Research on Finance Reducing the Cost of Real Businesses

-- Empirical Evidence from Chinese Industrial Firms

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Abstract. In the context of financial development tending to be digital and technological, exploring the relationship between fintech and the cost of real enterprises is significant for the high-quality development of real enterprises. Using provincial panel data from 2011-2020, this study empirically investigates the impact, heterogeneity characteristics and transmission mechanism of fintech on the cost of real enterprises using a two-way fixed effects model. This study demonstrates that fintech significantly lowers the cost of real businesses; in terms of different regions, the impact of fintech development on the cost of real enterprises is more significant in eastern regions than in central and western regions; corporate gearing, innovation capacity, financing constraints and financial regulation are the moderating variables of fintech impact on the cost of real firms. Based on this, suggestions are made in this paper related to the high-quality development of fintech, this is an important study to promote the deep integration of fintech and real businesses and to promote high quality development of the real economy.

Keywords: Fintech; Cost of Real Enterprises; High-quality Development; Deep Integration.

1. Introduction

The real economy provides the foundation for national development and is the basis for the development of China's market economy and the struggle for the initiative of the global competition of the market economy, therefore, a variety of effective measures should be taken to promote the development and growth of real businesses. Chinese real enterprises have shifted to the stage of high-quality development, and cost reduction has been a major issue that cannot be avoided in the complete life cycle of enterprise growth. Therefore, in order to improve the value creation ability of real enterprises, the cost control of real enterprises should be focused. However, at this stage, the overall cost of China's enterprises is high, and some costs have a tendency to rise further. Total industrial costs in China continue to rise, energy and raw material costs remain high, industrial factor costs are generally high, labor costs are generally increasing, investment costs remain high, real estate costs are on the rise, tax costs are generally heavy, institutional transaction expenses remain high, and logistics costs are burdened with high costs[1]. With the advent of the digital economy, more and more scholars are studying the cost control of real enterprises under the effective application of data and information with the help of information technology. It is found that relying on information technology can mitigate the impact of manual computing on cost control, reduce labor costs, and strengthen the awareness of enterprise cost control; enterprises can improve the level of enterprise cost input decisions and effectively reduce cost forecast deviations through modeling and analysis of key economic data information[2]. Therefore, at the current stage, the development of real enterprises and enterprise cost control need to be combined with Internet + digital technology to improve the level of intelligence and thus effectively manage costs[3].

As a development tool that is both innovative and inclusive, fintech, as a new technology that has stimulated the financial market in recent years, provides more possibilities for economic development with its speed, accuracy and low cost[3]. In 2018, China became the world's top market for fintech investments[4]. Various scientific research results have shown that fintech can effectively promote China's economic growth by increasing the accumulation of corporate investment capital and matching long-tail consumption; due to the application of fintech, it has significantly reduced the cost of collecting and transmitting corporate financial information, reduced the difficulty of corporate

financing, brought more financing channels, investment methods, cheaper costs and more efficient services to market players, and alleviated The application of fintech may increase the systemic risk to a certain extent, thus curbing the high-quality development of China's economy[2]. Therefore, it is of great ideological and practical significance to explore the impact and mechanism of FinTech on the development of real enterprises and their cost control for the deep integration and development of FinTech and real economy.

Faced with the continuous promotion of high-quality development of China's real economy, the importance attached to cost control of real enterprises, and the explosive development of fintech, the question that requires great attention is whether the integration of fintech and real firms can effectively lower the cost of real firms? In view of this, this paper analyzes the combination of fintech and real enterprise costs to explore the relationship between fintech and real enterprise costs. This paper selects panel data from 2011-2020 at the provincial level in China to explore whether the use of fintech in China reduces the costs of real enterprises, i.e., whether it reduces the burden of real enterprises. The relationship between the effects of fintech development on real enterprises costs is empirically analyzed, as well as the transmission mechanism to uncover effects of fintech on the cost of real enterprises, and recommendations are made accordingly.

The possible marginal contributions of this paper are: first, this paper focuses on the relationship between effects of fintech on the cost of real enterprises in the research theme, and provides a new entry point for understanding the role played by fintech in the process of high-quality development of real enterprises. Second, through empirical testing, this paper not only examines the direct benefits of fintech on the costs of real enterprises, but also explores the moderating impact of fintech on the cost rate of real enterprises, as well as incorporates heterogeneity into the analysis framework, which helps to comprehensively understand the relationship between fintech and the costs of real enterprises, and enriches the research content of fintech; third, this paper empirically examines the impact of fintech on the costs of real enterprises. The research analysis and conclusions of the article reflect the important role and value of fintech in the process of lowering the cost of real enterprises, and provide useful references for the future formulation of China's fintech policies, vigorous development of fintech, and promotion of the in-depth integration of fintech and companies to reduce the realization of the cost of real enterprises. It is of great reference value to deeply understand the connection between fintech development and the real economy, to help the capital market run smoothly and to promote the high-quality development of the real economy[4].

