Financial technology and commercial credit redistribution

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Abstract. Whether financial technology can restrain the redistribution of commercial credit is of far-reaching significance for preventing financial risks of enterprises. Based on this, this paper uses the data of China's Shanghai and Shenzhen A-share listed companies from 2012 to 2021 to investigate the impact of financial technology on commercial credit reallocation. The results show that the development of financial technology can significantly weaken the redistribution of commercial credit, which is still valid after a series of robustness tests. Further analysis shows that the role of financial technology is more obvious in areas with weaker financial development, state-owned enterprises and large-scale enterprises. The mechanism test shows that the development of financial technology can alleviate the financing obstacles faced by enterprises in direct financing, enhance the allocation efficiency of credit resources, and thus inhibit the redistribution of commercial credit. This paper not only provides solutions for micro-subjects to improve financing channels, but also provides theoretical support for understanding and proposing the development of financial technology under the new normal to some extent.

Keywords: Financial technology; Commercial credit reconfiguration; Financing constraints; Credit allocation efficiency.

1. Introduction

According to previous studies, enterprises with high credit status in the credit market tend to transfer their funds in the form of accounts receivable, bills receivable, etc. through the supply chain to those small and medium-sized enterprises that are at a disadvantage in the credit market (Meltzer, 1960). There is credit discrimination in China's credit market, and credit resources tend to support the state-owned economy, while the private economy suffers from greater financing constraints (Zhang Xinmin and Zhang Tingting, 2016), which leads enterprises in a dominant position of credit to tend to redistribute their bank credit to other enterprises through commercial credit (Yu Minggui and others, 2010). High-quality credit objects valued by commercial banks engage in "shadow banking" activities in this process, and enterprises involved in the process of commercial credit reconfiguration will amplify financial risks.

The rapid development of financial technology has changed the external financing environment of enterprises and provided more convenient direct financing for small and medium-sized enterprises. There are obstacles in the direct financing of enterprises, and the existing credit control leads to the small and medium-sized private enterprises in the real economy can not get effective financial support. Existing studies have found that financial technology can make credit decisions with lower financing costs and faster approval speed, solve the financing problems existing in enterprises, broaden the channels for understanding enterprises (Zhu, 2019), and improve the efficiency of credit allocation. Financial technology solves the financing constraints of small and medium-sized enterprises, enhances the efficiency of credit resource allocation of financial institutions, and optimizes traditional financial institutions (Huang et al., 2018). With the assistance of financial technology, traditional financial institutions can make great progress in information identification and risk control, and achieve the purpose of improving the allocation of credit resources. With the continuous development of financial technology, the common information asymmetry in the process of credit allocation has been weakened, credit discrimination has been alleviated, financing constraints faced by enterprises have been alleviated, and the efficiency of credit allocation has been improved (Song Min et al., 2020).

Then, can the development of financial technology inhibit the redistribution of commercial credit? What is its mechanism of action? There have been studies on the influence of digital inclusive finance

on the secondary allocation of commercial credit by reducing the excess bank credit of listed companies (Kai Zhong et al., 2022), and some scholars have also investigated the role of macro-monetary policy on the redistribution of commercial credit of enterprises. This paper systematically analyzes and empirically tests the role of financial technology in the redistribution of commercial credit, and draws the conclusion that the redistribution function of commercial credit is weaker in areas with higher development level of financial technology, which makes up for the shortcomings of previous studies.

The possible marginal contributions of this paper are as follows: First, this paper explores the heterogeneous influence of financial technology on commercial credit reallocation from the two levels of financial development and enterprises, which is helpful to reduce shadow banking business and promote the rational allocation of credit resources. Secondly, it reveals how macro factors affect the micro-behavior of enterprises. Financial science and technology is an important institutional innovation to traditional finance, a useful supplement to the research on commercial credit financing, and is conducive to promoting finance and promoting the development of the real economy.

2.   Theoretical analysis and research hypothesis

There are financing constraints and inefficient credit allocation in the process of financing, which seriously inhibits the investment and operation behavior of enterprises. Commercial credit plays an important role in the allocation of financial resources (Wang Yanchao, 2014). Under the traditional financial model, small and medium-sized private enterprises are constrained by credit and prefer commercial credit financing in the choice of informal financing methods. Therefore, it promotes the generation of commercial credit redistribution. As a provider of commercial credit reconfiguration, enterprises have comparative advantages in information acquisition, customer control and property recovery compared with formal financial institutions such as banks (Yu Minggui et al., 2010).

