The Impact of Financing Constraints on the Shadow Banking of Non-Financial Firms

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Abstract. According to China's Financial Stability Report, since 2020, instability and uncertainty at both domestic and international levels have risen significantly. While financial risks are multifaceted, regional financial risks remain hidden, the risk of default on some enterprises' debts has increased, and the risks of individual small and medium-sized banks are more prominent. In the face of risks, China clearly pointed out that financial security is an important part of economic security. While promoting economic and social development, China should maintain the continuity, stability, and sustainability of macro financial policies, prevent financial risks, and deepen the reform of financial institutions. Currently, some non-financial enterprises in China are engaged in shadow banking through direct or indirect means. However, shadow banking has the characteristics of hidden risks and cross-market risk contagion, which can induce risks in the process of development and threaten the stability of the financial system and financial security. Therefore, further research on shadow banking is needed. Using a sample of A-share non-financial listed companies in China from 2010-2021, this paper conducted a fixed-effects regression on panel data to empirically investigate the regional heterogeneity of financing constraints on the shadow banking of non-financial enterprises and the heterogeneity of the nature of corporate ownership, and obtained the following conclusions. a) financing constraints will enhance the scale of shadow banking of non-financial enterprises. b) there is regional heterogeneity concerning the influence of financing constraints on the shadow banking of non-financial enterprises. c) there is heterogeneity in the nature of ownership for financing constraints.

Keywords: Shadow banking, financing constraints, shadow banking by non-financial corporations.

1. Introduction

Shadow banking refers to a system of credit intermediation (including all types of related institutions and business activities) that is outside the banking regulatory system and may rise problems such as systemic risk and regulatory arbitrage. Financial repression, bank credit discrimination and underdeveloped financial markets in China have subjected SMEs and private enterprises to severe hard budget constraints, and the phenomenon of credit creation outside the formal banking system has been widespread in different forms, serving as an alternative financing method to compensate for the imbalance in the initial allocation of credit resources [1]. However, shadow banks hide their credit activities in on-balance sheet interbank accounts, investment accounts or off-balance sheet items through complex transaction structures and accounting account treatments in order to achieve regulatory arbitrage [2]. Moreover, shadow banking is not regulated by the Basel Accord, which reduces the transparency of market information and increases information asymmetry between different actors, thus leading to increasing financial frictions and further reducing the efficiency of resource allocation [3]. For a long time, shadow banking has been considered one of the "culprits" of the international financial crisis in 2008, as it has been hidden from regulation and cross-contaminated with risks. It was the rapid growth of shadow banking that led to the increasing vulnerability of the US banking system and ultimately to the crisis and recession [4]. In December 2020, the CBRC released the Report on Shadow Banking in China, which clearly stated that shadow banking is characterised by systemic risk. If the cash flow of non-financial enterprises engaging in investment activities in financial assets cannot be recovered, it will inevitably lead to a negative impact on the enterprises' productive investment activities and even face the risk of bankruptcy due to the occurrence of a liquidity crisis [5]. Currently, according to the latest Quarterly Monitoring

Report on China's Shadow Banks by international rating agency Moody's, China's broad shadow banking assets stood at RMB 57 trillion at the end of 2021, with shadow banking assets accounting for 49.8% of nominal GDP. This shows that the current scale of shadow banking in China is still large and represents a very high proportion of GDP. Since 2017, China has been implementing special treatment on shadow banking. The "Report on Shadow Banking in China", firstly released by the CBRC's task force, points out that after three years of special treatment, China's shadow banking assets basically showed a downward trend after 2017, but its scale is still very large. Moreover, in recent years, a large number of non-financial enterprises have continued to leave the real economy and become involved in financial activities, showing a significant trend of financialization [6]. With the advent of the financialization of the economy, more non-financial enterprises are engaging in shadow banking by acting directly as "substantial credit intermediaries" or "indirectly participating in the shadow banking credit market", becoming another major participant in shadow banking [7].

The mechanism of the impact of shadow banking is more complex and there is no consensus in the academic community on its impact. Some scholars regard the shadow banking of non-financial corporations as beneficial to capital markets. In a sub-optimal world, such re-lending activities could be a Pareto improvement to the imperfect financial systems of developing countries. Shadow banking can reduce the cost of financing for firms and ease their financing constraints [8]. In China, lending outside the formal financial system due to severe credit constraints has been a persistent phenomenon. Large non-financial enterprises (state-owned or listed companies with financing advantages) often acting as financial intermediaries, providing loans to SMEs to ease their credit constraints [9]. SMEs raising funds through shadow banks can alleviate the financing difficulties to some extent. The government should therefore further promote market-oriented reforms to improve the business environment for SMEs and fast their development. The development of SMEs can bring a lot of vitality to the market and the economy, and therefore China needs to vigorously support SMEs. At the same time, the development of shadow banking has increased the income of non-financial enterprises themselves. However, there are also many scholars who believe that shadow banking has significant risks and is not conducive to the healthy development of the national economy. Shadow banking has a credit-creating function and will pose a new challenge to existing monetary policy [10]. A period of economic upturn driven by unregulated shadow banking credit expansion can gather significant financial risk [11]. Based on the leverage level of capital asset pricing model, shadow banking amplifies the overall level of leverage in immature financial markets, posing a threat to financial stability [12]. The presence of shadow banking increases the instability of macroeconomy and financial sector when the economy and financial system are subject to external shocks [13]. Shadow banking reduces the quality of information and reinforces the incentive for regulatory arbitrage, making it easy to form hidden debt and guarantee networks in shadow banking, thereby exacerbating systematic financial risks [14]. The development of shadow banking has had a negative impact on SME financing, as it induced that private lending, micro-lending and pawnbrokers struggling to become the major source of funding for SMEs. But it can only acting as the emergency funding for enterprises as a result of its high costs and irregular operations [15]. Shadow banking increased the cost of financing for small and medium-sized enterprises (SMEs), and some of the funds are not fully and directly entering the real economy, resulting in a net loss of social welfare. Many people therefore believe that we should curb the development of shadow banking and prevent its brutal growth.

