Does FinTech Promote the Profitability of Real Enterprises in China?

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ABSTRACT

The innovative development of fintech has optimized the function of financial services and resource allocation, thus consolidating and strengthening the foundation of the real economy. Based on the data set of Chinese A-share listed companies from 2011 to 2018, this paper uses a fixed-effect model to test the impact of fintech on the profitability of real enterprises. The mechanism of fintech's influence on the profitability of real enterprises is discovered using the intermediary effect model; that is, by reducing the information asymmetry between financial institutions and enterprises, alleviating the financing constraints of enterprises, and thus promoting the growth of actual enterprise profitability. After employing robustness analyses such as adding control factors and modifying proxy variables, the conclusion holds up, demonstrating that the fintech promotion effect on enterprise profitability can be steady.

Keywords: financial technology, ROA, information asymmetry, financing constraints.

1. INTRODUCTION

Fintech is entering a new era of innovation accumulation and sustainable development. The financial service model is undergoing quick and significant changes as cutting-edge information technologies such as big data, artificial intelligence, blockchain, cloud computing, and the Internet of Things are continuously deepened and iteratively upgraded. The financial inclusion aspect is noteworthy, and the financial sector's and real economy's inclusive growth are heavily supported [1]. The Chinese government proposed in March 2021 that it would continue to consolidate and strengthen the real economy's foundations while also speeding up the creation and development of the modern industrial system. As a result, one of the "three responsibilities" in the financial field is to pay special attention to and service the actual economy. Many researchers are debating how to improve the financial industry's compatibility and service level to serve the real sector and achieve high-quality economic development with the help of fintech.

Resource-based theory points out that the key to creating and maintaining enterprises' growth potential and competitive advantage still comes from the effective acquisition, allocation, and utilization of internal and external resources[2]. Sasidharan[3] made an empirical analysis based on the Euler equation and concluded a significant positive correlation between corporate profitability and corporate financing. Thanks to the innovation and application of fintech, financial institutions, based on big data, artificial intelligence, and other technologies, have significantly reduced the degree of information asymmetry with enterprises, significantly improved the financing efficiency of enterprises and the financing constraints[4]. Lee[5] focuses on the fintech category and builds an analytical framework that includes fintech development, information friction, and the financing gap. He divided fintech into information processing technology and information collection technology and found that both technologies help reduce the probability of misclassifying good companies as bad ones, thus narrowing the financing gap and optimizing credit allocation. In the capital supply chain, fintech enables enterprises to obtain more credit support to meet the financing needs of enterprises' R&D, innovation, and production activities and thus promote the profitability of enterprises. Therefore, this paper makes assumptions:

H1: The more substantial the company's profitability, the higher the level of financial technology development.

Specifically, this paper uses the number of financial technology companies in prefecture-level cities to measure the development level of regional financial technology, selects China's Shanghai and Shenzhen A-share listed companies from 2011 to 2018 as the research object, and explores the impact of regional financial technology development on corporate profitability. The findings are as follows: Fintech development can significantly promote the profitability of local enterprises by reducing the information asymmetry between financial institutions and enterprises and easing the financing constraints of enterprises.

The main contribution of this paper is to integrate fintech into the profitability analysis framework of micro-enterprises and reveal the potential mechanism of fintech promoting profitability from the perspective of credit rationing.

2. ECONOMETRIC APPROACH

2.1. Data Source

The research subject in this paper is Chinese A-share listed companies on the Shanghai and Shenzhen stock exchanges. The Wind and CSMAR databases provide the key features and financial data of listed firms, and the China Statistical Yearbook provides the yearly sales output value of industrial enterprises. After excluding missing variable samples, insolvent firms, and companies with less than one year trading periods, observations for 15,761 publicly traded companies encompassing 24 industries and 29 provinces and cities were obtained. Furthermore, all continuous variables were tail-tailed by 1% to remove the study's impact from a few extreme values.

2.2. Variable Definition

Explained variables: Regarding Phan et al.[6], this paper selects ROA (defined as the net profit ratio at the end of the period to the total average assets) as the benchmark proxy variable for profitability. The indicator is easy to obtain, comprehensive and applicable.Display equations should be flush left and numbered consecutively, with equation numbers in parentheses and flush right. First, use the equation editor

to create the equation. Then, select the equation, and set the "Equation" Style. Press the tab key and type the equation number in parentheses.

