

Digital Inclusive Financial Popularization and China's SME Financing Constraints

Zihan Chen^{1,a,*}

¹Zhongnan University of Economics and Law, Wuhan, China

a. 13397152435@163.com

**corresponding author*

Abstract: The problem of financing constraints has always been an important factor restricting the development of small and medium-sized enterprises (SMEs), and digital inclusive finance has also been increasingly developed to become a powerful helper in alleviating the financing constraints of the enterprises. Based on the provincial panel data of digital inclusive finance from 2011 to 2020, the paper focuses on analyzing the improvement of SMEs' financing constraints by the development of digital inclusive finance and its secondary indicators covering depth, breadth, and digitization degree, specifically from the nature of the enterprise's shareholding and the economic location of the province where the enterprise operates to perform the heterogeneity analysis. The empirical results show that the development of digital inclusive finance can significantly improve the problem of SME financing constraints, especially for non-state-owned enterprises and enterprises located in the eastern provinces, the mitigating effect is the strongest, and the degree of digitization of digital inclusive finance has the best effect on the improvement of enterprise financing constraints among the three secondary indicators. Therefore, this paper suggests that digital inclusive finance should continue to strengthen the universality, strengthen the digitization degree of digital inclusive finance as well as the guiding role of the government policy, and promote the various types of enterprises in all regions of China to broaden the financing channels and improve the source of funds, so as to promote the benign development of China's enterprises and economic prosperity.

Keywords: digital inclusive finance, small and medium-sized enterprises, financing constraints, nature of corporate equity.

1. Introduction

At the G20 Hangzhou Summit in 2016, China put forward the concept of digital financial inclusion. In 2017, General Secretary Xi Jinping made it clear that he would actively promote financial inclusion in the direction of digitization, marking the fact that digital financial inclusion has become the main direction of development for China's new finance[1]. The model focuses on providing affordable and accessible financial services to all groups, especially strong financial support for SMEs whose financial needs are always strong. Characterized by low threshold, convenience and high efficiency, digital inclusive finance can expand the boundaries of financial services, expand the existing forms of financial services, effectively promote the process of “inclusive” financial services in China, and is a powerful helper in solving the imbalance of regional and urban-rural development in China[2].

SMEs play a crucial role in China's market economy. However, they face enormous financing difficulties, especially due to the huge demand for financing and the social and political pressure on SMEs. The financing gap is as high as US\$1.9 trillion due to the imbalance between the huge demand for financing and the supply of social capital. Other reasons for financing difficulties include: most of China's SMEs have low profitability and do not have enough assets to secure collateral; higher loan risks and supervision costs. However, at the same time, China's financial system is still imperfect, the number of small-sized and medium-sized financial institutions targeting SMEs is relatively small, the scope of services is narrower, and the funds are limited, which is also unable to meet the extensive financing needs of SMEs.

Digital inclusive finance, as a new model of financial development, breaks the restricted scope of traditional inclusive financial services and increases the popularity of modern financial services through the application of big data, cloud computing and other digital technologies. This model builds a “digital financial bridge”, enabling faster and more accurate information transfer between SMEs and financial institutions, mitigating the problem of asymmetric information, and facilitating two-way choices, thereby reducing transaction costs. This provides an innovative way to solve SME financing problems, which is expected to reduce financing constraints on a larger scale and promote easier access to loans.

The study aims to address the financing challenges of SMEs, which have been facing the problems of financing, which limits their development. By studying the relationship between digital inclusive finance and SME financing, it is possible to explore how digital technology can provide new financing channels and lower the financing threshold, thus solving SME financing challenges.

