

Digital Inclusive Financial Development, Financing Constraints and Shadow Banking by Non-Financial Firms

Jinsha Jiang *

School of Economics, Hangzhou Dianzi University, Hangzhou Zhejiang, 310000, China

* Corresponding author Email: 1027222961@qq.com

Abstract: Shadow banking by non-financial enterprises is outside the banking regulatory system, and its scale is expanding, posing a threat to China's financial stability and security. The development of digital inclusive finance can help restrain its blind expansion, and this restraint is mainly reflected in two effects: firstly, the 'technological' and 'inclusive' nature of digital inclusive finance has a direct restraint effect on the shadow banking business of non-financial enterprises; secondly, the digital inclusive finance has a direct restraint effect on the shadow banking business of non-financial enterprises. First, the 'technological' and 'inclusive' nature of digital inclusive finance has a direct inhibitory effect on shadow banking of non-financial enterprises; second, the development of digital inclusive finance has an indirect inhibitory effect by reducing the financing constraints of SMEs, thereby reducing the demand for shadow banking of SMEs in the region. Further heterogeneity analysis shows that the inhibitory effect of digital inclusive finance on shadow banking is more pronounced in enterprises with a low degree of digital transformation, suggesting that digital inclusive finance enhances the information transparency of enterprises, and also facilitates their seamless connection with the formal financial system, thus reinforcing the inclusive nature of digital finance.

Keywords: Digital Financial Inclusion; Shadow Banking; Regional Banking Competition.

1. Introduction

According to the China Monetary Policy Implementation Report for the First Quarter of 2023 released by the People's Bank of China, as of the end of March 2023, the balance of China's broad shadow banking stood at RMB 77.83 trillion, accounting for 80.4 per cent of GDP and 30.8 per cent of the total scale of social financing. These informal loans, which have been straying outside the regulatory system of the banks, not only increase the vulnerability of the financial system. They may also trigger systemic risks, thus affecting the healthy development of the real economy, and have caused great concern among China's financial regulators. The root causes of shadow banking of non-financial enterprises in China lie in the uncoordinated development of the capital market and the credit market, financial inhibition, credit constraints and the existence of credit discrimination. China's capital market is not well-developed, and enterprise financing mainly relies on the bank-led credit financing system. However, banks discriminate against enterprises of different natures in their credit operations, tending to grant loans to large enterprises and taking a wait-and-see attitude towards the loan needs of small and medium-sized enterprises, and there is obvious information asymmetry among market players, making it more difficult for the vast majority of small and medium-sized enterprises to obtain credit funds from banks, and leading to the marginalisation of enterprises with financing disadvantages from the formal financial system, and the need for them to obtain the funds they need from shadow banks.

In recent years, China has focused on the construction of the digital inclusive financial sector, emphasising the continuous and orderly promotion of digital inclusive financial development over the next five years, the

optimisation of inclusive financial products, and the improvement of the system of multi-level inclusive financial institutions. In the same year, the People's Bank of China issued the Specification for Digital Models of Banking Inclusive Finance Business, the first domestic financial industry standard in the field of digital inclusion, which emphasises that banking financial institutions provide comprehensive services to inclusive customers such as micro and small enterprises, individual businessmen and women, using digital models and technology as key elements. The use of digital financial inclusion triggers the innovation effect of traditional financial business models and processes through technical means such as big data mining, artificial intelligence and cloud computing, enabling financial institutions to optimise supply, strengthen services, promote the restoration of market vitality, facilitate the balance of supply and demand, and smooth the economic cycle, and open up a wider market space for the real business entities. In addition, the latest data from the State Financial Supervision and Administration Bureau showed that the balance of loans to inclusive small and micro-enterprises across the country at the end of 2023 increased by more than 23 per cent compared with the beginning of the year, strongly and effectively supporting the development of micro-enterprises. Data from the People's Bank of China show that the inclusive small and micro loan support tool has provided a cumulative total of 39.8 billion yuan of funds to local legal entity financial institutions, supporting an increase in inclusive small and micro loans of 2.2 trillion yuan.

