The Impact of Financial Technology Reform on Corporates' Growth: Evidence from Panel Data Regression

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Abstract—In China, the problem of difficulty in financing restricts the growth of many enterprises and the development of digital finance may have a positive impact on this phenomenon. This paper aims to explore the relationship between the coverage breadth of digital finance and enterprise growth with the model of OLS and panel fixed-effect estimation. After adding control variables, the result indicates that there is a positive correlation between these two variables, that is, an increase in coverage breadth of digital finance can promote the growth of enterprises. Through heterogeneity analysis, we find that digital finance's impact on different scales of enterprises has a significant variance. Compared with large enterprises, the increase in coverage breadth seems to be more conducive to the growth of small and medium-sized enterprises. Finally, our research has a policy implication that with the purpose of continuous enterprise growth, the regulators in the financial sector should provide incentives to increase the coverage breadth of digital finance.

Keywords- Digital Finance, Corporates' growth, Empirical evidence

1 INTRODUCTION

Digital finance generally refers to a new financial business model which uses digital technology to achieve the functions of financing, payment, and investment and it is widely applied by both traditional financial institutions and internet-based financial platforms. In 2004, the establishment of Alipay marked the beginning of digital finance in China [1]. Compared with the traditional financial model, digital financial service has some advantages. The first one is convenience. Based on the internet, people can easily access different kinds of financial services. Then financial institutions can take advantage of big data to analyze the financial situation of users and provide the services according to their demands. This decreases the transaction cost of financial services [2]. In the past, traditional financial institutions such as banks required more human

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capital and land to set up branches. However, with the development of digital finance, this condition has changed. Although some network banks have less than 2,000 employees, they can provide online loan services for more than 10 million enterprises and individuals [3]. This implies that the efficiency of financial services has been increased. The third advantage of digital finance is the broad coverage. This new model breaks through geographical restrictions and provides equal opportunity to all firms, which may benefit the firms in rural areas. Recent research shows that digital finance promotes economic growth in rural areas [4]. Due to these three characteristics of digital finance, its industry has been developing rapidly in China in recent years. Now there are several digital finance companies in China, which are controlled by large internet firms. Until 2019, two dominant firms – WeChat pay and Alipay had over a billion active users separately [5]. It seems that the market of digital finance still has great potential.

Enterprises are faced with many constraints in their growth, such as loan failure, lack of labor force, and lack of profit model. Most enterprises rely entirely on loans to maintain their lives. However, if money is tight and they have low credit ratings, it will lead to loan difficulties for enterprises [6]. Then, enterprises will only face bankruptcy under the premise of a serious lack of money, which is the first dilemma encountered by the development of China's small and medium-sized enterprises. Second, when the company's income is not enough or the profit is too low, the company may choose to reduce the salary. But once the salary is reduced or the salary increase is canceled, some employees will leave. They may think "I work hard for the salary, so what can I do if the salary is reduced or the salary increase is cancelled?" Another reason is that in the 1980s, there were very few people who started businesses, so job seekers had fewer opportunities to choose jobs. Of course, enterprises are good at recruiting. However, there are enterprises all over the country, and job seekers have naturally become a scarce resource. When human resources are scarce, the labor cost of enterprises naturally increases. The increase of labor cost inevitably leads to the increase of survival pressure of enterprises. Speaking of the profit model, most of China's small and medium-sized enterprises are difficult to survive, and the key is the lack of a profit model. In a market economy with seriously homogenous products, the more people there are, the more expenses there will be because the enterprise has no profit model. Therefore, the profit model determines the enterprise's employment demand, and the talent team determines the earning capacity of the enterprise.

Digital finance can boost company growth in general by easing the financing constraints of enterprises. There are two main ways for digital finance to ease the financing constraints of enterprises. Firstly, digital finance can rely on big data and artificial intelligence to obtain more financial resources than traditional financial enterprises which can provide sufficient cash flow for enterprise innovation and enterprise-scale expansion more effectively. Besides, digital finance uses the Internet to reduce the cost of financial services, which can reduce the requirements of financial services and increase the financing channels of enterprises. In this way, the financing constraints of enterprises will be eased to a large extent. Secondly, using big data, digital finance fully collects data resources from banks and credit companies to reduce information asymmetry between enterprises and traditional financial enterprises, which can help financial enterprises better assess risks. In this way, companies have more chances to get as many start-up funds as they can get to conduct business operations. These are the two main ways that digital finance alleviates financing constraints. According to the vast practice, financing constraints are negatively correlated with enterprise growth. Financing is mainly divided into equity financing and debt financing, between which companies tend to choose the latter one as it

is more beneficial in reputation. However, in traditional financial enterprises, the information asymmetry always leads to financing being further constrained, which will restrict the growth of enterprises to a certain degree. In the modern financing mode, digital finance can solve the problem of information asymmetry, which means digital finance can greatly promote the growth of the enterprise [7]. The more advanced digital finance is, the more significant it is in promoting corporate growth.