Less credit resources in China's banking system are directly allocated to non-state-owned sectors. In order to maintain the stability of the whole supply chain, listed companies will provide financing support by providing commercial credit to upstream and downstream enterprises in the supply chain, and the credit resources will indirectly flow to non-state-owned sectors, thus supporting the development of non-state-owned enterprises. However, this kind of commercial credit financing based on supply chain has lengthened the asset supply chain and increased the credit risk.

Commercial credit redistribution has become the manifestation of shadow banking business of non-financial enterprises, and financial technology will play a restraining role. Financial technology plays an important role in solving financing constraints, inefficient credit allocation and financial repression, and is an important supplement to traditional finance. Financial technology uses machine learning algorithms to provide strong support for fraud identification and credit risk management, reduce loan costs and improve credit allocation efficiency, and the application of financial technology can increase the direct financing scale of SMEs in the upstream and downstream of the supply chain (Kai Zhong et al., 2022). Financial technology can improve the availability of financial services, ease the financing constraints of enterprises, guide the precise allocation of funds, and enhance the risk prevention ability of financial institutions. This not only creates a good external financial environment for enterprises, but also enhances the availability of loans for small and medium-sized enterprises in the upstream and downstream of the supply chain. Financial institutions such as banks can provide diversified financial services to small and medium-sized suppliers and customers, making it easier for them to obtain funds at a lower capital cost, and improving the accuracy and effectiveness of capital allocation (Tan Changchun et al., 2021). Therefore, the development of financial technology can effectively reduce the willingness of small and medium-sized suppliers and customers to demand commercial credit, and then weaken the willingness and motivation of shadow banks to reconfigure commercial credit.

Therefore, this paper puts forward research hypothesis 1:

Research hypothesis 1: Under certain other conditions, the development of financial technology will help to alleviate the redistribution of commercial credit of listed companies.

3. Research design

3.1 Data source

Taking 2012-2021 as the sample interval, this paper selects A-share non-financial listed companies listed on the main boards of Shanghai Stock Exchange and Shenzhen Stock Exchange as the research object. The data of the development level of financial science and technology comes from Peking University Digital inclusive finance Index (2011-2018), and the financial data and macroeconomic data come from the CSMAR database of Taian.

Following the existing literature convention, this paper excludes the following samples: (1) financial enterprises; (2)ST and *ST enterprises; (3) Abnormal samples with leverage ratio greater than 1; (4) Abnormal samples with net assets less than 0. In order to avoid the influence of outliers, all continuous variables at the enterprise and macro-economic level are subjected to Winsorize truncation by 1% up and down. At last, the unbalanced panel data are obtained, with a total of 25,697 sample observations.

3.2 Model construction

In order to test the relationship between financial technology and commercial credit reallocation, this paper adopts fixed effect panel regression according to Wang Yanchao's (2010) method. Set the model as follows:

$$TC = \beta_0 + \beta_1 FINDEX \times SBANK + \beta_2 FINDEX + \beta_3 SBANK + \sum CONTROLS + \delta_i + \theta_t + \varepsilon_{i,\ t} \qquad (1)$$

Among them, TC is the proxy variable of commercial credit allocation and the commercial credit provided by listed companies. FINDEX is a proxy variable of financial technology, which is measured by the natural logarithm of Peking University digital inclusive finance index. Because enterprises are most likely to transfer short-term bank credit through commercial credit (Wang Yanchao, 2010), short-term loans are chosen as the core explanatory variables, and SBANK is the short-term loans obtained by listed companies through formal financial institutions. CONTROLS are the control variables involved in regression analysis. δ_i and θ_t are fixed effects of enterprise and year, respectively. This paper focuses on the coefficient β_1. If β_1 is significantly negative, it shows that financial technology has a negative impact on the commercial credit redistribution of listed companies, which proves the hypothesis of this paper.

3.3 Key variables measurement

3.3.1 Financial technology (FINDEX). In this paper, Guo Feng et al. (2020) used the China Digital inclusive finance Index, which was jointly compiled by the Digital Finance Research Center of Peking University and Ant Financial Group, to measure the development level of regional financial technology. This index is the panel data at the city level and can reflect the financial technology level at the regional level to some extent.