2. Literature review

As for the status of financing difficulties of SMEs in China, Lin Yifu and Li Yongjun proposed to solve the operating difficulties of state-owned enterprises and the problem of non-performing loans of state-owned banks, and to prevent the risks from the aspects of the market and the managers of the institutions[3]; Lin, Yifu, and Sun, Xifang analyze the positive effects of informal financial institutions on SMEs' financing from the perspective of informal financial institutions[4]; Li, Yong suggests that inappropriate ideas and ideologies should be eliminated, and public enterprises should be reformed, so as to break the situation of “dominance of a single enterprise”[5] Zhang Jie, and Wang, Xiao conduct research on different growth cycles of SMEs, and analyze and compare enterprise ownership and enterprise size on enterprise financing. It helps to alleviate the problem of financing constraints of SMEs[6]; Deng Kebin and Zeng Haihua start from the nature of shareholding, enterprise scale, and product market competition and other factors to explore the impact of corporate financing constraints, and find that the existing theories of financing constraints are inapplicable to China and put forward a preliminary explanation, that is, to confirm that China's financing constraints have a fundamental characteristic that is externally originated from the market[7]; Hong Jie and Chen Shaohua explore the influence of government financing constraints and the impact of the market competition in China[8].

As the development of digital financial inclusion in China is relatively short and varies greatly, the existing literature also conducts comparative studies for the different levels of development in various regions, combining the correlation between financial inclusion and the regional economy, bank competition, industrial structure and other aspects of research and analysis. Among them, Chen Yin'e, Sun Qiong, Xu Wenyun pointed out that the development of digital financial inclusion in China presents a small downward trend, the development of inclusive finance in the eastern region is gradually dispersed, and the central and western regions are more and more convergent, in which the central region gradually presents the phenomenon of polarization, and the polarization of the western region gradually disappears[9]. Ge Heping, Zhu Huwen concluded that regional economic

development has a nonlinear impact on digital financial inclusion, the lag phase of digital financial inclusion, population density, financial awareness, Internet use are all significantly positively correlated with digital financial inclusion, and the urban-rural income gap has an inverse relationship with digital financial inclusion[10].

To summarize, the previous research can be divided into macro and micro aspects, the macro level is mainly about the social environment, involving the region, urban-rural income gap, the level of consumption of residents and other areas, while the micro level is mainly related to corporate innovation, digital empowerment and other aspects of the study of corporate financing constraints, and most of the research is concentrated in the level of theoretical analysis, empirical research is not enough. In addition, due to the fact that the financial data of many enterprises are constantly updated over time, the degree of development, promotion and application of digital financial inclusion varies, and the conclusions based on this may be different, so the research made in this paper is very necessary.

3. Theoretical analysis

3.1. Digital inclusive finance and financing constraints.F

In order to optimize the supply-demand ratio of funds, traditional financial institutions often only provide traditional credit services according to the process. However, the development of digital inclusive finance has given rise to various new financing methods, such as public loans, supply finance, crowdfunding and other new financing methods, which have broadened the financing channels and optimized the financing sources. At the same time, the development of digital inclusive finance can effectively reduce the cost of enterprise financing, the addition of the Internet to the digitization process of inclusive finance is conducive to lowering the operating costs of institutions, lowering the interest rate of the loan, and providing more flexible financing service products. In addition digital inclusive finance can also reduce the problem of information asymmetry, financial institutions are able to obtain more detailed information about the enterprise and assess its credit risk, and the enterprise is also able to grasp more accurate market information, which realizes the matching of resources. From this, we propose hypothesis 1.

H1: The development of digital inclusive finance can effectively alleviate the financing constraints of SMEs

3.2. Digital inclusive finance and the nature of equity

Then we consider the problem of ownership discrimination raised by Zhang Jie and Wang Xiao [10]. Generally speaking, state-owned enterprises (SOEs) can easily enjoy government support and preferential policies, such as low-interest loans, government guarantees, higher information disclosure, better credit assessment, and often rely on state-owned banks, equity investment and other channels to obtain financial support, which can reduce their financing costs; whereas non-state-owned enterprises (NSOEs) mainly rely on the market mechanism, and are subject to the influence of market competition and capital market fluctuations, with imperfect information disclosure and incomplete assessment systems, and mainly rely on commercial banks, capital markets and the private sector for financing. incomplete, mainly rely on commercial banks, issue bonds or obtain loans from SMEs, with high financing costs and low difficulty. Therefore, we believe that the degree of financing constraints of non-SOEs is much higher than that of SOEs. And when digital inclusive finance continues to develop, it provides SMEs with a new type of road that distinguishes them from traditional financing methods, combined with a number of factors such as SMEs are more flexible in management, have a greater need for capital and rely less on mainstream financing methods, we propose hypothesis 2 in this paper.

