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Does Fintech Help Enterprises Get Rid of the Real and Turn to the Virtual?—In Light of the Investigation of Listed Entity Enterprises in China from 2012 to 2023

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Abstract. Fintech may not only guide capital to return to the real economy, but also aggravate capital idling due to lowering the threshold of financial investment. Based on this, this study empirically analyzes the impact of Finance on the "de real to virtual" of enterprises, combining with the data of Chinese listed entity enterprises from 2012 to 2023. The research finds that, first, Fintech has helped enterprises "shift from real to virtual", and has passed a series of robustness tests; Second, Fintech can release a large number of financial resources by alleviating enterprise financing and enhancing the resilience of enterprise supply chain, which further increases the tendency of enterprises to "shift from real to virtual"; Third, for private enterprises, enterprises in the eastern region and enterprises without important defects, the impact of Fintech on enterprises' de reality to virtual is more significant, while for state-owned enterprises, enterprises in the central and western regions and enterprises with important defects, this effect is not obvious.

Keywords: Fintech, From excess to deficiency, Financing constraints, Supply chain resilience

1. Introduction

1.1. Research background

In view of the accelerated evolution of global Fintech and the profound changes in the financial market, the vigorous development of global Fintech has not only provided diversified and convenient financial support for the real economy, but also quietly changed the allocation logic and flow direction of financial resources, enabling more market players to participate in financial activities. However, it may also lead to the risk that financial resources are "from real to virtual", that is, financial activities are excessively concentrated in the field of virtual economy, which deviates from the effective support for key areas such as the real economy, especially manufacturing. In this context, it has become a pressing area of inquiry in the field of coordinated development of Finance and the real economy to explore how Fintech affects enterprises' behavior of shifting from the real economy to the virtual economy.

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In view of the the special challenges and policy orientation of China's economic transition, China's economy is at a critical stage of transformation from high-speed growth to high-quality development, and the real economy is facing the urgent need for transformation and upgrading. As the main body of the real economy, the manufacturing industry is generally faced with financing difficulties, expensive financing, capital mismatch and other problems in the process of transformation. In order to pursue short-term benefits, some enterprises invest their funds in the virtual economy fields such as real estate and financial derivatives, resulting the "disenchantment from real to virtual". Meanwhile, the Chinese government places substantial emphasis on the functional positioning of financial services for the real economy, and has issued a series of relevant policies and systems, committed to enhancing the ability and efficiency of financial services for the real economy. As an important direction of financial innovation, whether Fintech can effectively mitigate enterprises' financing constraints, rationalize the allocation of funds,and then check the tendency of "shifting from the real economy to the virtual economy"has become the focus of common concern of policy makers and academia.

From the perspective of the interaction between corporate behavior motivation and Fintech, under the traditional financial system, SMEs are difficult to obtain sufficient physical investment funds due to insufficient collateral and low credit rating, and instead put idle funds into the financial market to obtain short-term returns; Large enterprises may also diversify through financial channels, or even deviate from their main business. The intervention of Fintech has changed this behavioral logic: on the one hand, by reducing information asymmetry and optimizing the risk control model, it provides more accurate credit support for real enterprises, alleviates their financing constraints, and guides the return of funds to the real economy; On the other hand, it is also possible to reduce the threshold of virtual investment by innovating financial products, attract enterprises to invest more resources in high-risk and highly volatile financial activities, and intensify the shifting from the real economy to the virtual economy. This two-way mechanism makes the relationship between Fintech and enterprises "from real to virtual" present complex nonlinear characteristics. It is urgent to clarify its specific impact path through empirical research.

1.2. Research significance

In this context, a systematic study of the impact of Fintech on enterprises' shift from the real economy to the virtual economy can not only provide theoretical support for understanding the internal mechanism of the coordinated development of financial innovation and the real economy, but also provide empirical evidence for policy makers to design a regulatory framework of "combination of dredging and blocking". At the same time, for enterprises, the research conclusions help them rationally evaluate the advantages and disadvantages of the application of Fintech, and avoid the risk of excessive financialization while enjoying the convenience of digital finance; For financial institutions, it provides practical reference for optimizing product design, balancing innovation and risk control.