3.3.2Redistribution of commercial credit. In general, due to the high cost of obtaining long-term bank credit, enterprises are more inclined to transfer short-term bank credit through commercial credit (Wang Yanchao, 2010). Therefore, this paper uses Jin Qinglu (2012) and Wang Yanchao (2010) for reference to express bank credit by dividing short-term loans by total assets, and measures bank loans (SBANK) in the form of median grouping. Specifically, if the enterprise is in two larger groups, it is 1, otherwise it is 0. TC is the proxy variable of commercial credit allocation, which is the commercial credit provided by listed companies. Based on the practice of Sun Changling et al. (2021), the net commercial credit is adopted. In this paper, commercial credit is defined on the basis of operating income, and the calculation formula is (accounts receivable+notes receivable+prepayments-accounts

payable-notes payable-accounts received in advance)/operating income. The greater the TC value, the more commercial credit the enterprise provides to the outside world. Part of the bank credit obtained by listed companies will be transferred to other manufacturers in the form of accounts receivable and notes receivable through commercial credit channels, that is, the obtained SBANK will be transferred in the form of TC, which reflects and represents the degree of commercial credit redistribution of enterprises.

3.4 Other control variables

In order to solve the problem of missing variables as much as possible, this paper refers to the existing literature (Wang Yanchao, 2014; Li Chuntao et al., 2020), which controls many variables at the enterprise and macro level. Including: company SIZE (ROA), enterprise growth (growth), board size (DS), board INDEPendence (indep), property right nature (SOE), TOBINQ value (Tobin q), shareholding ratio of major shareholders (OWNCON), tangible assets (TANG) and asset-liability ratio (LEV). Considering that the macro and urban characteristics will also affect the redistribution of business credit, this paper also controls the price level index (CPI), the monetary policy level (M2R), the regional financial development level (FINANCE) and the annual fixed effect of the industry.

Table 1 Variables definition

Variables name	Abbreviation	Variables declaration
Commercial credit provided by enterprises to the outside world	TC	(Accounts receivable+notes receivable+prepayments-accounts payable-notes payable-accounts received in advance)/operating income.
Development level of financial science and technology	FINDEX	Digital inclusive finance index takes logarithm value.
Short-term loans of enterprises	SBANK	Virtual variable: Short-term loans are divided into three groups according to the median. If the enterprise is in the larger two groups, it is 1, otherwise it is 0.
Company size	SIZE	Total assets at the end of the year take natural logarithm.
return on asset	ROA	Ratio of year-end net profit to year-end total assets.
Enterprise growth	GROW	The growth rate of operating income.
Board size	DS	Number of directors on the board of directors.
Independence of board of directors	INDEP	The proportion of independent directors in the board of directors.
Nature of the property right	SOE	When the enterprise is a state-owned enterprise, the value is 1, otherwise it is 0.
Tobin q value	TOBINQ	The ratio of the market value of the enterprise in the current year to the total assets at the end of the period.
Proportion of shareholding of major shareholders	OWNCON	The shareholding ratio of major shareholders.
Tangibility of assets	TANG	The ratio of net fixed assets to total assets at the end of the period.
Asset-liability ratio	LEV	The ratio of ending liabilities to ending total assets.
Cash flow from operating activities	OCF	The ratio of cash flow from operating activities to total assets at the end of the period.
Price level index	CPI	Inflation level, consumer price index.
Monetary policy level	M2R	Monetary policy environment, broad money growth rate.

Financial development level	FINANCE	It is measured by the ratio of the loan balance at the end of the year to the GDP.

3.5 Descriptive statistic

Table 2 reports the basic statistical characteristics of the main variables. The average value of commercial credit (TC) provided by enterprises is 0.032, and the median value is 0.033, indicating that the results of commercial credit data are not obviously skewed. In this paper, the average value of FINDEX, the index of financial technology level, is 5.467 and the median value is 5.559 by logarithmic transformation, which shows that financial technology has developed rapidly and has a high level of development during the period of economic transformation. All variables are basically within a reasonable range, and the rest are basically consistent with the existing literature.