Against this background above, the research motivation of this paper is mainly that the traditional offline financial enterprise lending business can provide little help to the growth of enterprises, and sometimes even hinder enterprise innovation and expansion of enterprise scale. The research purpose of this paper is to analyze the relationship between digital finance, a new lending model, and enterprise growth. This paper tries to provide some helpful guidance for enterprises to better grow and innovate.

In the following paper, research design including data sources, model specification, variable definition, and descriptive statistics analysis will be introduced firstly, before showing our empirical results. Then this paper will provide the method for testing robustness. The last section will be the conclusion of our research.

2 RESEARCH DESIGN

2.1 Data Sources

One data in this paper is from the Digital Financial Inclusion Index of Peking University from 2011 to 2018. The index includes the digital financial inclusion index, the degree of digitalization of financial inclusion, the coverage and the depth of digital finance. In addition, the use of depth index also includes payment, credit, insurance, credit, investment, money funds, and other business sub-indexes. To scientifically and accurately describe the development situation of digital financial inclusion in China, the Digital Finance Research Center of Peking University and Ant Financial Group established a joint research group, using the massive data of Ant Financial on digital financial inclusion, to compile the Peking University Digital Financial Inclusion Financial Index. The index contains the data from two stages, the first stage ranges from 2011 to 2015 and the second stage ranges from 2016 to 2018. There are three levels for the spatial span of the index: provincial, city, and district/county levels. The time span is based on the first period of 2011 to 2015, and further supplements the data from 2016-2018.

Data of listed companies come from China Stock Market Accounting Research (CSMAR) database. It is a set of authoritative and accurate financial and economic databases. It is a senior professional financial, financial and economic series database designed and developed by Guotai 'an Company for the needs of experts and scholars in institutions of higher learning, financial and securities institutions, and social research institutions for China's financial and economic analysis and research. The research and development concept of CSMAR fully draws on the successful experience of internationally renowned databases such as the University of Chicago CRSP, Standard & Poor's.

Compustat, New York Stock Exchange TAQ, Thomson, GSIOnline, etc., and is carefully designed according to China's national conditions. The database is currently the largest and most accurate financial and economic database in China. It consists of eight series of stocks, funds, bonds, financial derivatives, listed companies, economics, industries, high-frequency data, and personalized data services.

2.2 Model Specification

In this section, this paper provides a linear regression model to estimate the coverage breadth of digital finance's impact on the growth rates of firms. The model is as follows.

$$y = \alpha\ Coverage\ Breadth + X\beta\ + \varepsilon \quad (1)$$

In formula (1), y is the outcome variable, which refers to the growth of firms. Coverage breadth is the core independent variable. X represents the control variables, including some key characteristics of firms.

2.3 Variable Definition

Coverage breadth of digital finance represents the core independent variable in our research. If there is an increase in the coverage breadth of digital finance, more firms might access to financial services they require and maintain growth. To simplify work, we take the digital inclusive finance index as a measure of coverage breadth. This data comes from Peking University Digital Inclusive Finance Index. They calculate the financial index of different regions in China from 2011 to 2018 through the logarithmic power function method. The index contains the effect of 3 aspects, including coverage breadth, depth, and degree of digitization. Our model will mainly focus on coverage breadth. Therefore, only the data of coverage breadth will be used. A higher index implies a greater coverage breadth and vice versa.

Enterprise growth is considered to be a result of high coverage breadth and it is the outcome variable in our model. For those listed companies, the expansion of main business income and market share is revealed by the growth rate of the main business. The firms with a faster expansion speed and a higher market share tend to have higher enterprise growth. Therefore, this paper takes the average growth rate of the main business income of the listed company in the current year and the previous year as the calculation method of the company's growth. In addition, to maintain the same data interval, the enterprise data is selected from 2011 to 2018.

To ensure the accuracy of the results, some basic characteristics of listed companies are taken as control variables. The selected control variables and their definitions are shown in Table 1.