Therefore, if digital inclusive finance can effectively play its 'inclusive effect', it can alleviate the financing difficulties of small and medium-sized enterprises (SMEs) and inhibit non-financial enterprises from conducting shadow banking business. The potential contributions of this paper are: first,

to explore the shadow banking of non-financial enterprises from the perspective of the external business environment of enterprises, i.e., the development of digital inclusive finance; second, to reduce the demand for shadow banking by SMEs in the region by alleviating the financing constraints, thus generating an indirect inhibitory effect; third, to explore the specific impact of the development of digital inclusive finance on the shadow banking of non-financial enterprises from the perspective of the degree of enterprise digitisation, and provide policy guidelines for enterprises to develop their business, enterprises to conduct their business and provide policy guidelines.

2. Literature Review

2.1. A Study of the Content of Digital Financial Inclusion Development and its Implications

Data from the Digital Finance Research Centre of Peking University show that digital inclusive finance has achieved leapfrog development in recent years [1]. Digital inclusive finance through digital information technology means, such as mobile Internet, cloud computing, big data, artificial intelligence, etc. to make up for the existence of the traditional financial system in the supply of short [3]. This paper mainly focuses on digital inclusive finance on traditional financial services and enterprise level, to sort out the literature.

The impact of digital inclusive finance on the services of traditional finance mainly focuses on expanding the increment and improving the stock [3]. Firstly, expanding the incremental quantity refers to the fact that digital inclusive finance can better serve those customer groups that are difficult to be covered by traditional financial institutions through the use of Internet technology [4,5], absorbing the idle funds of residents, broadening the borrowing channels, and reducing the demand for traditional private lending [6]. Secondly, improving the stock means that digital inclusive finance reduces the various costs of financial services by alleviating information asymmetry, improving information transparency and decision-making efficiency, improving payment and clearing efficiency, loan approval procedures, etc. At the same time, compared to Internet financial enterprises in relocating financial services online, digital inclusive finance pays more attention to the use of data and information analyses to improve the ability of risk control [7]. In addition, the banking sector plays multiple roles in traditional financial services, such as capital financing, risk management, payment and settlement, and financial planning, which plays a crucial role in the stability and development of the economy. And digital finance through technology to promote financial product innovation, promote the traditional financial digitization and business upgrading and transformation, which in turn improves the diversity of financial products and service quality, and promotes the obvious intensification of competition among banks in the credit business [8]. And under the intensification of competition, traditional commercial banks actively adopt digital technology transformation to enhance risk-taking capacity to achieve profitability [9]. Wu Yu et al. (2020) [10] found that banks integrate the advantages of digital inclusive financial institutions in terms of technology and customer resources, which helps to improve their learning ability mechanism and innovation ability, which in turn improves their development level.

The impact of the development of digital inclusive finance on the enterprise level centres on the financing constraints faced by enterprises and the phenomenon of ‘deconcentration’. On the one hand, digital inclusive finance focuses more on the popularity and universality of financial services than traditional finance, and SMEs can benefit from financing. Existing studies generally agree that digital inclusive finance plays an important role in alleviating financing constraints [11]: firstly, digital inclusive finance uses digital technology to promote the transformation of banks, improve resource allocation efficiency, and reduce the possibility of large enterprises obtaining excessive credit [12]; secondly, digital empowerment reduces the cost of access to information, so that financial institutions have a better understanding of the situation of the demand for funds, and then alleviate the information asymmetry problem between banks and enterprises [13]. Secondly, digital empowerment reduces the information acquisition cost so that financial institutions can better understand the situation of capital demanders, thus alleviating the information asymmetry problem between banks and enterprises [13], solving the adverse selection and ethical problems [14], and helping SMEs to open up financing channels. On the other hand, digital inclusive finance can help curb the trend of ‘de-realization’ of real enterprises, reduce the proportion of financialization of enterprises, and prevent the excessive expansion of the shadow credit market, so as to avoid a continuous decline in the willingness of real investment [15]. The use of digital technology by financial institutions to improve the transparency of information on credit enterprises and the use of funds for projects, and the establishment of differentiated credit pricing mechanisms and external supervision [16] can help to improve the efficiency of resource allocation, ensure financial services for the real economy, and thus curb the behaviour of enterprises to the virtual reality.

