

# A Research on the Influence of Digital Inclusive Finance on Financing Constraints of SMEs

Bo Huang<sup>1, a</sup>

<sup>1</sup>School of Economics and Management, Beijing Jiaotong University, Beijing, China

<sup>a</sup>18120496@bjtu.edu.cn

\*Bo Huang

**Keywords:** Digital inclusive finance, SMEs, Financing constraints.

**Abstract.** It is a hot topic that how to ease financing constraints of SMEs effectively. Nowadays, the development of digital inclusive finance provides a solution to this problem. Based on Chinese Digital Inclusive Finance Development Index, this paper empirically examines the impact of the development of digital inclusive finance on SME financing constraints. Besides, the paper analyzes the difference of the mitigation effect of the development of digital inclusive finance on the financing constraints of SMEs under different levels of financial development. This paper finds that the development of digital inclusive finance can significantly ease the financing constraints of SMEs. In addition, in regions with lower levels of financial development, the mitigation effect of the development of digital inclusive finance on the financing constraints of SMEs may be enhanced. To a certain extent, this paper provides empirical data support for the promotion of digital inclusive finance.

## 1. Introduction

All sectors of our society are paying close attention to the development of SMEs because SMEs can play an important role in promoting economic growth, stimulating market vitality and promoting scientific and technological progress. However, due to the constraints of the external financing environment and their own limitations, SMEs always have financing constraints. Thus, Chinese scholars have begun to focus on inclusive finance, aiming at providing appropriate and effective financial services for all social strata and groups, especially for vulnerable groups neglected by traditional finance, such as small and micro enterprises and low-income people. But Wu Jinwang and Gu Zhouyi (2018) pointed out that there has always been a phenomenon that ideas outweigh actions in the development of inclusive finance because it faces global common problems such as high cost, low efficiency, service imbalance, etc. Thus, how to balance policy support and market development is rather difficult.

Digital technology provides a possible solution to overcome the difficulties of inclusive finance because digital platforms can conduct credit risk assessment through big data in the use of tens of millions or even hundreds of millions of users, greatly reducing the cost of acquiring customers and the cost of risk control, and improving the feasibility of inclusive finance development. Based on this, China adopted the Advanced Principles of Digital Inclusive Finance at the G20. Therefore, digital inclusive finance is a continuous deepening of inclusive finance, and inclusive finance must develop in the direction of digital inclusive finance. It is of practical significance to study whether the development of digital inclusive finance can ease the financial restraint of SMEs effectively.

## 2. Literature Review and Theoretical Analysis

### 2.1 Literature Review

There are few studies on the relationship between digital inclusive finance and financing constraints of SMEs. The majority of the studies focus on the impact of traditional inclusive finance on financing constraints of SMEs. Li Tao et al. (2016) believe that the development of inclusive finance can effectively alleviate financial exclusion. Zou Wei and Ling Jianghuai (2018) examined

the impact of inclusive finance on the financing constraints of SMEs by using the survey data of listed companies in China's SME board and the World Bank's Chinese enterprises. The results show that the development of inclusive finance can ease the financing constraints of SMEs, and the level of economic development and the legal system environment are the important factors that restrict inclusive finance from easing the financing constraints of SMEs. However, there are certain difficulties in developing inclusive finance. Huang Yiping and Huang Zhuo (2018) pointed out that inclusive finance is difficult to do in China, mainly because its customer base is rather small and mortgage assets are scarce, which lead to higher customer acquisition costs and more difficult risk control for financial institutions. Digital finance can give full play to the advantages of "low cost, fast speed and wide coverage" through scenes and data to reduce the financial service threshold and service cost, improve the financing environment of SMEs, and more effectively serve inclusive financial subjects. And Wang Xin (2015) pointed out that digital finance promoted the rational allocation of financial resources according to the long tail theory. However, the above-mentioned documents are theoretical analysis and do not support the viewpoint through corresponding empirical data.

Therefore, the innovation of this paper lies in the empirical research and further deepening of the relationship between digital inclusive finance and financing constraints of SMEs, providing empirical data support for the promotion of digital inclusive finance.

## **2.2 Theoretical Analysis and Research Assumptions**

Zou Wei and Ling Jianghuai (2018) pointed out that inclusive finance is to ensure that the objects excluded from financial services gradually obtain the relevant services they need through continuous competition and innovation on the premise that financial institutions can afford the costs. Digital inclusive finance is a deepening of inclusive finance, with data and combination of financial innovative products decreasing the degree of information asymmetry between capital supply and demand more effectively and reducing the financial service threshold and service cost more significantly. Thus, digital inclusive finance can alleviate the financing constraints of SMEs.