Table 1 Definitions of Control Variables

Control Variable	Definition
Asset	Total assets at fiscal year-end
Debt	Total debts at fiscal year-end
Age	The length of time since corporate has been listed
Top1	The shareholding ratio of the largest shareholder (%)
Stated-owned Enterprise (SOE)=1	SOE=1, otherwise=0
Foreign=1	Foreign-owned enterprise=1，otherwise=0
Board Size	Scale of board of directors
No. of Independent Director	Number of independent directors

Salary	Executive compensation
ROA, %	Net income/ Average total assets

2.4 Descriptive Statistics Analysis

Descriptive statistics are shown in Table 2. As can be seen from the table, the maximum of coverage breadth is 290.3175 and the minimum is -10.49, which implies that the development of digital finance varies greatly. The mean value of enterprise growth is about 45.8733 and the maximum growth rate is 608.1357, showing that many firms are growing significantly. The standard deviation of growth is relatively high, so there might be some firms with the potential to dominate the growth. The standard deviations of assets, debt, and salary are also very high. It seems that there is a huge difference between different firms. In addition, companies in the financial sector may have a relationship with coverage breadth. To eliminate the endogeneity, samples of financial companies are not used in our model.

Table 2 Variables' Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Coverage Breadth	205.007	50.5279	-10.49	290.3175
Growth	45.8733	98.1405	-48.6506	608.1357
Asset, unit: 10000 Yuan	1419389.8	4376147.2	18657.975	45434239
Debt, unit: 10000 Yuan	871662.72	3114354.7	3627.572	33624640
Age	10.273	7.1336	0	25
top1	34.6173	15.0352	.29	89.99
SOE=1	.3837	.4863	0	1
Foreign=1	.0463	.2102	0	1
Board Size	8.6101	1.726	5	15
No. of Independent Director	3.1846	.5689	2	5
Salary, unit: 10000 Yuan	384.9538	366.6258	15.7712	2411.08
ROA, %	3.9384	6.2235	-32.8121	23.4179

Note: The sample of variables are screened according to the following principles: a) Exclude samples of companies in the financial sector; b) Exclude samples of companies that are ST and *ST; c) Exclude samples with missing values of variables; d) Considering the influence of extreme values, the main continuous variables are bilaterally winsorized by 1%.

3 EMPIRICAL RESULTS

3.1 Benchmark regression

The estimated results of the model are shown in Table 3. Among the four columns of results, the results in column (1) contain only the interested variable, and the results in column (2) add firm-level control variables. The results in columns (3) and (4) add time fixed effects and industry fixed effects.

From the estimation results in the first 2 columns, the coverage of digital finance has a positive impact on the growth of enterprises, and the coefficients are significant at the 1% confidence level.

The marginal effects are 0.0937 and 0.0851, respectively. The coefficient in column (3) is not significant, however, the estimation results in this column do not contain control variables.

This paper takes the results in column (4) as the criterion to analyze the coefficients of the variables of interest and the control variables.

It can be found that the marginal effect of the coverage of digital finance is 0.0614. That is, an increase in the coverage of digital finance by 1 unit will lead to an increase of 6.14 percentage points in corporate growth. As far as control variables are concerned, there is no quadratic relationship between firm age and growth. There is a positive relationship between age and growth, and the coefficient is significant at the 1% level. In addition, growth is negatively correlated with total assets and executive compensation and positively correlated with debt and ROA.

Table 3 Benchmark Regression

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
VARIABLES	Growth	Growth	Growth	Growth
Coverage Breadth	0.0937***	0.0851***	-0.0046	0.0614**
	(0.0143)	(0.0149)	(0.0266)	(0.0276)
Age		0.7974*		1.4629***
		(0.4735)		(0.4358)
Age-sq		0.0333*		-0.0291
		(0.0200)		(0.0182)
Ln asset		-20.9198***		-18.6400***
		(2.0894)		(2.0800)
Ln debt		17.4622***		13.1029***
		(1.5640)		(1.5344)
top1		0.0573		0.0175
		(0.0639)		(0.0603)
SOE=1		-6.0937***		1.3077
		(2.3321)		(2.1791)
Foreign=1		-0.8220		-3.0330
		(4.0224)		(3.8339)
Board Size		-3.0840***		-0.4917
		(0.7046)		(0.6607)
No. of Independent Director		3.3186		-0.6047
		(2.0389)		(1.9359)
Ln salary		-2.3450		-7.1275***
		(1.5450)		(1.4561)
ROA, %		0.4219***		0.6558***
		(0.1555)		(0.1471)
Constant	26.6667***	158.8999***	56.8689***	281.4774***
	(3.0466)	(22.5284)	(9.3630)	(23.3424)
Observations	15,646	15,646	15,646	15,646
R-squared	0.0023	0.0253	0.1933	0.2056
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Industry Dummy	No	No	Yes	Yes
Year Dummy	No	No	Yes	Yes

3.2 Heterogeneity Analysis

This paper also aims to study the influences on different enterprises through the method of heterogeneity analysis. Considering the complex influence of various factors, this paper takes the growth of enterprises as the dependent variable and the coverage breadth of digital finance as the independent variable. A dummy variable is introduced here, that is, the dummy is 1 when the quantile of total assets of the enterprise is above 50, otherwise it is 0， which is for small and medium-sized enterprises. It can be seen from the analysis results of the first and second columns that the interaction terms are not significant. However, when dummy variables are added, the interaction items in the third and fourth columns become negative, and the interaction items are significant at the significance level of 10%.