This paper is a study of the impact of financing constraints on the scale of shadow banking by non-financial firms by constructing a dynamic panel data model using a sample of A-share non-financial listed firms in China from 2010 to 2021. When firms face more financing constraints, they are more inclined to engage in borrowing, while the more difficult financing for SMEs will prompt many non-financial firms to engage in shadow banking. This study provides micro-level evidence on the impact of corporate financing constraints on shadow banking by non-financial firms, which has some theoretical value and practical significance. The contributions of this paper, firstly, is that this study enriches the impact of financing constraints theoretically and practically, it is conducive to curbing the brutal growth of shadow banking and preventing the financial market from detaching from the

real economy. Second, it further examines the heterogeneous impact of financing constraints on the shadow banking of non-financial enterprises at the regional level and at the firm level, which provides theoretical implications for deepening and extending the findings of this paper; third, it adopts a dynamic panel model to analyse the effect of financing constraints on the shadow banking of non-financial enterprises, which complements and improves the theoretical mechanism. The paper is then structured as follows. Part II is a literature review. Part III is a theoretical analysis and research hypothesis. Part IV is a research design. Part V is a benchmark regression. Part VI is a robustness test, and Part VII is a conclusion and policy recommendations.

2. Literature Review

The concept of shadow banking was first proposed by Pual McCulley, Executive Chairman of Pacific Investment Management in 2007, who defined shadow banks as financial institutions that are outside the banking regulatory system, as opposed to the traditional, formal, central bank-regulated commercial banking system, and may give rise to systemic risk and regulatory arbitrage. The 2013 China Financial Stability Report defines shadow banking as a system of credit intermediation constituted by the operations of institutions outside the formal banking system that have liquidity and credit conversion functions and are subject to regulatory arbitrage and may raise systemic risk. Compared to other countries, shadow banking in China emerged against the compounded background of the low financial marketisation, insufficient formal financial resources and credit discrimination against SMEs by traditional commercial banks. Shadow banking in China is a product of long-term financial suppression [16]. The core feature of the shadow banking system is that commercial banks transfer funds to off-balance in the form of channel business. In other words, Chinese shadow banking is essentially a shadow of commercial banks [17], to some extent assuming the function of complementing or even partially replacing bank credit. Shadow banking in the West, on the other hand, as proposed by Pozsar in 2010, is centred on securitization. Specifically, on the criteria of institutions and products, the Western shadow bank carries out investment and financing activities around various securitised products and derivatives based on financial engineering, and is a product of the development of financial markets to a certain stage.

China’s non-financial corporate shadow banking activities stem from the misallocation of credit resources caused by the imperfect financial system. Increased financial mismatch leads to an overall higher level of corporate shadow banking, and this effect is only significant in regions with higher levels of financial penetration and lower levels of market-based allocation of economic resources [18]. In China, for the motive of "regulatory arbitrage", financial institutions may engage in high-risk funding through off-balance sheet channels of shadow banking [19]. At the same time, non-financial enterprises with strong demand for shadow banking generally have high financing constraints, and those with greater financing constraints and less market power tend to obtain capital through informal financial channels. This provides opportunities for the rapid expansion of shadow banking. Under shareholder value orientation, companies obtain their capital mainly from the financial markets, and a minority of shareholders can control the company through the financial markets, enabling companies to be "shadow banking" for the purpose of capital management and profit-making. This has led to a deviation of the China's real economy, a phenomenon in which the proportion of financial assets allocated to enterprises has increased while the willingness to invest in the real sector has continued to decrease, thereby reducing the level of social welfare as a whole. Non-financial enterprises in China have gradually shown a trend towards financialisation in terms of financial asset allocation and profit accumulation.

