0.073	1.90
	ATU	0.172	0.350	0.177	.	.

Table 9: PSM results for the no-information constraint group

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Business Choice	**Unmatched**	0.210	0.315	-0.105	0.076	-1.38
	ATT	0.268	0.232	0.037	0.168	0.22
	ATU	0.345	0.276	-0.069	.	.

4.3.2 Testing of mechanisms for increasing the maximum loan amount and improving the market environment

Many existing studies have shown that dialect or language plays a significant role in people's economic activities, as language is a carrier of information. Effective communication and exchange can reduce people's communication costs [63-64], enhance people's trust [65], and thus play a role in increasing income, enhancing trade activities, and reducing management costs. From this perspective, this paper argues that the "Mandarin listening level" and "Mandarin speaking level" in the CGSS2017 questionnaire can be used as proxy variables to reflect the impact of digital finance on the tightness of credit constraints and the maximum loan amount. In this paper, the samples who could not understand Mandarin at all or listened to it at a poor level were recorded as 0, and those who were average or better were recorded as 1. The samples who could not speak Mandarin at all or spoke it at a

poor level were recorded as 0, and those who were average or better were recorded as 1. Grouping according to these two dimensions and excluding (spoke well, listened poorly) resulted in three groupings, namely: (spoke poorly, listened poorly), (spoke poorly, listened good) and (speak well, listen well).

The credit constraint (Credit Constraint) can be divided into two constraints in terms of credit constraint tightness and maximum loan amount, which can be expressed in differential terms as:

$$dCC = d\lambda + dk \tag{3}$$

Drawing on the Blinder-Oaxaca decomposition, this paper argues that the credit constraint can be decomposed by a similar technique. Suppose that individuals who are both poor listeners and speakers of Mandarin are neither able to expand their maximum loan amount by leaving the local area to expand their social network and thus resort to informal finance (because of their poor ability to listen to Mandarin and thus cannot understand what outsiders say), nor can they borrow in places with better market environments, i.e., looser credit constraints (because of their poor ability to speak Mandarin and thus cannot communicate their borrowing intentions), and thus their The poor Mandarin speakers but good listeners can leave the local area to expand their social network and thus expand the maximum loan amount with the help of informal finance, so there is only a constraint from the formal financial sector, i.e. the constraint brought by the market environment.

In simple terms, the marginal coefficient of the impact of digital finance on the probability of entrepreneurship is β0 for the unconstrained condition, β1 for the marginal coefficient of the more severe credit-only constraint, β for the marginal coefficient of the constrained maximum loan amount, and β23 for both constraints. Theoretically, β0 -β1 reflects the extent to which digital finance mitigates the financial exclusion that exists in formal lending, i.e., improves the market environment, and β1-β3 reflects the extent to which digital finance increases the maximum loan amount.

Therefore, only three of the marginal coefficient values need to be found to obtain all the results. In this paper, the regression results according to the three subgroups are shown in Table 10. Based on the regression results, we can know that digital finance promotes the easing of credit constraint (coefficient difference of 0.472) and improves the market environment, but leads to the shrinking of the maximum loan amount, which makes the credit constraint slightly stronger in this channel (coefficient difference of -0.405), which this paper believes is reflecting the has a crowding-out effect on private lending. Thus, while digital finance improves the market environment and alleviates financial exclusion from the formal financial sector, it reduces the maximum amount of credit available to the population by crowding out private borrowing.

Table 10: Grouping Probit regression results of credit constraints

	(1)	(2)	(3)
	(Poor listening, poor speaking)	**(Good listening, poor speaking)**	**(Good to hear and good to say)**
Digital Financial Use	0.241**	0.713***	0.308***
	(0.111)	(0.143)	(0.118)
Difference	(3) - (2) = -0.405	(2) - (1) = 0.472	
Note: Standard errors are in parentheses. *, **, *** represent significant at the 10%, 5%, % levels are significant.			