H2: Digital inclusive finance has a more obvious role in alleviating the financing constraints of non-state-owned SMEs.

4. Empirical research design

4.1. Data sources

In measuring digital inclusive finance, this paper adopts the 2011-2020 Beida Digital Inclusive Finance Index, selects provincial data, and further selects three secondary indicators to measure the breadth, depth and the degree of digitization, respectively.

As the main body of this paper is SMEs, also choose 2011-2020 as the time span, the financial data and other information from the Cathay Pacific and Wind databases. After sorting those data, a total of 5,270 sample observations are retained as the unbalanced panel data of SMB firms spanning 2011-2020.

4.2. Variable selection and descriptive statistics

Table 1: Variables and definitions

Variable type	Variable symbol	Variable meaning
Explanatory variable	ΔCash	Change in cash holdings
Explanatory variable	CF	Corporate cash flow ratio
	DIFI	Digital Inclusive Financial Index
Control variable	Insize	Firm size
	ΔSD	Change in short-term liabilities of the firm
	ΔNWC	Change in net working capital
	Growth	Growth
	Expend	Enterprise capital expenditures
	Ind	Industry Dummy Variables
	Year	Year dummy variable
Subgroup Variables	Soe	Type of firm's equity, if the enterprise is a state-owned enterprise, Soe=1, if not, Soe=0.
	Prov	Region where the enterprise is located, if the enterprise is registered in the eastern province, east=1, if in the central province, mid=1, if in the western province, west=1

4.3. Modeling

This research adopts the cash-cash flow sensitivity model proposed by Almedia et al. (2004) for empirical analysis.

Benchmark model:

$$\Delta \text{Cash}_{it} = \beta_0 + \beta_1 \text{CF}_{it} + \beta_2 \text{Growth}_{it} + \beta_3 \text{InSize}_{it} + \beta_4 \text{Expend}_{it} + \beta_5 \Delta \text{NWC}_{it} + \beta_6 \text{SD}_{it} + f_t + u_i + \varepsilon_{it} \quad (1)$$

β_0 is the sensitivity of the enterprise's cash flow, which is used to indicate the degree of the enterprise's financing constraints. The error term. u_i represents the individual effect, f_t represents the time effect, and ε_{it} is the error term. i represents the industry type, t represents the year, and $\beta_1 \sim \beta_6$ are the coefficients of each variable.

Testing the model: testing whether digital financial inclusion eases SME financing

$$\Delta \text{Cash}_{it} = \beta_0 + \beta_l \text{CF}_{it} + \beta_2 \text{DIFI}_{jt} * \text{CF}_{it} + \beta_3 \text{Growth}_{it} + \beta_4 \text{InSize}_{it} + \beta_5 \text{Expend}_{it} + \beta_6 \Delta \text{NWC}_{it} + \beta_7 \Delta \text{SD}_{it} + f_t + u_i + \varepsilon_{it} \quad (2)$$

$$\Delta \text{Cash}_{it} = \beta_0 + \beta_l \text{CF}_{it} + \beta_2 \text{Breadth}_{jt} * \text{CF}_{it} + \beta_3 \text{Growth}_{it} + \beta_4 \text{InSize}_{it} + \beta_5 \text{Expend}_{it} + \beta_6 \Delta \text{NWC}_{it} + \beta_7 \Delta \text{SD}_{it} + f_t + u_i + \varepsilon_{it} \quad (3)$$

$$\Delta \text{Cash}_{it} = \beta_0 + \beta_l \text{CF}_{it} + \beta_2 \text{Depth}_{jt} * \text{CF}_{it} + \beta_3 \text{Growth}_{it} + \beta_4 \text{InSize}_{it} + \beta_5 \text{Expend}_{it} + \beta_6 \Delta \text{NWC}_{it} + \beta_7 \Delta \text{SD}_{it} + f_t + u_i + \varepsilon_{it} \quad (4)$$

$$\Delta \text{Cash}_{it} = \beta_0 + \beta_l \text{CF}_{it} + \beta_2 \text{Digital}_{jt} * \text{CF}_{it} + \beta_3 \text{Growth}_{it} + \beta_4 \text{InSize}_{it} + \beta_5 \text{Expend}_{it} + \beta_6 \Delta \text{NWC}_{it} + \beta_7 \Delta \text{SD}_{it} + f_t + u_i + \varepsilon_{it} \quad (5)$$