Table 2 Descriptive statistic

Name	observation	Mean	SD	Min	Quarter	Media	3 quarter	Max
TC	25697	0.0320	0.314	-1.291	-0.0910	0.0330	0.182	0.913
FINDEX	25697	5.467	0.305	4.128	5.297	5.559	5.697	5.885
SBANK	25697	0.668	0.471	0	0	1	1	1
SIZE	25697	22.22	1.301	19.98	21.27	22.02	22.95	26.30
ROA	25690	0.0500	0.0600	-0.176	0.0190	0.0440	0.0790	0.302
GROW	25688	0.168	0.339	-0.481	-0.00700	0.114	0.269	1.951
DS	25697	8.468	1.619	5	7	9	9	14
INDEP	25694	0.376	0.0530	0.333	0.333	0.364	0.429	0.571
SOE	25697	0.320	0.467	0	0	0	1	1
TOBINQ	25697	2.008	1.207	0.855	1.250	1.620	2.300	7.760
OWNCON	25697	34.63	14.84	8.730	23.10	32.63	44.71	75.46
TANG	25697	0.199	0.148	0.00300	0.0830	0.170	0.281	0.669
LEV	25697	0.401	0.196	0.0560	0.240	0.393	0.548	0.847
OCF	25697	0.0510	0.0700	-0.744	0.0130	0.0500	0.0890	0.876
CPI	25697	102.0	0.641	100.9	101.6	102.1	102.6	102.9
M2R	25697	10.35	2.080	8.070	8.700	10.10	12.16	13.84
FINANCE	25694	0.0270	0.0250	0	0.00700	0.0170	0.0420	0.0800

4. Empirical results

4.1 Benchmark regression

Table 3 reports the regression results of financial technology on commercial credit redistribution. Each column of regression controls the fixed effect of industry and year, and the standard error of regression coefficient in this paper uses robust standard error.

The empirical results in the second column show that the estimation coefficient of the cross-product term is significantly negative at the level of 1%, indicating that the better the development of regional financial technology, the weaker the commercial credit redistribution of local enterprises, which proves the hypothesis. In addition, the significance and signs of other control variable coefficients are basically consistent with the existing literature.

Table 3 Basic test results

	(1)	(2)
	TC	TC
FINDEX×SBANK	-0.0168	-0.0325***
	(-1.3659)	(-2.9081)
FINDEX	-0.0440**	-0.1898***
	(-2.1265)	(-7.9293)
SBANK	0.1173*	0.2591***
	(1.7351)	(4.2201)
Controls	yes	yes
Industry-annual fixed effect	yes	yes
N	25697	25682
Adj-R²	0.3023	0.4121

4.2 Endogenous problem

4.2.1 Tool variable method. Referring to the research idea of Li Chuntao et al. (2020), the FINDEX mean (LNIN) of the neighboring prefecture-level city or district where the enterprise is located is used as a tool variable. This instrumental variable meets the requirement of correlation, because the financial development degree between adjacent regions is similar. At the same time, due to the obvious segmentation of the inter-regional business of financial institutions, it is difficult for the development level of financial technology in adjacent areas to affect the commercial credit reconfiguration of local enterprises, so this tool variable meets the exogenous requirements. Therefore, the tool variables selected in this paper meet the assumptions of correlation and externality.

The results show that the coefficient of LNIN is significantly positive at the level of 1%, indicating that the average level of financial technology development in neighboring areas is positively related to the level of local financial technology development. The second-stage regression results show that the coefficient of FINDEX×SBANK is significantly negative at the level of 1%, which proves the robustness of this conclusion.

Table 4 Instrumental variable

	First stage		Second stage
	FINDEX	FINDEX×SBANK	TC
LNIN	0.4531***	-0.2916***	
	(96.1348)	(-59.6981)	
FINDEX			-0.692***
			(-6.45)
FINDEX×SBANK			-0.055***
			(-2.62)
LNIN×SBANK		0.9028***	
		(305.1970)	
SBANK		0.6159***	0.385***
		(37.8160)	(3.30)
Controls	yes	yes	yes

Industry-annual control effect	yes	yes	yes
N	23850	23850	23850
Adj-R²	0.9551	0.9996	0.397