5. Conclusion and policy recommendations

Digital finance has injected new dynamic energy into the development of entrepreneurial activities. Through theoretical analysis, this paper reveals the mechanism of the role of digital finance in influencing entrepreneurial activities, and points out the impact it has on various aspects of entrepreneurial activities. After that, this paper examines the overall and heterogeneous effects of the digital economy on entrepreneurial activities through the analysis of theoretical models and econometric tests by combining various data such as the China General Social Survey (CGSS) 2017, the Beida Inclusive Finance Index (2011-2018), and the 2017 provincial statistical yearbooks. In addition, this paper examines the mechanism of the role of digital finance on entrepreneurial activities and its differential impact in different contexts. The main findings of this paper are as follows:

Digital finance can play a role in many factors prior to the development of entrepreneurship, and the use of digital finance increases the probability of entrepreneurship among residents, and its marginal effect on entrepreneurial choice is 9.6%. After taking into account regional heterogeneity, the effect of digital finance on the probability of entrepreneurship shows an inverted U-shaped trend among the eastern, central, and western regions; and after taking into account urban-rural heterogeneity, the marginal effect of digital finance on the probability of entrepreneurship among rural residents is significantly higher than the marginal effect on the probability of entrepreneurship among urban residents.

Digital finance ultimately improves entrepreneurial performance by acting on many factors of entrepreneurial activity, and its marginal effect on entrepreneurial performance is 0.599 units after taking the logarithmic value of the annual income of entrepreneurs. After taking into account regional heterogeneity, the effect of digital finance on the probability of entrepreneurship shows a positive U-shaped trend among the eastern, central, and western regions; and after taking into account urban-rural heterogeneity, the marginal effect of digital finance on the entrepreneurial performance of urban residents is significantly higher than the marginal effect on the probability of entrepreneurship of rural residents.

According to the results of theoretical analysis and empirical tests, the mechanisms of digital finance on entrepreneurial activities can be summarized into three mechanisms: digital finance alleviates the information constraints faced by entrepreneurs and enhances their identification of entrepreneurial opportunities; digital finance improves the regional market environment and alleviates the financial exclusion faced by entrepreneurs; however, digital finance leads to a slight decrease in the maximum amount of loans available to entrepreneurs due to the crowding out of private lending. The maximum loan amount declined slightly.

General Secretary Xi Jinping pointed out that "from a large country to a strong country, the development of the real economy is crucial, and at no time can we take off the real to the virtual", "Finance should take serving the real economy as the starting and ending point". Then, how to make finance better serve the real economy, and thus serve the domestic general cycle? Based on the previous study, this paper makes the following recommendations:

First, accelerate the research and development of key information technology and promote the construction of digital infrastructure. Specifically, first, based on the needs of industrial digital transformation, gather universities, research institutes and other high-quality resources, increase the 5G enhancement technology, 6G technology research and development support, and then achieve a breakthrough in key information technology. Secondly, in view of the "digital divide", with the current opportunity of "new infrastructure", we will increase the investment in communication infrastructure, promote the construction of digital infrastructure in less developed areas, and then adopt the "digital equipment to the countryside" campaign to improve the digital infrastructure in less developed areas. The "digital equipment to the countryside" campaign will enhance the penetration rate of digital terminals in less developed areas and reduce the practical barriers to financial services for relatively poor groups.

Second, innovative financial regulatory mechanisms to prevent financial risks and safeguard information security. Specifically, first, establish and improve industry standards for digital technology, establish regulatory rules for digital financial products and services, and provide guidelines for financial digitization; second, improve the early warning mechanism of the financial system based on digital technology innovation and the use of big data analysis; third, revise and improve relevant laws to clarify the norms of the digital financial industry, including the flow of financial capital, the use of consumer information, and the transparency of information disclosure, so as to protect the sound development of digital financial enterprises and the security of consumer information.

Third, promote the construction of diversified credit systems to cultivate and enrich application scenarios. From the contextual analysis, we can see that digital finance will play a more significant role in a better institutional context, and a better cultural context and economic context will be more favorable for residents to choose entrepreneurship. Therefore, on the one hand, we should optimize financial regulatory policies and promote the construction of credit systems, etc.; on the other hand, we should promote the integration of digital infrastructure with

manufacturing, energy, agriculture, transportation and other real economies, so as to provide more application scenarios for the creation and use of digital finance innovation.

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