1.3. Marginal contribution

Based on this, This study conducts an empirical analysis of the impact of Finance on the "de real to virtual" of enterprises, combining with the data of Chinese listed entity enterprises from 2012 to 2023. From the perspective of research, this study combines corporate financing constraints and regional supply chain resilience to investigate the path of the impact of Fintech on the "de reality" of enterprises; In terms of the research content, this study further investigated the impact of Fintech on

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the "de reality to non reality" of enterprises under the conditions of different property rights, geographical location and corporate governance quality.

2. Literature review

From the perspective of the impact of Fintech on the real economy, Fintech can help promote the progression of the real economy, help the real economy cope with the crisis and repair. Zhang and Wang pointed out that Fintech can promote the stability of the real economy, reduce the impact of financial accelerator, correct the irrational behavior of investors, reduce the income distribution gap, and promote industrial transformation and upgrading, but it also brings new risks. It is necessary to promote the stability of the real economy from the perspective of system construction [1]. Through empirical analysis, shows that Fintech has a significant positive role in promoting the high-quality development of the real economy, with a positive spatial effect, and an intermediary effect such as credit scale, which should be achieved by dredging support channels [2]. Wang explored the impact of Fintech on the investment of real enterprises under the impact of the new crown epidemic, and found that Fintech significantly improved the investment level of real enterprises, alleviated capital constraints, enhanced enterprise resilience, and reduced macro fluctuations, revealing the internal mechanism of the impact of Fintech on the operation of the real economy [3].

From the perspective of the impact of Fintech on the financialization of enterprises or the shift from real to virtual enterprises, there are two views. One view is that Fintech inhibits the financialization of enterprises, and the other view is that Fintech promotes the financialization of enterprises.

From the perspective of Fintech inhibiting enterprise financialization, Liu took A-share listed manufacturing firms in China as the research sample, and found that Fintech development can significantly inhibit enterprises from "disenchantment to emptiness", and play a role by improving enterprise ESG performance, especially social responsibility and corporate governance [4]. Chang based on the quasi natural experimental analysis, found that the pilot initiative for integrating science-technology and financial sectors significantly inhibited the de facto to virtual of small and medium-sized enterprises in the manufacturing industry, and promoted the return of productive capital by increasing the leverage ratio [5] .Dai selected data from A-share listed corporations in China, and the research showed that the development of Fintech significantly reduced the level of entity enterprise financialization by easing the financing constraints of enterprises [6]. Zouying based on the dual principal-agent theory, found that the application of big data has a positive impact on the financialization of real enterprises and helps to solve the problem of disenchantment from reality to illusion [7]. Li found that the development of banking Fintech can weaken the motivation of enterprises by promoting the expansion of credit scale, thus effectively reducing the level of enterprise financialization [8]. Zhai selected the data of A-share listed companies in Shanghai and Shenzhen stock exchanges, and the results showed that under the loose monetary policy, Fintech strengthened the effect of restraining enterprise financialization through two channels of "stabilizing expectations" and "promoting R&D" [9]. Liu based on the data of A-share non-financial listed companies, the study found that Fintech had a significant inhibitory effect on enterprise financialization, and the inhibitory effect increased with the decline of economic policy uncertainty. By alleviating financing constraints, it should have a governance effect on specific enterprises and industries [10]. Zhuang analyzed the micro data of Chinese enterprises from the perspective of enterprise financial investment motivation, and found that the development of Fintech would aggravate the speculative profit seeking motivation of enterprises, but could also inhibit the industry cluster effect of enterprise financialization by improving the return on financial investment [11].

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Drawing on data of A-share listed companies in China, Xin found that Fintech affected corporate behavior through competitive effect and cost effect [12]. Wu utilizing the dataset of A-share listed firms on China's Shanghai and Shenzhen Stock Exchanges, the test found that the improvement of the matching degree of "Fintech - financial regulation" can inhibit enterprise financialization, but the "excessive" development of Fintech will boost enterprise financialization [13].

From the perspective of Fintech promoting enterprise financialization, Zheng and Zhuang found that the development of Fintech will intensify the speculative profit seeking motivation of enterprises, promote enterprises' preference for financial investment activities, and aggravate the issue of "shifting from real economic activities to virtual-oriented operations" [11,14].