Explanatory variables: Fintech is a technology that mixes finance and technology into financial services, as described by the Global Financial Stability Board (FSB). Fintech can improve the productivity of the traditional financial business while also lowering operational costs by using cloud computing, big data, blockchain, artificial intelligence, and other developing technical tools. Based on this, this study first searched for "fintech," "cloud computing," "big data," "blockchain," "artificial intelligence," "Internet of things," and other terms, and then acquired information on all relevant firms' business registrations. Only samples containing the above keywords in the firm name or business scope are maintained in this study to avoid overlapping characters in the retrieval. Furthermore, this research excludes the sample of firms that have been in business for less than one year or have anomalous operating conditions to prevent the registration of shell companies from compromising the accuracy of fintech development indicators (such as suspension, dissolution, cancellation). The data is then further filtered in this article. The fuzzy matching of finance-related keywords such as "finance," "insurance," "credit," "clearing," and "payment" is carried out in the business scope of companies with regular expressions, and the matching samples are retained, according to the business scope of fintech companies in the sample and the classification of financial skills business model by Basel Committee on Banking Supervision. Finally, the annual number of fintech companies in prefecture-level cities is counted to measure the development level of fintech in the region. The higher the value, the higher the level of fintech development. Control variables: This article controls firm-level parameters such as firm size (Size), firm age (Age), cash flow (Cashflow), leverage (LEV), growth, and board independence (Indep), following previous literature. This study accounts for both regressions because fintech indicators may also contain regional economic development and financial development information. Due to the geographical spillover effects of fintech, the number of non-local fintech enterprises within 200 km of prefecture-level cities is additionally controlled in all regressions.

Table 1. Variable definition

	The variable name	Variable description
Explained variable	ROA	Return on assets，the ratio of net income tototal assets
Explanatory variables	Fintech	Number of fintech companies in prefecture-level cities

Control variables	Fin200	The number of years the corporation was enrolled.
	Size	The growth of the business, the growth rate of revenue.
	Age	Cash flow, the ratio of net cash flow from operating activities to total assets
	Growth	Director independence, the proportion of independent directors in the board of directors
	Cashflow	Asset-liability ratio, the ratio of total assets to total liabilities
	Indep	New business loans, changes in long-term debt, and short-term debt as a percentage of total assets.
	LEV	The number of years the corporation was enrolled.
	Deltaloan	
	POE	Property rights , if the enterprise is a private enterprise, the value is 1; otherwise, the value is 0

2.3. Model construction

This paper constructs the following model to analyze the impact of fintech development on enterprise profitability:

$$ROA_{i,t} = \alpha + \beta Fintech_{m,t-1} + \gamma X_{i,t-1} + \delta_t + \phi_i + \epsilon_{i,t}$$

(1)

Where t stands for time; i = 1,..., N stands for the listed enterprise. The net interest rate on total assets, or ROA, measures a company's profitability. The number of regional fintech companies is a proxy variable for the extent of fintech development, according to Fintech. X represents the control variable, andrepresents the error term. Furthermore, and represent individual and time-fixed effects, respectively. The fixed effects type is utilized in this paper because of the short panel characteristics.

3. EMPIRICAL ANALYSIS

3.1. Descriptive statistics

The correlation coefficient between the variables tested is essentially below 0.3, and the VIF value is 1.26, so the empirical study in this article is not affected by multicollinearity. According to the descriptive statistical results, it can be seen from Table 2 that the number of fintech companies, the number of non-local fintech companies within 200km around the prefecture-level city, and the size of the company are right-biased, so the logarithmic transformation is performed.

Table 2. Sample statistics

VarName	Obs	Mean	SD	Median
Roa	15761	0.0426	0.0466	0.0375
Fintech	15761	382.0443	1328.3560	18.0000
Size	15761	22.1137	1.2903	21.9319
Age	15761	10.7155	6.6933	10.0000
Growth	15761	0.2242	0.5135	0.1274
Cashflow	15761	0.0428	0.0697	0.0421
Indep	15761	0.3729	0.0530	0.3333
LEV	15761	0.4297	0.2110	0.4243
FinDev	15761	0.0749	0.0378	0.0647
EconoDev	15761	0.0940	0.0261	0.0880
Fin200	15761	515.6224	1363.0279	122.0000

3.2. The benchmark regression

Table 3 reports the regression results of the impact of regional fintech development on firms' profitability. Each column of regressions is controlled for an individual firm and annual fixed effects and corrected for the standard error with regional clustering effects. The empirical results show that the estimated coefficient

of fintech is significantly positive at the 1% level, indicating that fintech development has a significant positive impact on the profitability of enterprises. The better the development of regional fintech is, the higher the profitability of local enterprises is. Hypothesis 1 has been proved.