Therefore, the first research hypothesis is that the development of digital inclusive finance is helpful to alleviate the financing constraints of SMEs.

In addition, if the development of digital inclusive finance can alleviate the financing constraints of SMEs effectively, the effect may differ for enterprises in different regions. The level of financial development is one of the key factors because companies will face higher external financing costs in underdeveloped financial markets and a good financial development environment will help ease the financing constraints faced by companies. For example, Love (2003) believes that the higher the level of financial development is, the lower the sensitivity of enterprise investment to internal cash flow is. Similarly, Khurana et al. (2006) find that underdeveloped financial markets will force enterprises to conduct internal financing to avoid costly external financing. Thus, the development of digital inclusive finance may be more important for SMEs in regions with lower levels of financial development.

In view of this, the second research hypothesis is that with the higher level of financial development, the development of digital inclusive finance weakens the mitigation effect on the financing constraints of SMEs.

## **3. Empirical Research**

### **3.1 Research Design and Variable Selection**

In order to test the research assumptions, this paper constructs Logit model to study the impact of digital inclusive finance development on the financing constraints of SMEs:

$$FNC = f(SZPH, Control\ Variables). \quad (1)$$

$$FNC = f(SZPH, FD, FD \times SZPH, Control\ Variables). \quad (2)$$

Among them, FNC is the explained variable representing the financing constraints of SMEs. Kuang Xuewen et al. (2010) think that the interest guarantee multiple can be used as a good proxy variable for the external financing constraints of the company. Specifically, the interest guarantee multiple provides information on the company's ability to repay its debts and the possibility of bankruptcy. The lower the interest guarantee multiple is, the higher the possibility of facing financing constraints is. Thus, if the interest guarantee multiple of the enterprise is less than the sample median, meaning this enterprise has a higher degree of financing constraints, its financing constraint index is assigned to 1. Otherwise, it is 0.

As for explanatory variables, the China digital inclusive finance development index compiled by the Digital Finance Research Center of Peking University is used to replace the development degree of digital inclusive finance. In order to further explore which level of digital inclusive finance plays a role in easing the financing constraints of SMEs, this paper also selects two sub-indexes of the digital inclusive finance development index (Guo Feng et al., 2019), namely, the digital inclusive finance coverage breadth index and the digital inclusive finance usage depth index. Besides, according to Yang Youcai (2014), this paper uses the balance of loans as a proportion of GDP to express the level of financial development. As for control variables, according to published papers, the research selects the capital structure, operation ability, profitability, growth and enterprise size.

The specific description of variables is shown in table 1.

Table 1. Variables Definition

Variable name	Variable symbol	Definition
Degree of Financing Constraint	FNC	If the interest guarantee multiple is less than the sample median, the value is 1. Otherwise, it is 0.
Development of Digital Inclusive Finance	SZPHAG	China Digital Inclusive Financial Development Index
Coverage of Digital Inclusive Finance	SZPHCV	China Digital Inclusive Financial Coverage Index
Depth of Digital Inclusive Finance	SZPHDP	China Digital Inclusive Financial Depth Index
Financial Development	FD	Balance of Loans/GDP
Capital Structure	EDR	Equity-liability Ratio
Operating Capacity	IVTR	Current Assets Turnover Ratio
Profitability	ROA	Return on Assets
Debt Paying Ability	CASHR	Cash Ratio
Enterprise Growth	TAGR	Growth Rate of Main Business Incomes
Enterprise Scale	LNAT	Natural Logarithm of Total Assets

### 3.2 Data

The China Digital Inclusive Finance Development Index comes from the Digital Finance Research Center of Peking University. In terms of levels of financial development, the balance of various provincial loans and provincial GDP data are compiled by the National Bureau of Statistics. As for the financial data of SMEs, this paper selects the listed companies of SMEs from CSMAR database from 2011 to 2018, and excludes the following companies: (1) financial listed companies; (2)\*ST, ST and PT companies; (3) companies with an asset-liability ratio greater than 1 that are insolvent; (4) companies with abnormal data. For example, the net cash flow from operating activities/total assets at the beginning of the period is greater than 1. Descriptive statistical results of main variables are shown in Table 2.