On the whole, scholars hold two conflicting perspectives regarding Fintech's influence on enterprise financialization. Most studies have shown that Fintech can effectively restrain enterprises' inclination toward "real-to-virtual diversion" andfacilitate the reallocation of capital back to the real economy by improving ESG performance, easing financing constraints, optimizing the credit environment and other mechanisms. However, some studies have pointed out that Fintech may aggravate the speculative profit seeking motivation of enterprises, especially under certain conditions, it will strengthen the trend of financialization. This differentiated impact depends on the application scenarios of Fintech, the degree of regulatory matching and the characteristics of enterprises.

3. Research design

3.1. Model setting

In order to further investigate the internal relationship between Fintech and enterprise financialization, this study sets the following model:

$$Financialization_{it} = \alpha_0 + \beta_0 Fintech_{it} + \sum \gamma_k Control_{it} + \lambda_t + \delta_i + \varepsilon_{it}$$

Here, Financializationit denotes the extent of enterprise financialization; Fintechit refers to the level of Fintech adoption by enterprises; Controlit stands for a set of control variables; λt and δi represent time-fixed and firm-fixed effects, respectively; and εit is the error term.

3.2. Variable definition

As for the measurement of Fintech, this study uses the proportion of financial assets in total assets to investigate.

As for the measurement of digitization, this study uses the frequency of relevant words in the annual reports of listed companies to investigate. Specifically, Based on the data pool established via Python for extracting texts from the annual reports of listed companies, search, match and count the word frequency according to the relevant feature words, and then classify and collect the word frequency of the key technology direction and form the final total word frequency, so as to build the index system of enterprise Fintech.

As for the intermediary variables, the first is the corporate financing constraint index, which is calculated as follows, where size represents the size of the enterprise and age represents the age of the enterprise.

$$SA = -0.737Size + 0.043Size^2 - 0.040 \times Age$$

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The second is supply chain resilience. This study refers to the practice of Yao to decompose the components of supply chain resilience from multiple dimensions [15]. Specifically, firstly, based on the actual scenario and theoretical connotation of supply chain operation, the evaluation system is constructed from five key dimensions. Secondly, the data is standardized; Finally, the comprehensive index is weighted by entropy weight method to obtain the supply chain toughness index.

As for the control variables, this study selected a series of control variables from the enterprise level and the macro level, including: (1) enterprise level variables: enterprise size, enterprise profitability, enterprise solvency, enterprise liquidity level, enterprise age, board size, executive compensation, equity concentration, P/E ratio; (2) Macro level variables: regional economic development level, regional industrial structure, and regional financial development level.

3.3. Data sources and descriptive statistics

This study takes A-share listed companies in Shanghai and Shenzhen from 2012 to 2023 as research samples, with the following processing steps: first, excluding ST, *ST, PT-labeled enterprises, those under suspension or delisting, and financial industry firms; second, removing samples with extensive missing data; third, conducting 5% winsorization on all continuous variables to mitigate extreme value impacts on results; fourth, matching and integrating variable data. For data sources, corporate Fintech information is extracted from listed companies' annual reports, other firm-level data from CSMAR, and macro-level data from Wind. Descriptive statistics of each variable are presented in Table 1.

Table 1. Descriptive statistics of variables

VarName	Obs	Mean	SD	Min	Max
FinRatio	39740	0.054	0.096	0.000	0.725
Finratio1	39740	0.163	0.782	-4.026	8.995
Fintech	41843	3.401	1.422	0.000	6.263
Fintech1	29428	67.664	126.620	0.000	1125.000
Size	41628	3.097	0.060	2.704	3.357
ROA	41627	0.036	0.060	-0.163	0.171
Leverage	36173	1.288	0.738	0.630	4.947
Liquidity	41591	0.693	2.010	-5.723	8.204
Board	30545	8.408	1.662	0.000	18.000
Salary	30483	0.288	0.350	0.005	1.689
Age	41625	9.735	8.012	0.000	27.000
PE	34853	72.049	100.902	6.843	550.452
Top5	41383	0.488	0.190	0.200	0.994
Industry	41831	54.922	11.224	34.500	84.800
GDP	41831	10.700	0.764	6.565	11.818
Finance	41831	1.666	0.458	0.701	2.998

DOI: 10.54254/2754-1169/2025.BL31878

4. Empirical analysis

4.1. Basic regression

Table 2 reports the benchmark regression results of this paper. Column (1) displays the estimated outcomes with solely the core explanatory variable "Fintech development level" with a coefficient of 0.0108, which is statistically significant at the 1% level, indicating a notable positive association between Fintech development and finratio.Column (2) adds control variables at the enterprise level and regional financial development level, the estimation coefficient of the development level of Fintech is still significant.