2.2. A Study on the Content of Shadow Banking of Non-Financial Enterprises in China and Its Implications

According to the financial data of non-financial listed enterprises, shadow banking investment accounts for about 19.07% of the total assets, which indicates that the shadow banking of non-financial enterprises is constantly emerging and has become an important investment channel for non-financial enterprises [17]. Relevant literature combing can be obtained, non-financial enterprises mainly through entrusted loans, entrusted financial management and private lending these three forms of participation in the shadow banking industry [18,19,20]. In entrusted lending, borrowers and lenders are usually related, and they can take advantage of the information advantage to enable small enterprises to obtain loans at a lower cost, such as listed companies issuing loans to subsidiaries or upstream and downstream suppliers. Private lending, on the other hand, helps lenders access borrower information and data more easily compared to the traditional financial sector through strong social networks, alleviating the financing difficulties of SMEs and improving financial inclusion. Entrusted wealth management is a business in which individuals or companies are entrusted by clients to preserve and increase the value of their assets through investment and management of client assets.

Shadow banking of non-financial enterprises acts as a financial intermediary, presenting a negative impact on the

level of bank liquidity hoarding, which to a certain extent alleviates the problem of SMEs' financing constraints [21], and is an important supplement and extension of traditional finance [22]. However, the behaviour of the entity enterprise shadow banking, will lead to the credit fund supply chain lengthening, and shadow banking outside the traditional banking system, has a hidden, easy to become a tool for enterprises to avoid financial regulation, for the community and the enterprise itself will bring the wind [23]. At the same time, non-financial enterprises risk identification and disposal capabilities compared to formal financial institutions lack of professional performance [24]. In addition, large enterprises as a 'real intermediary' in the event of default, the result will be more contagious and panic [25], resulting in the simultaneous deterioration of credit risk and liquidity risk.

It can be seen that, although non-financial corporate banking has enhanced the flexibility and efficiency of the financial market to a certain extent, it has attracted attention due to its low transparency, complex risk transfer and potential systemic risk; the development of digital inclusive finance has improved the service capacity of the financial industry, which is objectively conducive to curbing the expansion of non-financial corporate banking and resolving the risk of shadow banking. However, existing studies have not conducted in-depth research on the mechanism of digital inclusive finance to inhibit the expansion of non-financial corporate shadow banking, and also lack empirical analysis of the actual effect of digital inclusive finance development in recent years in dissolving shadow banking risks, which makes people have a vague understanding of the impact of digital inclusive finance development on shadow banking, which is not conducive to both the development of digital inclusive finance and shadow banking risk mitigation. This paper will explore these issues in order to clarify and reveal the important role and significance of the development of digital inclusive finance for the resolution of shadow banking risks.

3. Theoretical Analysis and Research Hypothesis

3.1. Analysis of the Direct Effects of Digital Financial Inclusion on Shadow Banking for Non-Financial Firms

The intrinsic motivation for non-financial enterprises to engage in shadow banking is mainly driven by the need to solve their own investment and financing problems, seek higher returns on investment, and adapt to financial market innovation. However, the development of digital inclusive finance is committed to the inclusion and accessibility of financial services, promoting the digitalization process of the traditional financial industry, improving the efficiency and fairness of resource allocation in the financial market, and breaking through the coverage and financing bottlenecks of traditional financial institutions. This paper specifically illustrates the impact of the development of digital financial inclusion on the shadow banking of non-financial enterprises from two dimensions: demand and supply.

From the perspective of demand, digital inclusive finance's use of tools such as information technology, big data and the Internet helps eliminate the problem of information asymmetry between banks and enterprises, breaks down geographic restrictions, and reduces financing costs. This

enables traditional financial institutions to obtain accurate information on SMEs at lower costs, mitigates the problem of adverse selection between banks and enterprises, and promotes the traditional credit sector to provide financing directly to SMEs. At the same time, the development of digital inclusive finance has increased competition among the traditional financial sector and pushed the transformation of the traditional financial system to digitalization, as banks have begun to provide more diversified financing services to SMEs in order to enhance their position in the market. As a result, with the expansion of financing channels for SMEs, their reliance on shadow bank funding has decreased. From a supply perspective, firstly, the fairness of financial resource distribution has been significantly improved under the benefits of inclusive finance, and large enterprises are less likely to receive excess credit. Secondly, the use of digital technology in the financial sector has led to an increase in the transparency of information of listed companies, standardization of information disclosure, and a significant weakening of the covert nature of shadow banking carried out by enterprises. In addition, the development of digital inclusive finance reduces the cost of financing for small and medium-sized enterprises (SMEs), forcing enterprises to carry out banking business at a lower rate of return, thus reducing their willingness to carry out shadow banking business.