In order to test H1, we add the interaction terms of cash flow ratio and digital inclusive finance index, breadth, depth and degree of digitization, respectively in the paper to verify whether the three secondary indicators of digital inclusive finance can effectively alleviate the financing constraints of China's SMEs and make the empirical results more credible.

5. Empirical Analysis

5.1. Descriptive statistics

After the initial screening and processing of data, this paper uses stata17.0 to statistically analyze the main indicators of the empirical model, and the descriptive results are shown in the following table.

Table 2: Results of descriptive statistics

Variable name	Sample size	Mean	Variance	Minimum	Maximum
ΔCash	5270	0.003	0.103	-0.580	0.767
CF	5270	0.047	0.074	-0.760	0.530
Insize	5270	21.853	0.942	20.280	25.260
Expend	5270	0.059	0.054	0.000	0.640
Growth	5270	0.264	0.656	-0.820	3.241
ΔNWC	5270	1.044	2.483	-3.181	9.807
ΔSD	5270	0.314	0.171	0.005	3.017
Lnpdp	5270	9.677	0.437	8.542	10.760
Depth	5270	2.496	0.952	0.128	4.887
Coverage	5270	2.242	0.911	0.031	3.970
Digitalization	5270	2.955	1.183	0.076	4.622
DIFI	5270	2.434	0.939	0.162	4.319

5.2. Correlation Analysis

In order to prevent the problem of multicollinearity between variables and thus affect the reliability of the regression results, this paper firstly carries out correlation analysis on the main variables[11].

Table 3: Correlation analysis of main variables

	ΔCash	CF	Growth	Insize	Expend	ΔSD	DIFI	NWC
ΔCash	1							
CF	0.138***	1						
Growth	0.056***	-0.052***	1					
Insize	0.071***	0.024*	0.054***	1				
Expend	-0.127***	0.101***	-0.109***	-0.052***	1			
ΔSD	0.004	-0.168***	0.0110	0.394***	-0.077***	1		
DIFI	0.055***	0.139***	0.0160	0.311***	-0.256***	0.102***	1	
ΔNWC	0.102***	0.0170	0.098***	0.446***	-0.203***	-0.130***	0.122***	1

Note: *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively.

The correlation coefficients between the main variables in this study are less than 0.5, excluding the problem of multicollinearity.

5.3. Model regression

In this paper, we adopt a two-way fixed-effects model, firstly, we conduct regression analysis on the benchmark model 1 to determine whether SMEs have financing constraints, and subsequently, we add the interaction terms $DIFI*CF$, $Breadth*CF$, $Depth*CF$, and $Digital*CF$ in different dimensional dimensions of cash flow and digital financial inclusion index, and regress the model (2), (3), (4), and (5) are regressed to determine whether and how digital inclusive finance can effectively alleviate the financing constraints of SMEs.

Table 4: Model regression results

	m1	m2	m3	m4	m5
CF	0.308*** (10.7)	0.456*** (6.97)	0.439*** (6.38)	0.437*** (7.04)	0.486*** (8.04)
$DIFI*CF$		-0.0674* (-2.48)			
$Depth*CF$			-0.0575* (-2.05)		
$Coverage*CF$				-0.0641* (-2.30)	
$Digital*CF$					-0.0673** (-3.31)
Insize	0.0152*** (3.52)	0.0151*** (3.49)	0.0151*** (3.49)	0.0151*** (3.50)	0.0151*** (3.47)
Expend	-0.420*** (-9.30)	-0.419*** (-9.25)	-0.420*** (-9.26)	-0.419*** (-9.25)	-0.421*** (-9.26)

Table 4: (continued).