Table 2. Basic regression analysis

	(1)	(3)
VARIABLES	FinRatio	FinRatio
Fintech	0.0108***	0.0024***
	(29.76)	(4.12)
Control variables	No	Yes
Constant	0.0268***	-0.0994
	(14.56)	(-1.62)
Observations	39,740	25,222
Number of stkcd	5,260	3,365

4.2. Robustness test

One is to replace the explained variable. This study further uses finratio1 to replace the cause variable. The results show that after replacing the explained variable index, the coefficient pertaining to "Fintech development level" is still significantly positive. The second is to replace explanatory variables. This study uses the new explanatory variable "the number of newly registered Fintech companies in that year" to measure, and the result shows that the coefficient is still significantly positive, which further shows that using different indicators to measure the development of Fintech can still promote enterprise financialization. Third, use other models. This study uses the random effect model to estimate, and the results show that the positive correlation between variables still exists. Fourth, carry out lag term analysis.To lessen the query of the reverse causality, that is to exclude the possibility of the reverse causality that "the high level of enterprise financialization" leads to its better promotion of "the development of Fintech". By replacing the explanatory variable with the "Fintech development level" of the previous period (lagging behind the previous period), we can better infer the causal relationship. The coefficient of lag_Fintech development in the later period is significantly positive. This shows that the development level of Fintech in the early stage can significantly promote the enterprise financialization in the current period.

Table 3. Robustness test

	(1)	(2)	(3)	(4)
VARIABLES	FinRatio	FinRatio	FinRatio	FinRatio
Fintech	0.0077*		0.0024***	

DOI: 10.54254/2754-1169/2025.BL31878

Table 3. (continued)

	(1.76)		(4.12)	
Fintech1		0.0000***		
		(4.91)		
lag_Fintech				0.0026***
				(4.52)
Control variables	Yes	Yes	Yes	Yes
Constant	-0.6325	0.0041	-0.0994	-0.0440
	(-1.58)	(0.06)	(-1.62)	(-0.67)
Observations	25,222	17,534	25,222	22,213
Number of stkcd	3,365	2,376	3,365	3,320

4.3. Mechanism analysis

In order to deeply explore the internal channels of Fintech influencing enterprise financialization, this study conducted a mechanism analysis. The regression results in Table 4 reveal two significant action paths: the financing constraint mitigation mechanism and the supply chain toughness improvement mechanism.

From the perspective of corporate financing constraint mechanism, column (1) shows that the coefficient of Fintech development level is significantly negative at the level of 1%. Sa_index is a reverse indicator, and the smaller its value, the lighter the financing constraint. The results show that the development of Fintech has effectively reduced the financing pressure faced by enterprises by providing diversified financing channels and improving the availability of credit. Column (2) shows that the mitigation of financing constraints (sa_index) enhances the motivation of enterprises to make financial investment in order to seek high returns, thus promoting the financialization of enterprises. Therefore, Fintech has further aggravated the degree of enterprise financialization by easing the financing constraints of enterprises.

From the perspective of supply chain resilience mechanism, column (3) shows the development level of Fintech has a significant positive impact on "supply chain resilience", indicating that the application of Fintech has effectively enhanced the robustness and risk resistance of enterprise supply chain. Column (4) further included "supply chain resilience" as a control variable in the regression equation,showing both the development level of Fintech and supply chain resilience had a significant role in promoting finratio. Therefore, Fintech has brought more stable cash flow and business environment for enterprises by improving the toughness of the supply chain, thus releasing more disposable financial resources and ultimately promoting the allocation of financial assets of enterprises.