Private enterprises have significantly higher equity financing costs compared to state-owned enterprises [20]. Given the underdevelopment of the capital market, especially the equity market, the problem of difficult and expensive financing for SMEs has become more prominent [21]. This has given rise to the shadow banking of non-financial corporations. In economies with financial frictions and credit discrimination, the more severe the financial disincentives for financing-constrained firms,

the higher the degree of shadow banking by non-financial firms. Corporate shadow banking can provide effective alternative financing for high-productivity firms, and the higher the productivity, the greater the relief from financing constraints obtained by the more productive firms [22]. Chinese style shadow banking is a powerful supplement to the enormous social financing needs that are difficult to meet under formal financial operations and an important source of funding to drive the development of China's private economy [23]. Shadow banking can reduce the cost of financing for companies and ease their financing constraints, but shadow banks tend to finance short-term funds to companies, increasing the share of short-term debt of companies. And for SMEs, shadow banking does not alleviate but rather exacerbates the disincentive of financing constraints on corporate R&D investment [24]. Therefore, some scholars also believe that the development of shadow banking has reduced the already scarce resources of bank loans and made it more difficult for enterprises to borrow money, which has increased the financing constraints of enterprises while promoting their industrial investment [25]. The relationship between shadow banking and the financing constraint is therefore currently viewed in different ways by different scholars.

Many scholars have conducted studies on the risks of shadow banking. The risk of shadow banking is mainly affected by the monetary policy pipeline, which can amplify the transmission effect of monetary policy. When commercial banks are subject to risk shocks, the probability of shadow banking suffering from risk increases accordingly [26]. The implicit risk retention mechanism developed by banks in regulatory arbitrage tends to lead to underestimate the potential risks of credit enhancement, thereby exacerbating the fragility of the shadow banking system through excessive risk-taking [27]. The lack of regulation and guidance, coupled with the influx of funds from banks and listed companies, has further increased the risk of loan sharking. There are also risks associated with shadow banking such as P2P network lending, asymmetric information on financial products, private finance and the "runaway crisis" [28]. The practice of "shadow banking" in China is not disintermediated, but rather acts as a credit intermediary between investors and financiers instead of banks, and its risk profile is therefore similar to that of traditional banks, notably in terms of maturity mismatches at the level of financial institutions. Unlike in the US, the institutional roots of these risk characteristics in China lie less in the dualistic regulatory structure of financial institutions and markets and more in long-standing financial constraints, path preferences and stereotypes [29].

After the above comprehensive analysis, it can be found that the current research on the definition of shadow banking and the impact of shadow banking on corporate financing constraints by scholars at home and abroad is relatively abundant. Most scholars agree that shadow banking has the effect of reducing the financial constraints of SMEs. Scholars have analysed from many different perspectives and concluded that reducing information asymmetry, and enriching the forms of financing, are the mechanisms of shadow banking to alleviate financing constraints based on empirical research. This provides a solid theoretical foundation for the research to be conducted in this paper. However, direct research on the specific impact of financing constraints on the shadow banking of non-financial firms has rarely been mentioned by previous scholars. It will be empirically explored in the paper. This paper will further enrich the empirical evidence on shadow banking research in China, and provide implications for the regulation of shadow banking in China. Moreover, this paper aims to provide a reference for the People's Bank to regulate shadow banking and risk control, and develop a guidance for the investment and financing behaviour of SMEs.

3. Theoretical Analysis and Research Hypothesis

Regarding the impact of financing constraints on the scale of shadow banking by non-financial corporations, some scholars argue that the scale of shadow banking by non-financial corporations will be hit under financing constraints. Financing-constrained non-financial businesses have restricted sources of funding and reduced available cash flow, resulting in a lack of internal cash flow. In addition, financing-constrained companies typically are subject to higher interest rates and exhibit higher investment-cash flow sensitivity, with a significant positive relationship between the two [30].

As financing constraints increase, investment-cash flow sensitivity increases [31]. As a result, non-financial corporations will be cautious in their choice of financing business. Moreover, as shadow banking is inherently characterised by high risk, high leverage and high information asymmetry, engaging in shadow banking will further exacerbate the volatility of corporate cash flows, increasing the likelihood of liquidity crises and exacerbating the business risks of enterprises [32]. This is why some academics argue that for smaller firms, financing constraints will discourage firms from engaging in shadow banking and reduce the likelihood of firms participating in the shadow banking credit market. However, some other academics argue that financing constraints will boost the scale of shadow banking by non-financial firms. Companies with financing constraints generally face a rising costs of financial burdens, which leads to an increased required rate of capital return on projects [33]. In other words, firms with financing constraints face higher financing costs and need higher expected returns on real investment projects to cover that financing cost. If non-financial firms are unable to earn high returns on their real investments, they may realise their profit-chasing goals by shadow banking. Shadow banks, on the other hand, are characterised by short financing terms and high yields, which have a mitigating effect on corporate financing constraints [34]. As a result, financing constraints can exacerbate the scale of shadow banking by non-financial firms. Based on the above analysis, this paper develops two alternative hypotheses, and they are as follows.

Hypothesis H1a: Financing constraints will increase the scale of shadow banking among non-financial corporations.

Hypothesis H1b: Financing constraints will constrain the scale of shadow banking by non-financial corporations.