Growth	0.0101*** (3.32)	0.0102*** (3.35)	0.0101** (3.32)	0.0102*** (3.34)	0.0102*** (3.40)
ΔNWC	0.0114*** (5.11)	0.0118*** (5.18)	0.0118*** (5.18)	0.0118*** (5.18)	0.0119*** (5.19)
ΔSD	0.0191*** (3.71)	0.017*** (3.53)	0.0172*** (3.56)	0.0171*** (3.54)	0.0172*** (3.56)
Cons	-0.323*** (-3.45)	-0.324*** (-3.47)	-0.324*** (-3.46)	-0.324*** (-3.47)	-0.323*** (-3.44)
Year	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES
N	5270	5270	5270	5270	5270

Note: *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively.

Regression of the benchmark model reveals , where the coefficient of the CF variable is positive, indicating that financing constraints are prevalent among listed SMEs. Model 2, in which the coefficient of the cross-multiplier is quite negative, indicates that the development of digital inclusive finance makes SMEs less sensitive to cash holdings, and thus can alleviate external financing constraints, proving the hypothesis 1 mentioned above.

In testing models 3, 4 and 5, this research adds the cross-multiplier terms, and the regression results show that the development of the three secondary indicators are all able to effectively alleviate the financing constraints of the SMEs. The degree of digitization is significant at the 5% level and the empowerment effect is the most obvious among three secondary indicators.

5.4. Heterogeneous variable construction

The above empirical regression analyzes the overall role of digital financial inclusion on SME financing constraints. To further test hypotheses 2, 3, and 4, i.e., the role of digital inclusive finance on the financing constraints on SMEs with different nature of equity and local economy[4]. We first group SMEs according to the nature of company equity, which are SOEs and non-SOEs, in accordance with the Cathay Pacific data, and conduct a two-way fixed effect model regression on the basis of model (2).

Table 5: Results of Heterogeneity Analysis of Equity Nature

	(1) Overall	(2) SOEs	(3) Non-SOEs
CF	0.321*** (4.65)	-0.644*** (-2.80)	0.311*** (4.39)
DIFI*CF	-0.0298 (-1.14)	-0.0257 (-0.95)	-0.235** (-2.44)
Insize	0.0130*** (3.24)	0.0335 (0.81)	0.0124*** (2.99)
Expend	-0.462*** (-10.48)	-1.340*** (-4.48)	-0.465*** (-10.27)
Growth	0.0108*** (3.87)	0.0183** (2.46)	0.0117*** (3.89)
ΔNWC	0.0128***	0.0221***	0.0131***

Table 5: (continued).

	(6.28)	(2.83)	(6.10)
ΔSD	0.00736	0.0721	0.00917
	(0.39)	(0.85)	(0.47)
Cons	-0.249**	-0.449	-0.231**
	(-2.39)	(-0.53)	(-2.15)
R^2	0.100	0.594	0.101

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, numbers in the first row indicate regression coefficients, standard errors in parentheses

Observing the coefficients of the cross-multiplier terms of the cash flow changes of state-owned SMEs and non-state-owned SMEs with the digital financial inclusion index, it can be seen that the coefficients of the two are -0.0257 (non-significant), and -0.235 (significant) respectively, which means that digital inclusive finance alleviates the financing constraints of non-state-owned enterprises to a greater extent, which verifies Hypothesis 2.

Table 6: Results of the regional heterogeneity analysis

	(1) Eastern	(2) Central	(3) Western
CF	0.213*** (1.97)	0.176 (0.83)	0.462** (5.92)
DIFI*CF	-0.0738** (-2.32)	-0.0720 (-0.82)	-0.0544** (-2.45)
Insize	0.0121** (2.48)	0.00968 (0.85)	0.0251 (1.53)
Expend	-0.366*** (-7.37)	-0.523*** (-3.93)	-0.715*** (-4.11)
Growth	0.0105*** (3.03)	0.0126* (1.75)	0.00421 (0.36)
ΔNWC	0.0139*** (4.72)	0.0172*** (3.72)	0.0274*** (3.57)
ΔSD	0.0560** (2.57)	-0.0395 (-0.59)	0.0585 (0.77)
_cons	-0.300*** (-3.00)	-0.321 (-1.54)	-0.479 (-1.41)
N	2411	642	402
R^2	0.146	0.148	0.212
F	.	.	.