Table 2. Descriptive Statistics

Variable symbol	Sample number	Mean	Standard deviation	Minimum	Maximum
FNC	2340	0.5	0.5001069	0	1
SZPHAG	2340	214.6975	84.4356	18.33	377.7337
SZPHCV	2340	195.4287	81.5503	1.96	353.8671
SZPHDP	2340	220.3406	86.7088	6.76	400.3972
FD	2306	1.3640	0.4048	0.6553	3.0846
CASHR	2339	0.4983	0.7619	0.0020	13.7038
EDR	2340	1.7249	1.5027	0.0635	16.1561
IVTR	2337	5.8981	9.5174	0.2381	119.9731
ROA	2340	0.0603	0.1165	-2.1517	0.3797
TAGR	2340	0.2187	0.3546	-0.6025	5.7789
LNT	2340	22.1263	0.9437	19.2878	26.1516

#### 4. Analysis of the Empirical Research

##### 4.1 Regression Analysis

In order to investigate the mitigation effect of the development of digital inclusive finance on the financing constraints of SMEs, this paper uses econometric models to test assumptions respectively. The regression results obtained are shown in Table 3.

Table 3. the Regression Results

Independent variable	Dependent variable: FNC					
	H1			H2		
	(1)	(2)	(3)	(4)	(5)	(6)
SZPHAG	-0.0018599** (0.0009213)			-0.0025934 (0.0023255)		
SZPHCV		-0.0020828** (0.0009691)			-0.0021769 (0.0023648)	
SZPHDP			-0.0011437* (0.0008784)			-0.0031141 (0.0023868)
SZPHAG*FD				0.0005622 (0.001645)		
SZPHCV*FD					0.0000733 (0.0016874)	
SZPHDP*FD						0.0014465 (0.0016424)
FD	-0.4177006** (0.1740638)	-0.3856952** (0.1798695)	-0.4702863*** (0.1768695)	-0.5474527 (0.4088483)	-0.4015993 (0.3988539)	-0.8054087** (0.4130675)
Number of Observations	2302	2302	2302	2302	2302	2302
R <sup>2</sup>	0.4483	0.4485	0.4475	0.4483	0.4485	0.4478

Note: \*, \*\*, \*\*\* indicate the significance levels of 10%, 5% and 1%, respectively. The robust standard errors of the estimated parameters are shown in brackets.

The regression result (1) in Table 3 shows that the regression coefficient of the digital inclusive finance development index is significantly negative at the 5% significance level, i. e. the higher the development level of digital inclusive finance is, the lower the financing constraints of SMEs are, which means that the development of digital inclusive finance has indeed significantly eased the financing constraint of SMEs in China. The result verifies H1 and provides enterprise-level

evidence for vigorously promoting the development of digital inclusive finance in China. Furthermore, the regression results (2) and (3) in Table 3 respectively show that the regression coefficient of the coverage breadth of digital inclusive finance is significantly negative at the significance level of 5%, and the regression coefficient of the usage depth of digital inclusive finance is significantly negative at the significance level of 10%, which show that the good development of the two components of digital inclusive finance, i. e. coverage and depth of digital inclusive finance, can also significantly ease the financing constraints of SMEs. In conclusion, regression results (1) to (3) all show that, the development of digital inclusive finance is helpful to alleviate the financing constraints of SMEs.

Besides, after the above-mentioned models correspondingly add the cross terms of the digital inclusive finance and financial development, the coefficients of the development level of digital inclusive finance, coverage scope and use depth of digital inclusive finance are still negative, and the coefficients of the cross terms are all positive, which is in line with the expected assumption, although the above coefficients are not significant at the significance level of 10%. The results show that the mitigation effect of the development of digital inclusive finance on the financing constraints of SMEs may be different in regions with different levels of financial development and hypothesis 2 may be correct.

## 4.2 Robustness Test

The above article has confirmed that the development of digital inclusive finance has indeed significantly eased the financing constraints of SMEs, and in regions with higher levels of financial development, the mitigation effect of the development of digital inclusive finance on the financing constraints of SMEs may be weakened. In order to further verify the robustness of the results, this paper uses the cash-cash flow sensitivity model proposed by Almeida et al. (2004) to test the above results. The basic model set is as follows:

$$\Delta CH_{i,t} = \beta_0 + \beta_1 CF_{i,t} + \beta_2 CF_{i,t} \times SZPHAG_{i,t} + \beta_3 SZPHAG_{i,t} + \sum \beta_j \times Control_{i,t}^j + \varepsilon_{i,t}. \quad (3)$$

Among them,  $\Delta CH$  is the proportion of annual net increase in cash and cash equivalents to total assets at the beginning of the period and  $CF$  is the proportion of annual cash flow from operating activities to total assets at the beginning of the period. The meanings of other explanatory variables and control variables are the same as above.