Based on the above analysis, the following theoretical hypotheses are proposed:

Theoretical Hypothesis 1: The development of digital inclusive finance can inhibit non-financial enterprises from conducting shadow banking.

3.2. Analysis of the Indirect Effects

Based on the analysis of the above direct effects, it is not difficult to find that the rise of digital financial inclusion has had a direct and far-reaching impact on the financing model of non-financial enterprises. At the same time, the national policy level has also actively affirmed the importance of using digital financial technology to promote the development of credit service inclusion. In this process, financing constraints, as a key factor, play a particularly significant role in exploring how digital finance affects the phenomenon of shadow banking of real enterprises. Next, we will further refine this analysis from a corporate perspective.

The first is the significant reduction of information asymmetry. Modern information technology tools have gradually become the financial infrastructure of traditional financial institutions, and the layout of banks has shifted to 'industrial digitisation', which significantly improves information processing and analysis capabilities. Financial institutions are able to gain a comprehensive understanding of enterprise operation, finance and credit, accurately assess risk, build credit images, and at the same time, the whole process of dynamic supervision to control and reduce credit risk, significantly improve information transparency, reduce the degree of information asymmetry between the borrowing and lending parties, enhance the trust of financial institutions in small and medium-sized enterprises, and promote bank-enterprise credit co-operation. Second is the diversification and convenience of financing channels. The development of digital finance provides enterprises with more diversified and convenient financing channels, breaking the time and space limitations of traditional financial services. Through the Internet financial platform, mobile payment, network lending

and other new financial forms, network lending, equity crowdfunding, supply chain finance and other emerging modes have also become a new choice for enterprise financing. Finally, it is the reduction of financing cost and the improvement of efficiency. By optimising the allocation of financial resources, reducing intermediate links, improving the effectiveness of financial services, and relying on the scale effect and diminishing marginal cost characteristics, digital finance has reduced the unit cost of financial services, helping enterprises to obtain financing support at a lower cost and improving overall operational efficiency.

The alleviation of corporate financing constraints by the development of digital inclusive finance has led to a shift in the driving force for shadow banking by non-financial enterprises. First, the attractiveness of formal financing channels is enhanced. When corporate financing constraints are eased, the likelihood of obtaining stable, long-term and cost-controlled funds from formal financial channels increases significantly, and the attractiveness of formal financial channels increases significantly as costs are reduced, processes are simplified, and they become more efficient, thus reducing reliance on shadow banking. Second is the reduction of risk management costs. Shadow banking is often accompanied by higher interest rates and complex contract terms, which increase the financial burden and risk management difficulty for enterprises. With the easing of corporate financing constraints, firms do not have to bear additional shadow banking risk management and compliance costs in order to raise capital. Finally, it promotes stable and sustainable business development. The innovation in financing models brought about by digital finance has improved the financing environment in which SMEs find themselves. In this environment, enterprises tend to focus on real economic growth compared to the high risk and opacity of shadow banking. By setting up better capital allocation mechanisms and risk control measures, enterprises continue to optimise their organisational structure and improve their management level, increase their creditworthiness to maintain their competitiveness, and create a virtuous cycle of low-cost access to capital.

In conclusion, digital inclusive finance reduces the degree of information asymmetry, broadens the diversification and convenience of financing channels, and lowers the cost of financing by alleviating the financing constraints of enterprises, thus attracting enterprises to obtain financing from formal financing channels, and enterprises reduce their reliance on shadow banking, driven by sustainable development. Based on the above analysis, the following theoretical hypothesis is proposed:

Theoretical Hypothesis 2: Digital inclusive finance indirectly inhibits shadow banking by non-financial enterprises by alleviating corporate financing constraints.