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Table 4. Mechanism analysis

	(1)	(2)	(3)	(4)
VARIABLES	SA_index	FinRatio	resilience	FinRatio
SA_index		-0.0410***		
		(-9.18)		
Fintech	-0.0045***	0.0018***	0.0009***	0.0019***
	(-7.07)	(3.19)	(12.28)	(3.30)
Resilience				0.2181***
				(4.27)
Control variables	Yes	Yes	Yes	Yes
Constant	-2.8633***	-0.2714***	-0.0462***	-0.0818
	(-37.61)	(-4.23)	(-5.86)	(-1.31)
Observations	25,595	25,222	24,717	24,533
Number of stkcd	3,451	3,365	3,393	3,355

4.4. Heterogeneity analysis

First, from the attribute of property rights, Fintech has significantly promoted the financialization of non-state enterprises, but the impact on state-owned enterprises is not statistically significant. This shows that non-state-owned enterprises are more sensitive to the new financing channels and investment opportunities brought by Fintech. The reason may be that non-state enterprises have been facing the problem of difficult and expensive financing for a long time. Fintech provides it with an effective financing supplement outside the traditional banking system, which may encourage it to allocate more funds to financial assets to obtain short-term returns. However, the financing channels of state-owned enterprises are unobstructed, and their dependence on and response to Fintech are relatively weak. Non state owned enterprises' business objectives are more profit focused, the decision-making mechanism is flexible, and they can use Fintech tools to carry out arbitrage financial investment faster. State owned enterprises bear more policy burden, their main business is relatively stable, and their motivation for financialization is weak. Non state owned enterprises may have higher risk preference and prefer to use the leverage effect of Fintech to carry out financial activities with high risk and high return.

Second, with regard to regional distribution, the driving role of Fintech is mainly concentrated in the economically developed eastern region, while the impact on enterprises across the central and western regions stands not significant. The reasons may be as follows: the eastern region is the gathering place of Fintech enterprises, with perfect digital infrastructure and higher acceptance and utilization rate of Fintech products by enterprises and residents; The eastern region has more mature financial ecology and scientific and technological talents, and enterprises can integrate Fintech resources more effectively. The central and western regions lag behind in technology and market

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environment; With developed economy and more investment opportunities in the eastern region, it is easier to combine Fintech with the existing investment needs of enterprises.

Third, from the attribute of property rights corporate governance quality, the promotion effect of Fintech is very significant for enterprises that do not have important defects in internal governance. However, for enterprises with governance defects, the impact is not significant, indicating that good corporate governance is an important prerequisite for Fintech to play a positive role. The possible reasons are: enterprises with good governance have perfect internal control and risk management systems, and can more rationally evaluate and use Fintech opportunities to improve the efficiency of their main business or make sound financial investment. However, for enterprises with defective governance, the decision-making may be short-sighted or driven by the private interests of the management, resulting in distorted investment behavior, and the application effect of Fintech is difficult to predict and may even aggravate the risk; For enterprises with poor governance, Fintech may not "help in the snow", but "add fuel to the fire", providing convenience for them to make high-risk and speculative financial investment, but may damage the long-term value of enterprises.

Table 5. Heterogeneity analysis

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	State-owned enterprise	Non-state-owned enterprises	Eastern Regions	Central and Western Regions	Enterprises with significant deficiencies	Enterprises without significant defects
Fintech	0.0011	0.0031***	0.0020***	0.0012	0.0044	0.0024***
	(1.21)	(4.19)	(2.88)	(1.17)	(1.17)	(4.20)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.2346**	-0.2565***	-0.1821**	0.0419	-0.0876	-0.1125*
	(2.38)	(-3.14)	(-2.44)	(0.41)	(-0.26)	(-1.82)
Observations	7,097	16,419	19,431	5,790	215	25,007
Number of stkcd	917	2,605	2,661	739	159	3,365

5. Conclusion

Using data of China's listed firms entity enterprises from 2012 to 2023, this paper empirically examines the influence of Fintech on the "de reality" of enterprises. The research finds that, first, Fintech has helped enterprises "shift from real to virtual", and has passed a series of robustness tests; Second, Fintech can release a large number of financial resources by alleviating enterprise financing and enhancing the resilience of enterprise supply chain, which further increases the tendency of enterprises to "shift from real to virtual"; Third, for private firms, eastern-region enterprises, and companies without major operational flaws, Fintech's effect on their real-to-virtual shift is more significant, while for state-owned entities, central and western-region firms, and enterprises with prominent defects, this effect is not obvious.

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