4.2.2 Double difference method. This paper further uses the State Council's "Promoting the Development Plan of inclusive finance (2016-2020)" as the impact of exogenous events, and uses the double difference method to alleviate the potential endogenous problems. On December 31, 2015, the State Council issued the Plan for Promoting the Development of inclusive finance (2016-2020). Considering that this policy was formulated by the central government, it can be regarded as an exogenous shock for financial institutions and meets the conditions for establishing a double difference model (Song Min et al., 2021). Referring to the method of Qian Haizhang et al. (2020), according to the secondary index of "Digitalization Degree" in Peking University Digital inclusive finance Index in 2015, this paper sets the area greater than the median as the control group, and the others as the control group, with TREAT of 1 in the control group and 0 in the control group. At the same time, this paper takes 2016 as the point of policy impact, and the value of policy implementation variable POST is 1 in 2016 and after, and 0 before. The specific DID model is established as follows:

$$TC = \beta_0 + \beta_1 TREAT \times POST \times SBANK + \beta_2 FINDEX + \beta_3 SBANK + \sum CONTROLS + \delta_i + \theta_t + \varepsilon_{i,\ t} \quad (2)$$

Among them, TREAT is the identification of the experimental group, POST is a time variable, and other variables are consistent with the above description. The results show that the coefficient of the cross product term is significantly negative at least at the level of 5%, which is consistent with the expectation, indicating that the conclusion of this paper is still valid after the robustness test of exogenous shocks.

Table 5 DID Regression result

	TC
TREAT×POST×SBANK	-0.0184**
	(-2.3991)
POST	0.0000
	(.)
TREAT	0.0000
	(.)
SBANK	0.0943***
	(13.7563)
FINDEX	-0.2132***
	(-9.8883)
Controls	yes
Industry-annual control effect	yes
N	25682
Adj-R²	0.4120

4.3 Robustness test

Replace the measurement index of the development level of financial technology. China Digital inclusive finance Index, jointly compiled by Digital Finance Research Center of Peking University and Ant Financial Group, includes several sub-indicators. In this paper, two sub-indicators are selected as proxy variables for the development level of financial technology: (1) Fintechu; (2) FINTECHB (digital finance coverage). After changing the measurement index, the conclusion of this paper is still robust, and the conclusion is consistent with the previous one.

Table 6 Replace the measurement index of financial technology development level

	TC	TC

FINTECHU×SBANK	-0.0259**	
	(-2.4384)	
FINTECHU	-0.1941***	
	(-9.8177)	
FINTECHB×SBANK		-0.0397***
		(-3.6126)
FINTECHB		-0.0865***
		(-4.9405)
SBANK	0.2239***	0.2979***
	(3.8526)	(4.9371)
Controls	yes	yes
Industry-annual control effect	yes	yes
N	25668	25668
Adj-R²	0.4133	0.4113

5. Mechanism analysis

By exploring whether financial technology can reduce the financing constraints of enterprises and enhance the efficiency of credit allocation, this paper further and more directly studies whether financial technology can significantly reduce the redistribution of commercial credit of enterprises.

5.1 Financial Technology, Financing Constraints and Commercial Credit Redistribution

Under the traditional financial model, small and medium-sized enterprises face the financing constraints of formal financing, and then turn to informal financing, among which commercial credit financing is more preferred in the choice of informal financing methods. Therefore, it promotes the secondary allocation of commercial credit (Kai Zhong et al., 2022). However, financial technology can alleviate information asymmetry, reduce the financing constraints of enterprises, directly alleviate the financing constraints of small and medium-sized enterprises, and then inhibit the commercial credit redistribution of listed enterprises through technology spillover effect.

Theoretical analysis shows that the application of financial technology in enterprises and financial institutions can indirectly reduce the redistribution of commercial credit by reducing the financing constraints of enterprises. Referring to the method of Tan Yue and Xia Fang (2011), this paper uses KZ index to reflect the financing constraints faced by enterprises. Based on this, this paper constructs the following model to test the influence of financial technology on financing constraints:

$$KZ = \beta_0 + \beta_1 FINDEX + \sum CONTROLS + \delta_i + \theta_t + \varepsilon_{i,\ t} \tag{3}$$

The results show that the coefficient of FINDEX is significantly negative at the level of 1%, indicating that financial technology can significantly reduce the financing constraints of enterprises. The above test results show that financial technology can indirectly reduce the redistribution of commercial credit by reducing the financing constraints of enterprises.