4. Empirical Analysis

4.1. Data Sources

In this paper, non-financial listed companies are selected as the sample for empirical analysis from 2013 to 2022, and the level of digital financial inclusion development is measured by the 'Peking University Digital Financial Inclusion Index' compiled by Peking University Digital Finance Research Centre, and the enterprise-level data is obtained from the CSMAR database. When combining the region (prefecture-level city) where the company is registered with the Digital

Financial Inclusion Index, the initial sample data was processed as follows: (1) The samples of listed companies in the ST and *ST categories were excluded. (2) In accordance with the Guidelines on Industry Classification of Listed Companies (revised by the SFC in 2012), data of listed companies in the financial category (J66-J69) were excluded. (3) Data of certain listed companies with incomplete data were excluded. A total of 15,071 observation samples were obtained by applying the before-and-after 1% Winsorize treatment to continuous type variables.

4.2. Description of Variables

Explained variable - enterprise shadow banking (Shadow): The main forms of shadow banking of non-financial enterprises include entrusted loans, entrusted wealth management and private lending. According to the current accounting standards, most listed companies record entrusted loans under 'non-current assets due within one year', 'other non-current assets' and 'other current assets' under the accounting accounts. Therefore, this paper estimates the size of entrusted loans by summing up the balances of the three types of accounting accounts. The entrusted finance data comes from the CSMAR database of foreign investment. Enterprises engaging in shadow banking activities in the form of private loans such as bridge loans are generally recorded in other receivables, so this paper uses 'other receivables' as a proxy variable for private loans, and the data come from the relevant columns of the balance sheets of listed companies in the CSMAR database. The size of shadow banking business of non-financial enterprises is equal to the sum of entrusted loans, entrusted wealth management and private lending, and the data after summing are logarithmised in this paper.

Core Explanatory Variable--Digital Inclusive Finance Index: The 'Peking University Digital Inclusive Finance Index (2013-2022)' compiled by Peking University's Digital Finance Research Centre measures the level of digital inclusive finance development in various regions of China. The time span of the index is 2013-2022. This paper mainly adopts the composite index of digital inclusive finance at the prefecture-level city level as the index to measure the development level of digital inclusive finance, and the index is logarithmised in the actual parameter estimation.

Control variables: this paper incorporates a number of relevant control variables reflecting the financial characteristics of enterprises, the degree of engaging in financial activities, and so on, in the model. In addition, time fixed effects, industry fixed effects and prefecture-level city fixed effects are also included as control variables.

4.3. Model Construction

In order to test the impact of digital financial inclusion on non-financial enterprises conducting shadow banking, this paper constructs the following econometric model for analysis:

$$Shadow_{i,j,t} = \alpha_0 + \beta_1 Index_{i,t} + \Sigma Control_{i,j,t} + FE_{Year} + FE_{Are} + FE_{Industry} + \varepsilon_{i,j,t} \quad (1)$$

Where, $Shadow_{i,j,t}$ is the proxy variable for shadow banking of non-financial firms, $Index_{i,t}$ is the proxy variable for digital financial inclusion, $\Sigma Control_{i,j,t}$ is the control variable involved in the regression analysis, FE_{Year} , FE_{Are} and $FE_{Industry}$ represent time, prefecture-level city and

industry fixed effects, respectively, $\varepsilon_{(i,j,t)}$ is the random perturbation term, i,j,t represents city, industry and time respectively.

4.4. Analysis of Baseline Estimation Results

Table 1 reports the estimation results of model (1). Column (1) considers only the univariate effect of digital financial inclusion development on shadow banking by non-financial firms, controlling for time, industry and prefecture fixed effects. Without adding any control variables, we find that the coefficient of the digital financial inclusion index (Index) is negative and significant at the 1% significance level, and the model has a goodness of fit of 21.2%. This result suggests that an increase in the level of digital financial inclusion development will reduce the scale of shadow banking

conducted by non-financial firms, showing a significant dampening effect. After adding a number of control variables reflecting the financial characteristics of enterprises and the degree of engaging in financial activities in column (2), the digital financial inclusion index (Index) is still significantly negative at the 1% level, still showing a significant inhibitory effect and the model's goodness-of-fit is increased to 36.8%, and the parameter signs of the control variables in the model are in line with the theoretical expectations and are all significant, which indicates that the model setup does not have obvious bias. The sign of the parameters of the control variables in the model is consistent with the theoretical expectation and are all significant, indicating that there is no obvious bias in the model setting.