The macro environment in which firms operate has a significant impact on corporate shadow banking. Significant differences in the level of development in different parts of the country is due to historical and natural conditions. Regional heterogeneity is mainly brought by the different degrees of marketisation in various regions. Regions with a high degree of marketisation are able to achieve an optimal allocation of resources and factors [35], which can provide more credit resources to improve the banking system, generate scale effects, reduce transaction costs and provide more financing solutions for enterprises. At the same time, a higher degree of marketisation would avoid the formation of relationship-based lending between the country's monopolistically powerful banks and enterprises. This would make the various transactions and industry norms in the market more transparent, increasing the access of SMEs to loans and reducing the extra financing costs for SMEs due to government or bank bias in favour of other state-owned enterprises or large enterprises. In addition, corporate disclosures and credit ratings of firms from banks and other credit sectors in more market-oriented regions will be more comprehensive, thus reducing information asymmetry [36]. It means that adverse selection and moral hazard will be minimised, thereby improving firms' access to external finance. In summary, the higher the degree of marketisation, the lower the degree of financing constraints suffered and the weaker the effect of financing constraints on shadow banking by non-financial firms. A second hypothesis is therefore proposed.

Hypothesis H2：There is regional heterogeneity in the extent to which financing constraints affect the shadow banking of non-financial firms.

Compared with state-owned enterprises (SOEs), China's private enterprises are smaller in scale and have been suffering from "difficulties in financing and expensive financing" [37]. Compared with other countries, China's financial market is dominated by the four state-owned banks, which are limited by the benchmark interest rates, loan risks, and loan interest rates set by the regulatory authorities. Large commercial banks in China are more inclined to lend to state-owned enterprises and are biased against SMEs in order to obtain stable profits, and there is ownership discrimination in the process of financial resource allocation [38]. Moreover, private enterprises in China have insufficient collateral of their own for loan, together with bank's high cost to obtain the information about the enterprise due to information asymmetry [39], making it difficult for them to obtain bank loans and subject to stronger financing constraints. In addition, in order to achieve stable capital market development, China has strict controls and high thresholds for the stock market, making it

difficult for most non-state enterprises to raise direct financing from the stock market [40]. Considering China's specific national conditions, compared to private enterprises, SOEs have obvious advantages in terms of property rights protection, government-enterprise relations, and financing treatment, while having relatively less moral hazard [41], and local government preferences [42]. State-owned enterprises are strictly regulated, having stable relationships with the government and abundant sources of financing, so that they can obtain a large amount of capital from the market using their own resources. In summary, there are significant differences between state-owned and non-state-owned enterprises in China in terms of financing constraints. A third hypothesis is therefore developed.

Hypothesis H3: There is a heterogeneity in the nature of ownership of financing constraints.

4. Research Design

4.1. Sample Selection and Data Sources

This paper takes a sample of China's A-share non-financial listed companies for the period 2010-2021. This paper includes three data sources. Firstly, listed companies' entrusted wealth management data is from Guotaian CSMAR database of listed companies in China, and secondly, financial data of listed companies is from Wind database. The above two data are used to construct indicators of the extent of corporate shadow banking and corporate financing constraints respectively. In addition, in conducting the heterogeneity analysis in this paper, the marketization index of Chinese provinces and cities is used, and this data is obtained from Wang Xiaolu et al.(2019) [43].

4.2. Empirical Model Setting

To further test the impact of financing constraints on the shadow banking of non-financial firms, a benchmark model of main effects is constructed based on the above theoretical analysis as shown below.

$$SB_{i,t} = B0 + B1 * FC_{i,t} + B2 * X + \varepsilon_{i,t} \quad (1)$$

In model (1), the predicted variable $SB_{i,t}$ represents the size of shadow banking for firm i in year t, and the explanatory variable $FC_{i,t}$ is the degree of financing constraints faced by firm i in year t. X is a set of control variables. $\varepsilon_{i,t}$ represents the residual term for firm i in year t. This paper uses fixed effects to elaborate the model.

4.3. Definition of Benchmark Model Variables

(1) The predicted variable: Referring to Han Xun and Li (2020), the sum of the firm's entrusted loans, entrusted finance and accounts receivable in that year is calculated and then taken as the logarithm to measure the size of the firm's shadow banking. In testing for regional heterogeneity, the predicted variables set to $SB_{i,d,t}$, which represents the size of shadow banking of the firm i in region d in year t. Calculated as above.

(2) Core variables: the explanatory variable is financing constraint, refer to Yang Jiayu (2012) [44]. The nature of ownership soe is a dummy variable, setting 1 for state-owned enterprises and 0 for non-state-owned enterprises. The degree of regional marketisation is expressed as market_diff and the data is sourced from the latest data prepared by Wang Xiaolu.