5.2 Financial Science and Technology Development, Credit Allocation Efficiency and Commercial Credit Redistribution

In China, many enterprises use commercial credit as a means of financing, especially the unlisted small and medium-sized private enterprises which are discriminated and constrained by bank credit are more dependent on commercial credit (Yu Minggui et al., 2008). Research shows that in traditional finance with limited formal financing channels, commercial credit is the most commonly used informal financing method for most enterprises constrained by bank credit (Zhang Xinmin and Zhang Tingting, 2016). In this case of credit discrimination and inefficient credit allocation, enterprises constrained by bank credit have great demand for commercial credit financing, an informal financing method. Financial technology, relying on information technology, can mine more

sufficient enterprise information, thus guiding credit resources from inferior enterprises to high-quality enterprises, especially benefiting high-quality small and medium-sized private enterprises, and optimizing the allocation of credit resources among departments (Song Min et al., 2020). Based on this, this paper believes that alleviating credit discrimination and enhancing the efficiency of credit allocation will reduce the demand for this kind of informal financing and weaken the situation of commercial credit redistribution.

Theoretical analysis shows that the application of financial technology in enterprises and financial institutions can indirectly reduce the reallocation of commercial credit by enhancing the efficiency of credit allocation. Jianze et al. (2013) believe that the sensitivity of new loans to corporate profitability reflects the allocation efficiency of credit resources, and the greater the sensitivity, the higher the efficiency of credit allocation. In order to test whether financial technology can reduce the demand of enterprises for commercial credit financing by enhancing the efficiency of credit allocation, this paper constructs the following model to test the influence of financial technology on the efficiency of credit allocation:

$$DELTALOAN = \beta_0 + \beta_1 PERFORMANCE + \beta_2 FINDEX \times PERFORMANCE + \beta_3 FINDEX + \sum CONTROLS + \delta_i + \theta_t + \varepsilon_{i,\ t} \tag{4}$$

Among them, DELTALOAN is the net change of bank loans of the enterprise in that year, PRERFORMANCE is the enterprise performance, which is expressed by ROA, which represents the current performance of the enterprise, and other variables are consistent with the previous definitions.

The cross-product coefficient is significantly positive at the level of 5%, indicating that financial technology has increased the sensitivity of new loans to ROA and optimized the allocation efficiency of credit resources. To sum up, financial technology is helpful to improve the loan screening ability of traditional financial institutions, optimize the allocation of credit resources, and significantly inhibit the redistribution of commercial credit.

Table 7 Test results of influence mechanism

	(1)	(2)
	KZ	DELTALOAN
FINDEX×PRERFORMANCE	-0.4308***	-0.0001
	(-4.2806)	(-0.0106)
FINDEX		0.0601**
		(2.2536)
PERFORMANCE	-9.7128***	-0.1614
	(-46.4540)	(-1.0856)
Controls	yes	yes
Industry-annual control effect	yes	yes
N	23486	23642
Adj-R²	0.7774	0.1387

6. Heterogeneity analysis

6.1 Heterogeneity analysis based on the nature of enterprise property rights

State-owned enterprises have credit advantages, while private enterprises often suffer from greater financing constraints and obstacles in the process of financing (Li Xu Chaodeng, 2017), which leads to different needs of different enterprises for commercial credit redistribution. Therefore, the influence of financial technology on the commercial credit redistribution of enterprises with different ownership may be different. The regression results show that the inhibitory effect of commercial credit redistribution brought by financial technology is more obvious in state-owned enterprises. This is mainly because private enterprises are subject to greater financing constraints in formal financing channels and will provide less commercial credit to upstream and downstream SMEs. When the

financing cost of state-owned enterprises is relatively low, they are more willing to participate in the shadow banking business and reallocate the credit funds obtained.

Table 8 Heterogeneity analysis based on the nature of enterprise property rights

	State-owned enterprise	Private enterprise
	TC	TC
FINDEX×SBANK	-0.0605***	-0.0249*
	(-3.4211)	(-1.8923)
FINDEX	-0.0362	-0.2536***
	(-0.8755)	(-8.8273)
SBANK	0.3938***	0.2321***
	(4.0897)	(3.1989)
Controls	yes	yes
Industry-annual control effect	yes	yes
N	8223	17459
Adj-R²	0.4146	0.3948

6.2 Heterogeneity analysis based on enterprise scale

Similar to the nature of property rights, large enterprises often have more advantages in the credit market. The regression results show that the inhibitory effect of commercial credit redistribution brought by financial technology is more obvious in large-scale enterprises.