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, numbers in the first row indicate regression coefficients, standard errors in parentheses

From the table, it can be learned that the CF coefficients of listed SMEs located in eastern, central and western provinces are all positive, indicating that enterprises in all regions have financing constraints and the financing constraints of enterprises in western regions are the most serious. The CF regression coefficients of enterprises located in eastern, central and western provinces are 0.462, 0.176 and 0.213 respectively, among which the coefficients of SMEs in western provinces are the largest cash sensitivity coefficients, indicating that they have the highest difficulty in financing. This

may be related to the fact that enterprises in eastern provinces have better geographical location, better investment environment and more complete financial system.

And from the digital inclusive finance and cash flow interaction term, the three coefficients are -0.0738 (significant), -0.0720 (not significant) -0.0544 (significant), indicating that digital inclusive finance can effectively alleviate the problem of enterprise financing constraints in all geographic regions, in which the coefficients of the eastern region are the largest in absolute value and the best alleviation effect, which verifies Hypothesis 3.

5.5. Robustness Test

5.5.1. Fixed effects regression with fixed company individuals

In order to make the empirical results more complete and accurate, the fixed industry and year used in the main text is first changed to a more rigorous fixed-effects regression, fixing the individual company and year.

Table 7: Fixed sector analysis results

	(1) Cash	(2) cash	(3) cash	(4) Cash
DIFI*CF	-0.0675** (-2.44)			
Depth*CF		-0.0584** (-2.05)		
Coverage*CF			-0.0638** (-2.24)	
Digital*CF				-0.0673*** (-3.25)
CF	0.449*** (6.87)	0.443*** (6.30)	0.429*** (6.91)	0.478*** (7.94)
Insize	0.0134*** (3.18)	0.0134*** (3.18)	0.0134*** (3.19)	0.0133*** (3.15)
Expend	-0.412*** (-9.25)	-0.413*** (-9.26)	-0.412*** (-9.25)	-0.413*** (-9.25)
Growth	0.0101*** (3.46)	0.0101*** (3.43)	0.0101*** (3.45)	0.0102*** (3.50)
Δ NWC	0.0112*** (4.89)	0.0112*** (4.89)	0.0112*** (4.88)	0.0113*** (4.88)
Cd	-0.0181 (-1.27)	-0.0182 (-1.27)	-0.0182 (-1.28)	-0.0184 (-1.29)
Soe	0.000463 (0.04)	0.000243 (0.02)	0.0000634 (0.01)	0.000984 (0.09)
Cons	-0.274*** (-2.98)	-0.274*** (-2.98)	-0.274*** (-2.98)	-0.274*** (-2.97)
N	2965	2965	2965	2965
R ²	0.137	0.136	0.137	0.139
F	17.39	17.23	17.39	17.58

The empirical results yield that the coefficients of the four cross-multiplier terms are still significantly negative.

6. Conclusions and Recommendations

6.1. Main Conclusion

1. The development of digital inclusive finance can significantly alleviate the financing constraints of China's SMEs, improve the quantity and quality of the financing obtained by SMEs, and facilitate the operation of SMEs as well as the sustainable development of Chinese economy.

2. through the heterogeneity analysis, we conclude that digital inclusive finance plays a stronger role in alleviating the financing constraints of non-state-owned enterprises; at the same time, it has a greater role in solving the problem of financing constraints for SMEs in the eastern region, and the overall effect is "East>Central>West".

6.2. Policy Implications

After drawing the above conclusions, this paper also puts forward the following suggestions and inspirations:

Firstly, the government should help the rapid development of digital inclusive finance and downward popularization, strengthen the degree of digitization of inclusive finance, and facilitate the enjoyment of inclusive financial services for enterprises in all regions.

Secondly, we suppose that the government should also strengthen the development of digital inclusive finance in the central and western regions, so as to make the related products and technologies better promoted and applied.

Thirdly, enterprises should actively improve their information disclosure, focus on innovation and development, actively try new types of financial instruments, cooperate with the various policies promulgated by the government for digital inclusive finance, expand their financing channels as much as possible, and optimize the use of funds.

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