Table 1. Baseline estimate result

variable	Shadow	
	(1)	(2)
Index	-1.465*** (0.328)	-0.964*** (0.294)
Lev		-0.558*** (0.0798)
ROE		-0.632*** (0.0703)
Finance		0.0795*** (0.00994)
OCF		-0.460*** (0.128)
Size		1.141*** (0.0209)
Q		0.0186** (0.00942)
Constant	25.96*** (1.661)	-1.531 (1.565)
Time-fixed effect	Yes	Yes
Industry fixed effect	Yes	Yes
Fixed effect of prefecture-level city	Yes	Yes
Number	15,071	15,071
R ²	0.212	0.368

Robust standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

4.5. Analysis of the Intermediation (Indirect) Effects of Regional Financial Markets

The results of the mediation effect test are shown in Table 2. Column (2) of the table shows that the digital financial inclusion index corporate financing constraint (KZ) shows a negative correlation and is significant at the 1% level. This implies that the development of digital financial inclusion eases the corporate financing constraints. Column (3) of the table shows that after adding the corporate financing constraint (KZ) variable, the estimated coefficient of the digital inclusive finance index is still significantly negative at the 1% level of significance, while the estimated coefficient of the KZ index is significantly positive at the 1% level of significance, which indicates that the corporate financing constraints play an intermediary role, i.e., by alleviating the problem of financing constraints of non-financial

corporations, digital inclusive finance has an indirect inhibitory effect on shadow banking of the sample corporations. banking with an indirect inhibitory effect, which supports the theoretical hypothesis of this paper2.

4.6. Heterogeneity Analysis

In view of the strategic direction of accelerating the development of the digital economy and the deep integration of the real economy, which is clearly stated in the government work report, this paper focuses on the perspective of enterprise digital transformation, analyses the potential role played by digital technology at the enterprise level, and expands the analysis for further clarifying the complex relationship between digital financial inclusion and shadow banking of non-financial enterprises.

Table 2. Results of mediation effect test

variable	Shadow (1)	KZ (2)	Shadow (3)
Index	-0.964*** (0.294)	-0.144*** (0.0327)	-0.800*** (0.292)
KZ			1.138*** (0.0770)
Lev	-0.558*** (0.0798)	-0.344*** (0.00888)	-0.166** (0.0835)
ROE	-0.632*** (0.0703)	0.181*** (0.00783)	-0.838*** (0.0711)
Finance	0.0795*** (0.00994)	0.000142 (0.00111)	0.0793*** (0.00986)
OCF	-0.460*** (0.128)	-0.0522*** (0.0142)	-0.401*** (0.127)
Size	1.141*** (0.0209)	-0.174*** (0.00232)	1.338*** (0.0246)
Q	0.0186** (0.00942)	-0.0246*** (0.00105)	0.0466*** (0.00953)
Constant	-1.531 (1.565)	5.227*** (0.174)	-7.477*** (1.604)
Time-fixed effect	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes
Fixed effect of prefecture-level city	Yes	Yes	Yes
Number	15,071	15,071	15,071
R ²	0.368	0.518	0.379

While digital financial inclusion aims to enhance the universality and inclusiveness of financial services through the power of technology, enterprise digital transformation focuses on the use of advanced technologies such as big data, artificial intelligence, the Internet, and digital platforms to reconfigure production, sales, and research and development processes in order to achieve efficiency gains, cost reductions, and accelerated innovation, as well as further accelerating product research and development, increasing product competitiveness, and assessing risks and investment more effectively. Objectives. These two trends demonstrate the profound impact of digital technology on the economy and society from different dimensions. These positive effects, while leading to transparency in corporate information, also open up new paths for companies to grow, thus potentially weakening their incentives to engage in high-risk, high-yield shadow banking. On the contrary, firms that lag behind in digital transformation have difficulty in establishing information matching with the outside world, face greater operational pressure and financing challenges in digital development, and are thus more likely to be attracted by the high returns of shadow banking. In order to verify the above hypotheses, this paper takes the word frequency of the corresponding keywords in the annual reports published by listed firms as a proxy variable for the degree of digital transformation of the firms, and analyses its heterogeneous role in the process of digital inclusive finance influencing the shadow banking behaviour of the firms.