Table 9 Heterogeneity analysis based on enterprise scale

	Large-scale enterprise	Small scale enterprise
	TC	TC
FINDEX×SBANK	-0.0782***	-0.0030
	(-5.1925)	(-0.1991)
FINDEX	-0.2050***	-0.1536***
	(-6.2485)	(-4.5755)
SBANK	0.4911***	0.1141
	(5.9392)	(1.3960)
Controls	yes	yes
Industry-annual control effect	yes	yes
N	12637	13045
Adj-R²	0.4546	0.3836

6.3 Heterogeneity analysis based on the degree of financial development

The degree of financial development will have an important impact on the financing behavior of listed companies, and the level of regional financial development will often affect the channels for enterprises to obtain external financing (Claessens and Laeven, 2003). The regional financial development level is measured by the logarithm of the number of branches of commercial banks in each province in each year, and the total sample is divided into two sub-samples with strong financial development level and weak financial development level. The regression results show that the inhibitory effect brought by the development of financial technology is more obvious in areas with weak financial development. This is because areas with strong financial development have lower financing constraints and higher credit allocation efficiency.

Table 10 Heterogeneity analysis based on the degree of financial development

	Strong level of financial development	The level of financial development is weak
	TC	TC
FINDEX×SBANK	-0.0192	-0.0438***
	(-1.2782)	(-2.8976)
FINDEX	-0.0801*	-0.1825***
	(-1.9085)	(-5.4964)
SBANK	0.1871**	0.3236***
	(2.2591)	(3.9122)
Controls	yes	yes
Industry-annual control effect	yes	yes
N	12350	13095
Adj-R²	0.4186	0.4291

7. Conclusions and policy recommendations

7.1 Main conclusions

Based on the data of A-share listed companies in Shanghai and Shenzhen from 2012 to 2021, this paper investigates the influence and mechanism of financial technology on commercial credit redistribution. It is found that commercial credit redistribution is weaker in areas with higher development level of financial technology, and this result is still valid after robustness test. Further analysis shows that the role of financial technology is more obvious in areas with weaker financial development, state-owned enterprises and large-scale enterprises. The mechanism test shows that the introduction of financial technology can reduce the financing constraints of enterprises and enhance the allocation efficiency of credit resources, so as to achieve the effect of inhibiting the redistribution of commercial credit, and then inhibit large enterprises from acting as "shadow banks" to redistribute funds.

7.2 Policy enlightenment

7.2.1 Adhere to the development of financial science and technology, commit to solving the financing problems of small and medium-sized enterprises, enhance the ability of financial services to the real economy, and promote high-quality development. Small and medium-sized enterprises are the new force of economic development, but the "financing difficulty" restricts the further development of small and medium-sized enterprises in China, because the scale of small and medium-sized enterprises is small and the cost of bank loans is high. Financial science and technology innovation can reduce the transaction cost of supply chain financing and realize the information and data sharing of all participants in supply chain finance. Deepen the structural reform of the financial supply side, improve the financing mechanism that meets the development needs of small and medium-sized enterprises, focus on cracking the bottleneck restricting the development of small and medium-sized enterprises, and promote the healthy development of small and medium-sized enterprises according to law.

7.2.1 Use the development of financial technology to reduce the information asymmetry between enterprises and financial institutions, optimize the credit supply of financial institutions, and then promote the progress of the real economy. Through Internet technology and big data, banks can solve the "two high" problems of risk cost and fixed cost of micro-finance, lower the threshold for small and micro enterprises to obtain loans, and improve the convenience and availability of financing. Financial technology can expand information channels through cutting-edge technologies such as big data and cloud computing, improve information accuracy, effectively alleviate information asymmetry in the credit process, and improve loan efficiency. Compared with traditional sources of

funds, financial technology has higher convenience and lower cost, which helps to promote transactions and better serve low-end customers. Financial technology helps to establish an efficient and convenient credit evaluation model and reduce the cost of risk evaluation by using efficient and convenient technical advantages. Information technology improves the breadth and depth of information sharing, reduces the time and material cost of screening and monitoring, and improves the efficiency of risk management. Therefore, we should continue to promote the development of financial technology, reshape the ecological pattern of the financial industry, solve practical problems for enterprises, and promote the development of the national real economy.

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