For financing constraints, the following three measures are mostly used in the academic community. The first approach is to use firm size as a proxy variable for the degree of financing constraint [45]. The second approach is to use an index [46]. The third is a multidimensional information score (Yang Jiayu, 2012), which will be the measurement standard followed by this paper. That is, according to Yang Jiayu(2012), eight financial indicators, including cash ratio, commercial credit ratio, enterprise size, net tangible assets ratio, repayment ratio, liquidity ratio, return on assets (ROA) and net sales margin, were selected from four dimensions, namely endogenous funding constraints, commercial credit funding constraints, external funding constraints, investment opportunities and

profitability. Then, they were calculated and analysed according to the position of the company in the industry in that particular year. Taking ROA as an example, the ROA of the company is ranked and assigned to the top 20%, 20-40%, 40-60%, 60-80% and 80-100% of other non-financial companies in the same industry in the corresponding year, with scores of 1, 2, 3, 4 and 5 respectively. Each of the eight indicators is assigned a value in this way, and then the sum of the scores of all eight indicators for the year is calculated and averaged to determine the degree of financing constraint of the company for that year. When verifying regional heterogeneity, the same calculation method is used as above.

(3) Control variables: The control variables were selected as CON_R (return on net assets attributable to the parent company), CASH_R (cash to total profit ratio), SALE_RA (expense to sales ratio), con_age (company age), ROA (return on total assets), and money_funds (monetary funds).

Table 1. Variable definition form

Variable	Description	Measurement
SH_BANK	Size of shadow banking of the firm	Natural logarithm of the sum of entrusted loans, entrusted finance, and account receivables
fc	Financing constraints	Refer to Yang, Jia-Yu (2012), see the body of the paper for details of the calculation method
con_age	Company age	Difference between the year of observation and the year of listing of the company
CASH-R	Cash to total profit ratio	Cash/total profit
SALE_RA	Expense to sales ratio	Expenses/Net sales
money_funds	Monetary funds	Sum of cash on hand, bank deposits and other monetary funds
ROA	Return on total assets	Net Profit / Total Assets
CON_R	Return on net assets attributable to the parent company	Net profit attributable to owners of the parent company /average net assets

5. Regression on Benchmark

5.1. Descriptive Statistics

In this paper, SH_BANK Size of shadow banking of the firm, SCALE_COM company size , ROA return on total assets, sum total financial assets, fc financing constraint, CON_R Return on net assets attributable to the parent company , CASH_R cash to total profit ratio, SALE_RA expense to sales ratio are selected for descriptive statistics and the results are shown in the below chart.

Table 2. Descriptive statistics for key variables

Variables	(1) Observed value	(2) Mean Value	(3) Standard Deviation	(4) Minimum Value	(5) Maximum Value
SH_BANK	30,369	18.57	2.013	3.912	26.63
SCALE_COM	30,382	22.09	1.356	13.08	28.64
ROA	30,375	0.0453	0.186	-7.285	20.79
SALE_RA	11,943	15.20	569.4	-746.8	57,877
CASH_R	9,716	-1.179	157.6	-13,317	4,192
CON_R	8,144	0.0267	1.869	-156.0	5.690
fc	30,382	3.138	0.0579	2.644	3.389

The data in Table 2 show the following. Firstly, the minimum value of size of shadow banking of the firm is 3.91, the maximum value is 26.63, the standard deviation is 2.01 and the mean value is 18.57. The large mean value indicates that the scale of shadow banking is relatively high and developing relatively fast, while the small standard deviation indicates that the scale of shadow banking of non-financial firms is relatively close to the mean and not very different from each other. From the perspective of return on total assets, the overall minimum value is -7.29 and the maximum value is 20.79, with a standard deviation of 0.19 and a mean value of 0.05. The gap between the minimum and maximum value indicates a relatively large variation in return on total assets for SMEs. A low mean value represents a relatively weak overall return on total assets. While a large standard deviation shows a considerable variation in return on total assets. Secondly, the fact that the mean and maximum values of financing constraints are relatively close to each other could indicate that financing constraints are a common phenomenon among companies. Thirdly, the standard deviation of the cash to total profit ratio and the expense to sales ratio reached 157.56 and 569.41 respectively, indicating the high volatility of the sample data and suggesting that there is a substantial variation in business revenue between companies.

5.2. Main Effects Analysis

Table 3. Regression results

SH_BANK	(1)	(2)	(3)	(4)
fc	34.868***	24.333***	24.333***	23.046***
	(56.71)	(18.89)	(18.89)	(18.96)
YEAR		0.125***	0.125***	——
		(13.47)	(13.47)	——
CON_R		-0.131	-0.131	-0.139
		(-1.19)	(-1.19)	(-1.27)
CASH_R		-0.000	-0.000	-0.000
		(-1.17)	(-1.17)	(-0.88)
SALE_RA		0.000	0.000	-0.000
		(0.24)	(0.24)	(-1.35)
con_age		-0.025	-0.025	-0.030*
		(-1.52)	(-1.52)	(-1.88)
ROA		-0.054	-0.054	-0.028
		(-0.35)	(-0.35)	(-0.19)
money_funds		-2.855***	-2.855***	-2.327***
		(-12.25)	(-12.25)	(-10.42)
Individual fixed effects	Uncontrolled	Uncontrolled	Controlled	Controlled
Time fixed effects	Uncontrolled	Uncontrolled	Uncontrolled	Controlled
N	30,369	6,495	6,371	6,371
Adjusted R^2			0.7083	0.7395

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

Note:* Represents 10% level of significance. ** represents the 5% level of significance. *** represents the 1% level of significance. The regressions in this paper are clustered at the individual level.