Table 3. Benchmark Regression

	(1)
	Roa
Fintech	0.0033***
	(2.6405)
Size	0.0081***
	(5.8840)
Age	-0.0078**
	(-2.3121)
Growth	0.0133***
	(18.3639)
Cashflow	0.1215***
	(18.8322)
Indep	-0.0204*
	(-1.7469)
LEV	-0.0966***
	(-16.7609)
FinDev	0.0864*
	(1.8154)
EconoDev	0.0912***
	(4.0438)
Fin200	0.0024
	(1.4622)
_cons	-0.0357
	(-0.6003)

Individual/ Year Effect	Controlled
N	15761
Adjusted R^2	0.2007

Adjusted R^2	0.2005	0.2003

3.3. Robust test

The number of fintech companies in a prefectural city can have much to do with its talent density. So this paper further uses Fintech_GDP (number of fintech companies in prefecture-level cities/per capita GDP) and Fintech_Edu (number of fintech companies in prefecture-level cities/number of regional universities) as proxy indicators for fintech regression. It can be seen from Table 4 that the coefficients of Fintech_GDP and Fintech_Edu are significant at least at the level of 5%, so the results of this paper are still robust.

TABLE 4. Consider the impact of talent density

	(1)	(2)
	Roa	Roa
Fintech_GDP	-0.0004***	
	(-5.5839)	
Fintech_Edu		0.0024**
		(2.1666)
Controls	Controlled	Controlled
Firm&Year	Controlled	Controlled
N	15708	15759

Considering that there are two types of fintech companies in the sample of this paper, namely limited liability companies and joint-stock companies, the number of the former is much larger than the latter. A limited liability company has a low entry hurdle, limited scope and size of capital raising, and a lower commercial scale than a joint-stock company. In addition, a-share listed companies in the sample of this paper are the essential types of enterprises in China, and it is difficult for small limited liability companies to interact with listed companies in financing business. As a result, fintech companies serving the financing needs of public companies are more likely to be large companies. Given this, this paper further ranks the top 30%, 20%, and 10% of the registered capital of limited liability companies according to their registered capital and recalculates the corresponding fintech indicators. After replacing the measurement index, the conclusion of this paper is still robust. It can be seen from Table 5 that the coefficient of Fintech the conclusion of this paper is still robust after the replacement of measurement indicators.

TABLE 5. Delete some samples of limited companies

	Keep the top 30 percent	Keep the top 20 percent	Keep the top 10 percent
	Roa	Roa	Roa
Fintech	0.0031***	0.0032***	0.0026**
	(2.7904)	(2.7932)	(2.2319)
Controls	Controlled	Controlled	Controlled
Firm&Year	Controlled	Controlled	Controlled
N	15761	15761	15761
Adjusted R^2	0.2008	0.2008	0.2006

Municipalities' financial technology is more developed than other cities in China, and the profitability of enterprises is often more potent. The problem of reverse causality may be more serious. Therefore, this paper removes the sample of municipalities directly under the central government and uses model (1) to re-estimate Table 3 again. Besides, the regression results would be biased if enterprises moved in due to the local fintech development level during the sample period. Therefore, this paper further deleted the sample of enterprises whose registered addresses changed across prefecture-level cities during the sample period and re-estimated it. Table 6 shows the regression results after excluding specific samples. It can be seen that the coefficient of fintech is still significantly positive.

TABLE 6. Delete the samples of municipal government and enterprise migration, respectively

	(1)	(2)
	Roa	Roa
Fintech	0.0035**	0.0029**
	(2.3323)	(2.2065)
Size	0.0100***	0.0076***
	(6.8174)	(5.3363)
Controls	Controlled	Controlled
Firm&Year	Controlled	Controlled
N	12620	14851
Adjusted R^2	0.2108	0.1997

Although the previous empirical findings found that the level of financial technology development can significantly promote corporate profitability, this conclusion may have been brought about by the spontaneous innovation of local financial institutions rather than the development of financial technology. In order to eliminate the influence of financial institutions' innovation on corporate profitability, this article further controls the innovation capabilities of financial institutions in the city where the company is located (Patent), using the natural logarithm of the number of patent applications from prefecture-level city financial institutions. After controlling the innovation capacity of financial institutions, Fintech's coefficient is still significantly positive at the 10% level, as shown in Table 7.

TABLE 7. Control innovation

	(1)
	Roa
Fintech	0.0032**
	(2.4204)
Patent	0.0003
	(0.6999)
Controls	Controlled
Firm&Year	Controlled
N	15761
Adjusted R^2	0.2007

In order to mitigate the spatial spillover effects of fintech, this paper further controls the number of fintech companies outside the city within a radius of 500km (Fin500) or the average fintech development level of neighboring cities (MeanFintech). It is clear from Table 8 that after controlling for possible spillovers, the Fintech coefficient is significant at the 95% confidence

level, meaning that the direct results of this article still exist.