If the development of digital inclusive finance can significantly ease the financing constraints of SMEs,  $\beta_2$  is significantly negative. To test hypothesis 2,  $CF \times SZPHAG \times FD$  is added to formula (3). If the mitigation effect of the development of digital inclusive finance on the financing constraints of SMEs is weakened in regions with higher financial development, the coefficient of  $CF \times SZPHAG \times FD$  should be positive. The breadth and depth of digital inclusive finance are the same. Finally, the regression results of robustness test are more than consistent with Table 3. Therefore, the above conclusion is stable and reliable.

## 5. Conclusion

Based on the data of SMEs from 2011 to 2018, combined with the corresponding provincial digital inclusive finance development index, this paper empirically examines the mitigation effect of the development of digital inclusive finance on the financing constraints of SMEs. This paper finds that the development of digital inclusive finance can significantly ease the financing constraints of SMEs. Besides, the breadth and depth of digital inclusive finance can alleviate the financing constraints of SMEs as well. It also finds that in regions with different levels of financial development, the development of digital inclusive finance may have different mitigation effects on the financing constraints of SMEs. To be specific, in regions with lower levels of financial development, the development of digital inclusive finance may enhance the mitigation effect on the financing constraints of SMEs. Therefore, China should continue to promote the development of digital inclusive finance by increasing the types of Internet financial services, strengthening the

deepening of Internet financial services, and enhancing the depth of digital inclusive finance. In addition, the promotion of digital inclusive finance may need to be adjusted according to the external environment.

## References

- [1] Kuang Xuewen, Shi Zhenyi, and He Enliang, Financing constraints index and index evaluation of listed companies in China, *Journal of Shanxi Finance and Economics University*, vol.32, pp. 110-117, 2010.
- [2] Yang Youcai, Financial development and economic growth: Based on China's financial development as threshold variable, *Journal of Financial Research*, No.404, pp. 59-71, 2014.
- [3] Wang Xin, A study on Internet finance helping relieve SMEs financing constraints, *Journal of Financial Research*, No.423, pp. 128-139, 2015.
- [4] Li Tao, Xu Xiang, and Sun Shuo, Inclusive finance and economic growth, *Journal of Financial Research*, No.430, pp.1-16, 2016.
- [5] Li Xiuting, Literature review of the relationship between small and micro businesses financing difficulties and inclusive finance, *Technoeconomics and Management Research*, No.8, pp.62-65, 2017.
- [6] Chen Xiao, Analysis on affecting factors and countermeasures of the relationship lending of rural SMEs, *On Economic Problems*, No.4, pp. 65-69, 2017.
- [7] Wu Jinwang and Gu Zhouyi, Literature review of digital inclusive finance, *Finance and Accounting Monthly*, No.19, pp.123-129, 2018.
- [8] Guo Feng, Wang Jingyi, Wang Fang, Kong Tao, Zhang Xun, and Cheng Zhiyun, Measuring China's digital financial inclusion: Index compilation and spatial characteristics, *Working paper, Institute of Digital Finance, Peking University*, 2019.
- [9] Zou Wei and Ling Jianghuai, Inclusive finance and the financing constraints of SMEs: Evidence from SMEs in China, *Collected Essays on Finance and Economics*, No.234, pp. 34-45, 2018.
- [10] Huang Yiping and Huang Zhuo, The development of digital finance in China: Present and future, *China Economic Quarterly*, vol. 17, pp. 1489-1502, 2018.
- [11] Almeida,H., M. Campello, and M. S. Weisbach, The cash flow sensitivity of cash, *The Journal of Finance*, vol. 59, pp.1777-1804, 2004.
- [12] Love I. Financial development and financing constraints: International evidence from the structural investment model, *Review of Financial Studies*, vol. 16, pp. 765-791, 2003.
- [13] Berger A.N., Miller N.H., and Petersen M.A., Does function follow organizational form? Evidence from the lending practices of large and small banks, *Journal of Financial Economics*, vol. 76, pp. 237-269, 2005.
- [14] Khurana, I., X. Martin, and R. Pereira. Financial development and the cash flow sensitivity of cash, *Journal of Financial and Quantitative Analysis*, vol. 41, pp. 787-807, 2006.