This paper uses a panel fixed effects model to conduct a basic test of the size of shadow banking by non-financial firms due to financing constraints. The regression results are shown in Table 3. The first column of which, without adding control variables and also without controlling for individual fixed effects and time fixed effects, regresses only fc on SH_BANK, with a regression coefficient of 34.868, which is significantly positive at the 1% level of significance. It implies that for every unit

increase in fc, the size of non-financial corporate shadow banking increases by 34.868 units. The second column is regressed by adding control variables but not controlling for time fixed effects and individual fixed effects, and the third column is regressed by controlling for individual fixed effects but not time effects on the basis of the second column, resulting in a regression coefficient of 24.333 for both fc, which are significant at the 1% level of significance. Furthermore, in the second and third columns, the coefficient on YEAR is 0.125 and the coefficient on money_funds is -2.855, both of which are significant at the 1% level. It indicates that as the year grows, the size of shadow banking will also increase. However, the size of shadow banking will decline as corporate money funds increase. The fourth column is regressed by adding control variables, controlling for individual and time effects, and the resulting regression coefficient for fc is 23.046, which is significantly positive at the 1% level of significance. The coefficients on money_funds are significantly negative at the 1% level of significance and con_age is significantly negative at the 10% level of significance, suggesting that the size of shadow banking will decline as the firm's money funds increase and age increases. In summary, hypothesis H1a is valid, namely that financing constraints will increase the scale of shadow banking by non-financial firms.

5.3. Regional Heterogeneity

Table 4. The impact of financing constraints on the size of shadow banking by non-financial firms: regional heterogeneity

SH_BANK	(1)	(2)	(3)
fc	24.791***	24.791***	23.372***
	(19.17)	(19.17)	(19.19)
market_diff*fc	-1.693***	-1.693***	-1.175**
	(-2.91)	(-2.91)	(-2.15)
market_diff	0.266**	0.266**	0.199**
	(2.46)	(2.46)	(1.97)
YEAR	0.124***	0.124***	——
	(13.38)	(13.38)	
CON_R	-0.139	-0.139	-0.140
	(-1.26)	(-1.26)	(-1.29)
CASH_R	-0.000	-0.000	-0.000
	(-1.38)	(-1.38)	(-1.00)
SALE_RA	0.000	0.000	-0.000
	0.33	0.33	(-1.18)
con_age	-0.026	-0.026	-0.032**
	(-1.60)	(-1.60)	(-1.98)
ROA	-0.059	-0.059	-0.032
	(-0.39)	(-0.39)	(-0.22)
money_funds	-2.824***	-2.824***	-2.318***
	(-12.18)	(-12.18)	(-10.42)
Individual fixed effects	Uncontrolled	Controlled	Controlled
Time fixed effects	Uncontrolled	Uncontrolled	Controlled
N	6495	6,371	6,371
Adjusted R^2		0.7095	0.7398

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

Note:* Represents 10% level of significance. ** represents the 5% level of significance. *** represents the 1% level of significance. The regressions in this paper are clustered at the individual level.

To further examine the effect of financing constraints on the regional heterogeneity of the scale of shadow banking among non-financial firms, this paper introduces market_diff_fc (the interaction term between marketability index and financing constraints) and market_diff (marketability index)

into the main effects regression for analysis. Table 4 presents the heterogeneous impact of financing constraints on the extent of shadow banking by non-financial firms across firms with different levels of regional marketisation. The first column adds the marketability index and the interaction term between the marketability index and the financing constraint to the main effects for the regression but does not control for fixed effects. The second column controls for individual fixed effects on the basis of the first column. By controlling for individual fixed effects and time fixed effects, the third column completes the model in the first column. The results show that the regression coefficients of financing constraints on the size of shadow banking of the firm are 24.791, 24.791 and 23.372 respectively, and are significantly positive at the 1% level of significance, with no change in the direction of the positive and negative signs. The coefficients of the interaction term between marketability and financing constraints are -1.693, -1.693 and -1.175 respectively, and are all significantly negative. It suggests that the higher the degree of marketisation, the smaller the impact of financing constraints on the scale of shadow banking by non-financial firms, which means that hypothesis H2 is valid. That is, there exists regional heterogeneity in the degree of impact of financing constraints on shadow banking by non-financial firms. Meanwhile, the coefficients of market_diff are 0.266, 0.266 and 0.199 respectively, all of which are significantly positive at the 5% level of significance, indicating that the greater the degree of marketisation, the larger the scale of shadow banking by non-financial firms. The coefficients of YEAR has a coefficient of 0.124 in both the first and second columns, and is significantly positive at the 1% level of significance, implying that the size of shadow banking increases as the year increases. The coefficients of money_funds in the first, second and third columns are all significantly negative at the 1% level of significance. The coefficient of con_age in the third column is -0.032, which is significantly negative at the 5% level of significance, implying that the scale of shadow banking will decline as the firm's monetary resources increase and its age grows.