As can be seen from table 4, through the method of heterogeneity analysis, digital finance has a greater impact on small and medium-sized enterprises.

As can be seen from the results of heterogeneity analysis, digital finance contributes more to the growth rate of small and medium-sized enterprises. Small and medium-sized enterprises occupy an important position in the economic development of our country, but there exist certain disadvantages to its development. To meet the demand of development, it is necessary to meet its funding needs. Digital finance helps financial institutions to realize the transformation and upgrading, it also uses the Internet technology to broaden the financing channels. What's more, digital finance can enrich the means of financing, which is more suitable for small and medium-sized enterprise development needs [8]. Of course, based on the positive conclusion that digital finance can help the growth of enterprises, large enterprises should also properly invest in the construction of this field to further develop their advantages.

To give full play to the advantages of digital finance, enterprises should combine digital finance with traditional finance when financing. In this process, enterprise managers take its essence and discard its dregs. In addition, it is also very important to establish a credit investigation platform for small and medium-sized enterprises, which can effectively solve the problem of information asymmetry, reduce investment costs and improve economic efficiency.

Table 4 Heterogeneity Analysis

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
VARIABLES	Growth	Growth	Growth	Growth
Coverage Breadth	0.1134***	0.1102***	0.0066	0.0731**
	(0.0152)	(0.0156)	(0.0277)	(0.0288)
Dummy	-17.9711	-31.0895	33.5639	36.3308*
	(21.7098)	(21.6110)	(20.8382)	(20.8518)
Dummy × Coverage Breadth	0.0276	0.0579	-0.1446*	-0.1384*
	(0.0844)	(0.0837)	(0.0796)	(0.0794)
Constant	23.6253***	135.1561***	55.2445***	280.7750***
	(3.1667)	(23.1277)	(9.3896)	(23.9618)
Observations	15,646	15,646	15,646	15,646

R-squared	0.0032	0.0272	0.1935	0.2057
Data	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Controls	No	Yes	No	Yes
Industry Dummy	No	No	Yes	Yes
Year Dummy	No	No	Yes	Yes

4 ROBUSTNESS TEST

To verify the reliability of the conclusion, the article employing robustness test verification, namely through digital balance panel and FE estimation method to estimate this model. The panel model is constructed with digital finance coverage as the independent variable and enterprise growth as the explained variable [9-10]. As can be seen from the table, digital financial coverage at a significant level of 1% has a significant positive relationship with enterprise growth.

Table 5 Robustness Test

	(1)	(2)	(3)	(4)
	Panel FE	Panel FE	Panel FE	Panel FE
VARIABLES	Growth	Growth	Growth	Growth
Coverage Breadth	0.0522***	0.0203	0.0024***	0.0404***
	(0.0174)	(0.0187)	(0.0006)	(0.0004)
Constant	34.3104***	88.5797**	65.5113***	183.5534***
	(4.0514)	(43.6935)	(15.4719)	(42.8243)
Observations	15,646	15,646	15,646	15,646
Number of id	2,958	2,958	2,958	2,958
Data	Balanced	Balanced	Balanced	Balanced
Controls	No	Yes	No	Yes
Year Dummy	No	No	Yes	Yes

5 CONCLUSION

This paper uses data from Peking University's Digital Financial Inclusion Index from 2011 to 2018 to study the impact of digital financial coverage on enterprise growth. The study found that the average growth rate of the company's main business income and digital finance income, the influence coefficient is positive. It is concluded that the development of digital finance has a positive impact on the growth of enterprises, that is, the coverage of digital finance promotes the growth of enterprises' main business income.

Through the method of heterogeneity analysis, this paper also finds that digital finance has a greater influence on Small and Medium-size enterprises (SMEs), that is, digital finance mainly promotes the development of SMEs.

Nowadays, with the increasingly widespread use of the Internet and the continuous updating of technology, China is indeed in the forefront of the world in the development of digital finance. It can be said that China is far ahead in third-party payments and online loans. Some experts say China has seized an opportunity in a new industry, but many leading experts say China's lead in

digital finance is only temporary. Some business models of science and technology finance in developed countries in Europe and the United States are very advanced. We need to learn more and make use of the influence of digital finance on the growth of enterprises. In the future, we can also study what problems digital finance can solve, or what the future of digital finance will look like.

Finally, there may be some shortcomings in this paper. The data on digital finance in this paper span only 8 years. In the future, we can use longer data collection cycles to conduct more diversified and accurate data analysis to study the impact of digital finance on corporates' growth.

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