Table 3. Results of heterogeneity analysis

Variables	Shadow
Index	-0.833*** (0.299)
Digital×Index	-0.0868* (0.0520)
Lev	-0.557*** (0.0798)
ROE	-0.631*** (0.0703)
Finance	0.0789*** (0.00994)
OCF	-0.462*** (0.128)
Size	1.140*** (0.0209)
Q	0.0184* (0.00942)
Constant	-2.589 (1.634)
Time-fixed effect	Yes
Industry fixed effect	Yes
Fixed effect of prefecture-level city	Yes
Number	15,071
R ²	0.369

Table 3 The empirical results show that the interaction term between the digital financial inclusion index and the degree of digitalisation of enterprises (Index × Digital) is negative at the 10% significance level, indicating that the development of digital financial inclusion exhibits a more significant shadow

banking inhibition effect among the sample group with relatively weak digitalization foundations. This phenomenon reveals information asymmetry as one of the main drivers for non-financial firms to get involved in shadow banking activities. The digital transformation not only enhances the information transparency of firms, but also facilitates their seamless integration with the formal financial system, thus reinforcing the inclusive nature of digital finance. This shift has helped steer firms back to their main business and avoided a 'shift from real to virtual'. At the same time, it provides policymakers with support for the effective use of digital technology to promote the healthy development of the real economy.

4.7. Robustness Test of the Model

In order to examine the robustness of the results of the econometric analyses, this paper conducts a series of robustness tests: replacing the independent variables, instrumental variable method, and excluding the impact of policies. Firstly, replacing the main variable as the provincial digital financial inclusion index, the regression is consistent with the regression results of prefecture-level city indicators. Second, selecting the digital financial inclusion index lagged by one period as an instrumental variable for robustness testing of the benchmark regression, the coefficient of the digital financial inclusion index is negative and significant at the 5% level, indicating that the basic conclusions remain unchanged. Finally, considering that the China Banking and Insurance Regulatory Commission (CBIRC) issued the Measures for the Administration of Entrusted Loans by Commercial Banks in 2018, which strengthened the regulation of entrusted loans. In order to eliminate the policy interference effect, this paper deletes the sample data in 2018 and later, and re-conducts regression analysis on the model, and the results show that the regression coefficient of the digital financial inclusion index is negative and significant at the 5% level, which still indicates that the basic conclusions remain unchanged. The above test indicates that the conclusion that 'the development of digital financial inclusion has a dampening effect on the shadow banking of non-financial enterprises' is robust and verifies the theoretical hypothesis.¹ Due to space limitations, the robustness test table is omitted.

5. Summary

The theoretical and empirical analyses in this paper show that the development of digital inclusive finance helps to inhibit the expansion of shadow banking of non-financial enterprises, and this inhibition is mainly reflected in two effects: first, the direct inhibition effect of digital inclusive finance on shadow banking of non-financial enterprises; and second, the indirect inhibition effect that the development of digital inclusive finance creates by alleviating financing constraints and thus reducing the demand for shadow banking by small and medium-sized enterprises (SMEs) in the region. the indirect dampening effect. Further heterogeneity analysis shows that the inhibitory effect of digital inclusive finance on shadow banking is more significant in samples with a low degree of digitisation, which suggests that its inhibitory effect is mainly achieved through market mechanisms.

Based on the above conclusions, this paper draws the following insights: at the government level, it is recommended to continue to promote the construction of the institutional system of digital inclusive finance, give full play

to the advantages of digital inclusive finance in solving the mismatch of traditional financial resources, and enhance the depth of its services. At the same time, digital technology should be reasonably used to strengthen the supervision of the sources and directions of enterprise funds, so as to avoid the accumulation of risks caused by informal shadow banking financing channels. At the level of financial institutions, they should focus on financial services for the real economy, expand the scope of financial services and improve the allocation efficiency of financial resources with the development of digital inclusive finance. The effective integration of digital technology and inclusive finance reduces the information asymmetry with small and medium-sized enterprises and provides them with diversified financing channels. On the enterprise side, it should focus on the development of its main business and serve the real economy. Enterprises should realise that financial investment arbitrage is difficult to maintain in the long term, and that the development of digital inclusive finance will reduce the demand for shadow banking funds by financing-constrained enterprises. At the same time, enterprises should actively adopt digital technologies to serve their main business, including but not limited to big data analytics, artificial intelligence and the Internet of Things (IoT), to improve efficiency, reduce costs, expand markets and provide a better customer experience, so as to enhance competitiveness and achieve sustainable development.

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