5.4. Ownership Heterogeneity

Table 5. The impact of financing constraints on the size of shadow banking by non-financial firms: ownership heterogeneity

SH_BANK	(1)	(2)	(3)
fc	23.913***	23.913***	22.697***
	(18.45)	(18.45)	(18.47)
soe*fc	23.836**	23.836**	19.843*
	(2.39)	(2.39)	(1.96)
soe	——	——	——
YEAR	0.123***	0.123***	——
	(13.52)	(13.52)	
CON_R	-0.130	-0.130	-0.138
	(-1.17)	(-1.17)	(-1.26)
CASH_R	-0.000	-0.000	-0.000
	(-0.90)	(-0.90)	(-0.71)
SALE_RA	0.000	0.000	-0.000
	(0.27)	(0.27)	(-1.33)
con_age	-0.026	-0.026	-0.032**
	(-1.63)	(-1.63)	(-1.98)
ROA	-0.058	-0.058	-0.031
	(-0.39)	(-0.39)	(-0.21)
money_funds	-2.875***	-2.875***	-2.346***
	(-12.29)	(-12.29)	(-10.44)
Individual fixed effects	Uncontrolled	Controlled	Controlled
Time fixed effects	Uncontrolled	Uncontrolled	Controlled
N	6495	6,371	6,371
Adjusted R^2		0.7088	0.7889

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

Note:* Represents 10% level of significance. ** represents the 5% level of significance. *** represents the 1% level of significance. The regressions in this paper are clustered at the individual level.

To further test whether there is heterogeneity in the nature of ownership of firms with financing constraints, this paper performs regression analysis by adding soe_fc (the interaction term between the nature of firm ownership and financing constraints) and soe (the nature of firm ownership) to the main effects regression. Table 5 presents the heterogeneous impact of financing constraints on the scale of shadow banking by non-financial firms across firms of different ownership. The first column adds soe_fc and soe to the main effects for regression, but does not control for fixed effects. On this basis, the second column controls for individual fixed effects. The third column further controls for individual fixed effects and time fixed effects. The results show that the coefficients of financing constraints on the size of shadow banking of the firms are 23.913, 23.913 and 22.697 respectively, which are significantly positive at 1% level of significance. The interaction coefficients of the nature of ownership and financing constraints are 23.836, 23.836, and 19.843, respectively, with the first two columns significantly positive at the 5% level of significance and the third column significantly positive at the 10% level of significance. This indicates a positive effect of the nature of business ownership on the main effect. The closer the nature of enterprise ownership is to 1, the greater the participation of state-owned enterprises in financing constraints and the scale of shadow banking by non-financial enterprises are. Namely, the H3 assumption is held. YEAR has a coefficient of 0.123 in both the first and second columns and is significantly positive at the 1% level of significance, implying that the size of shadow banking increases as the year increases. The coefficients of money_funds in the first, second and third columns are all significantly negative at the 1% level of significance. The coefficient of con_age in the third column is -0.032 and is significantly negative at the 5% level of significance, implying that the size of shadow banking will decline as the firm's monetary resources increase and as the number of years increases.

6. Robustness Testing

To further demonstrate the credibility of the empirical results of this paper and to overcome the endogeneity problem, the following three methods are used for robustness testing.

6.1. Instrumental Variables

6.1.1 Generalized Method of Moments (GMM) Estimation

Using the GMM estimation, the main effects are retained while a one-period lag of shadow banking is added as an instrumental variable in the first and two columns for regression and the results are compared with the third and four columns. The comparative results show that the effect of financing constraints on SH_BANK is still significantly positive after the inclusion of a one-period lag of shadow banking. The regression results still hold.

Table 6. GMM estimation

SH_BANK	(1)	(2)	(3)	(4)
fc	10.881***	19.267***	34.868***	23.046***
		(21.23)		(18.96)
SH_BANK_lag	0.581***	0.383***		
		(23.06)		
CON_R		0.034		-0.139
		(0.32)		(-1.27)
CASH_R		-0.000		-0.000
		(-0.79)		(-0.88)
SALE_RA		-0.000		-0.000
		(-1.50)		(-1.35)
con_age		-0.012		-0.030*
		(-0.83)		(-1.88)
ROA		-0.047		-0.028
		(-0.48)		(-0.19)
money_funds		-1.806***		-2.327***
		(-7.65)		(-10.42)
Individual Fixed Effects	Uncontrolled	Uncontrolled	Uncontrolled	Controlled
Time Fixed Effects	Uncontrolled	Uncontrolled	Uncontrolled	Controlled
N	26,345	5,734	30,369	6,371
Adjusted R^2				0.7395

6.1.2 Two Stage Least Square (2SLS) Method

Based on the 2SLS method, a regression is conducted using a one-period lag of fc as the explanatory variable in the first column and is compared with the regression with main effects in the second column. The regression results are shown in Table 7 and the results indicate that the coefficients on both the one-period lag of fc and fc are significantly positive at the 1% level of significance. The conclusion still holds.