TABLE 8. Control the level of fintech development outside the city

	(1)	(2)
	Roa	Roa
Fintech	0.0035***	0.0037***
	(2.8373)	(3.0012)
Fin500	0.0002	
	(0.0719)	
MeanFintech		0.0000***
		(2.8672)
Controls	Controlled	Controlled
Firm&Year	Controlled	Controlled
N	15761	15761
Adjusted R^2	0.2006	0.2012

4. MECHANISM ANALYSIS

Then comes the critical question: what are the underlying mechanisms by which fintech affects corporate profitability? This paper first explores whether fintech can alleviate the information asymmetry between financial institutions and enterprises and then further studies whether fintech can significantly reduce the financing constraints of enterprises.

4.1. Information asymmetry and corporate profitability

Severe information asymmetry is one of the main reasons for the difference in profitability among enterprises. Fintech uses big data, artificial intelligence, and other technologies to "empower" traditional financial institutions, centralize massive data processing, mine more comprehensive user information, and reduce information asymmetry between banks and enterprises[7][8]. In this paper, liquidity ratio[9], illiquidity ratio[10], and yield reversal index[11] were extracted. Then extracted the first principal component from the original indicators and captured their standard variation information, that is, the components related to asymmetric information, as the proxy variable of information asymmetry, denoted as ASY[12]. The larger the value of this indicator is, the more serious the information asymmetry is. The mediating effect model is used to test whether fintech can alleviate the information asymmetry between banks and enterprises and improve the profitability of enterprises.

The results in the first column of Table 9 show that the coefficient of Fintech is significantly negative at the 5% level, indicating that the development of Fintech can significantly reduce the degree of information asymmetry between external investors and enterprises. The ASY coefficient in the second column is significantly negative, indicating that information asymmetry will significantly reduce enterprise profitability. The coefficient of Fintech is significantly positive and decreased, indicating that alleviating information asymmetry is part of the mediating factor that Fintech promotes enterprises' total factor productivity. It means that fintech "empowers" finance with technology and can improve corporate profitability by alleviating the information asymmetry between traditional financial institutions and enterprises.

TABLE 9. Information asymmetry and corporate profitability

	(1)	(2)
	ASY	Roa
Fintech	-0.0458**	0.0027**
	(-2.5734)	(2.1680)
ASY		-0.0151***
Controls	Controlled	Controlled
Firm&Year	Controlled	Controlled
N	15736	15736
Adjusted R^2	0.6219	0.2219

4.2. Financing constraints and corporate profitability

David et al.[13] found that financing constraints hurt corporate performance by inhibiting corporate growth and reducing corporate investment. The fundamental reason for financing constraints is information asymmetry. Financial technology can alleviate information asymmetry and correct the pricing deviation of credit funds through technology spillover effects, thereby reducing corporate financing constraints. Regarding the formula of Hadlock and Piere[14], this paper use $-0.737 \times Size + 0.043 \times Size^2 - 0.04 \times Age$ to calculate the annual SA index of the observed enterprise and uses this as a measure of financing constraint FC. The SA index is negative, and the more significant the value, the higher the degree of financing constraints. Table 10 reports the results of the mediation effect test on financing constraints. The results in the first column show that the coefficient of Fintech is significantly negative, indicating that Fintech can significantly reduce the financing constraints of enterprises. In the second column, the coefficients of FC are all significantly negative at the 1% level, indicating

that financing constraints will indeed inhibit corporate profitability; the coefficients of Fintech are all significantly positive at the 5% level and are significantly lower than Table 3. It shows that after controlling financing constraints, the marginal effect of financial technology on corporate profitability has declined, which means that financing constraints are part of the intermediary factor between the development of financial technology and the improvement of corporate profitability.

TABLE 10. Financing constraints and corporate profitability

	(1)	(2)
	FC	Roa
FintechN	-0.0116**	0.0029**
	(-2.0410)	(2.2539)
FC		-0.0212***
		(-6.4414)
Controls	Controlled	Controlled
Firm&Year	Controlled	Controlled
N	15761	15761
Adjusted R^2	0.7967	0.2137

5. CONCLUSIONS

Improving the capacity of the financial sector to serve the real economy is key to achieving high-quality development. The continuous integration of emerging information technology and the financial sector has accelerated the construction of a modern financial system and promoted the inclusive development of the financial sector and the real economy. Based on the data of A-share listed companies in Shanghai and Shenzhen from 2011 to 2018, this paper innovatively measures the development level of regional fintech by the number of fintech companies in prefecture-level cities. It studied the impact of regional fintech development on corporate profitability and found that fintech can significantly improve corporate profitability. Mechanism analysis shows that the development of regional fintech can alleviate the degree of information asymmetry between financial institutions and enterprises, and then reduce the financing constraints of enterprises, thus promoting the profitability of enterprises.

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