Table 7. 2SLS method

SH_BANK	(1)	(2)
fc		23.046***
		(18.96)
fc_lag	17.015***	
	(13.47)	
CON_R	-0.067	-0.139
		(-1.27)
CASH_R	-0.000	-0.000
		(-0.88)
SALE_RA	-0.000	-0.000
		(-1.35)
con_age	-0.025	-0.030*
		(-1.88)
ROA	-0.262*	-0.028
		(-0.19)
money_funds	-2.121***	-2.327***
		(-10.42)
Individual Fixed Effects	Uncontrolled	Controlled
Time Fixed Effects	Controlled	Controlled
N	5613	6,371
Adjusted R^2		0.7395

6.2. Replacement of Explanatory Variables

The calculation method of the financing constraint is still based on Jiayu Yang (2012), which simply assigns a range of 80% to 100% of the corresponding indicators in the same industry and year, with a value of 1 if the range is met and 0 if the range is not met, and ultimately averages the scores of all eight indicators in the year as a proxy for the new financing constraint indicator. The regression results are shown in Table 8. It is indicated that the empirical results do not change substantially after replacing the explanatory variables. The coefficient of fc alternative remains significantly positive at the 1% level of significance, proving the robustness of finding that financing constraints can promote the shadow banking of non-financial firms.

Table 8. Replacement of Explanatory Variables

SH_BANK	(1)	(2)	(3)	(4)
fc alternative	30.019***	22.031***	22.031***	22.828***
		(10.24)	(10.24)	(10.40)
YEAR		0.210***	0.210***	——
		(10.61)	(10.61)	——
CON_R		0.007	0.007	0.085
		(0.03)	(0.03)	(0.34)
CASH_R		-0.001	-0.001	-0.001*
		(-1.42)	(-1.42)	(-1.69)
SALE_RA		-0.000	-0.000	-0.000*
		(-1.36)	(-1.36)	(-1.66)
con_age		-0.037	-0.037	-0.047
		(-1.45)	(-1.45)	(-1.62)
ROA		0.093	0.093	0.102
		(0.56)	(0.56)	(0.62)
money_funds		-3.451***	-3.451***	-3.072***
		(-12.07)	(-12.07)	(-11.05)
Individual Fixed Effects	Uncontrolled	Uncontrolled	Controlled	Controlled
Time Fixed Effects	Uncontrolled	Uncontrolled	Uncontrolled	Controlled
N	3,651	3,651	3,503	3,503
Adjusted R^2			0.7476	0.7601

7. Conclusion and Policy Recommendation

With the rapid growth of China's economic market and the downturn of the real economy, the phenomenon of de-realisation of China's economy is becoming more obvious. Increasingly driven by the pursuit of profit, more companies are acting as substantial credit intermediaries and using manipulated funds to conduct shadow banking business, further exacerbating the problem of corporate de-realisation. This paper constructs panel data on a sample of A-share non-financial listed companies in China from 2010 to 2021 to further investigate the issue. The paper focuses on the impact of financing constraints on the scale of shadow banking by non-financial firms, and further examines the possible regional heterogeneity and ownership heterogeneity of the impact. The findings suggest that financing constraints can raise the scale of shadow banking by non-financial firms. There exists regional heterogeneity in the extent to which financing constraints affect the shadow banking of non-financial firms while there is heterogeneity in ownership of financing constraints. With endogeneity treatments and robustness tests including Dynamic Panel Data Model, GMM Estimation,

the 2SLS Method, and replacement of explanatory variables, the conclusion in this article is still valid. This study enriches the impact of financing constraints in a theoretical sense and further investigates the impact of financing constraints on the shadow banking of non-financial enterprises. In practice, it is conducive to curbing the brutal growth of shadow banking, preventing the financial market from detaching from the real economy, and thus realising the return of finance to its original purpose of serving the real economy.

Although shadow banking provides new financing channels, in general, the participation of non-financial corporations in shadow banking can crowd out real investment, cause risk accumulation and increase macroeconomic uncertainty, which is not conducive to the smooth operation of the economy. Therefore, there is a need to appropriately restrict the shadow banking business of non-financial enterprises. Firstly, it is recommended to strengthen the regulation of information disclosure of listed companies, to enhance enterprises' control over shadow banking business, to implement penetrating regulation on the source and destination, and to discourage enterprises from carrying out shadow banking related supply. Secondly, considering that the investment behaviour of regions with different degrees of marketisation are greatly affected, the government should promote market-oriented reforms and the innovation of financial products, thereby widening the financing channels for enterprises, solving the problem of financing difficulties for enterprises, and driving economic development in the local area. Finally, for enterprises of different ownership, the government should guide fair competition among them, reduce discrimination against non-state-owned enterprises in financing, promote efficient allocation of financial resources, and alleviate the financing difficulties of SMEs, thereby fundamentally inhibiting the causes of the rapid growth of shadow banking and promoting stable economic growth.

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