2. Literature Review and Theoretical Analysis

In the high-quality development stage of the real economy, the root position must be continuously strengthened and strengthened, and the construction and development of modern industrial system must be accelerated. How to enhance the financial industry's support for real enterprises, and with the help of financial technology, with the aim of achieving high-quality development of the real business economy and reduce the cost of real enterprises, has become one of the hot topics that many scholars are more concerned about. Relevant research is mainly reflected in the following three aspects.

2.1 Section Headings

Overall, the integration of finance and enterprise may reduce financing constraints on real firms to some degree, and supplement the necessary capital for the development and operation of the entity, thus promoting the innovative development, enhanced core competitiveness and strength of the real enterprises; but at the same time, it can also allow the enterprises to obtain an excessive rate of return, causing the hollowing out of the industry and thus curbing its development. levine (1997)[5] argues that the financial industry's continuous development and innovation can ease funding constraints and reduce pressure on firms to raise capital., thus promoting the development of enterprises and further enhancing their innovation capacity, and innovation-driven enterprise development; Ducornber and Boateng (2009)[6] argue that when the level of finance is developed, it can bring enough external

funds to enterprises and make it more convenient for investors to obtain investment and financing decision information, to make it easier for businesses to get external funding support, which plays a role in the promotion of business development; Liu Dongdong (2022)[7] also pointed out that the financial services of real enterprises can not only reduce the financing constraints of enterprises and improve the efficiency of capital allocation, but also give enterprises the incentive to innovate, which in turn promotes the enterprise economy to obtain efficient The financial services can not only reduce the financing constraints of enterprises and improve the efficiency of capital allocation, but also bring innovation impetus to enterprises. However, under the condition of financing constraints, the limited resources crowd out the investment of R&D funds, and enterprises need to shift the focus of investment to the financial sector in order to achieve high returns in a short period of time, thus forming a situation of relying on financial channels for profitability, which in the long run reduces the motivation of R&D personnel to innovate and thus hinders the high-quality development of enterprises.

2.2 Relationship between Fintech and Real Enterprise Development

In general, fintech, as a development tool that is both innovative and inclusive, fully combines new technologies such as big data, cloud computing and artificial intelligence, which can improve the information processing ability of real enterprises, effectively optimize and improve the resource allocation of real enterprises, promote active innovation of real enterprises, and thus promote the high-quality development of enterprises. According to Du Jinmin et al. (2021)[8], fintech is rooted and permeated in all aspects of the business development of real enterprises, and fintech has an optimal effect on the resource allocation function of real enterprises, has a significant impact on the development of the main business of real enterprises and can stimulate their innovation power, and can effectively improve the operational efficiency and management capacity of enterprises. The core competitiveness of companies is the ability of R&D and innovation, and fintech stimulates their innovation momentum while effectively improving their competitiveness and promoting their innovative development; Luo Changlang and Ji Xinyu (2015)[9] found that fintech relies on digital technology to enable the interaction of information and data of real enterprises, improve their ability to collect information, reduce barriers to information exchange, and increase their willingness to innovate, thus promote technological innovation and the development of real enterprises.

2.3 Relationship between Fintech and the Cost of Real Enterprises

Overall, fintech has both negative reducing and positive increasing effects on the costs of real enterprises. On the one hand, fintech can reduce the cost of real enterprises. Through the use of digital information technology, fintech can improve the efficiency of enterprises, increase financing channels, and thus reduce the cost of enterprises. It is conducive to relaxing the financing constraints of real enterprises, which in turn reduces the financing costs and innovation costs of real enterprises. Du Jinmin et al. (2021)[8] argue that because modern fintech has the characteristics of overlapping frontier technologies, its financial infrastructure and business models have been innovated, transaction efficiency has been greatly enhanced, and service convenience has been improved, thus reducing the transaction costs of real enterprises and significantly contributing to the healthy growth of real enterprises. Fintech brings efficient financing channels and accurate personalized credit support services, which can effectively reduce the financial costs of enterprises. Luo Changlang and Ji Xinyu (2015)[9] found that FinTech, through the integrated use of digital technology and finance, easily facilitates inter-period transactions between enterprises and low-cost subjects, eases financing constraints, and achieves the effect of lower financing costs for real enterprises and provides incentives for innovation. Shaohua Yin et al. (2023)[10] argued that fintech increases the financing channels for enterprises in the real economy, and finance institutions can effectively lower the cost of businesses by obtaining information about potential customers through big data technology, and screening the actual credit and business status of customers based on the value analysis of the information by cloud computing functions. On the other hand, in some regions due to the external

environment, fintech can be difficult to function and increase the cost of real enterprises to some extent. Chaowei Li et al. (2022)[11] point out that in some regions with imperfect infrastructure, low frequency of financial transactions, fewer financial institutions, and insufficient financial supply, the use of fintech will increase the time cost and financial transaction cost of real enterprises.

3. Empirical Design

3.1 Econometric Model

This paper builds the following econometric model to investigate the impact of fintech on the cost of real enterprises based on the established theoretical as well as empirical research literature.

$$CER_{it} = \beta_0 + \beta_1 X_{it} + \alpha_i + \pi_t + \eta Control_{it} + \varepsilon_{it} \quad (1)$$

Where CER is the cost-to-cost ratio of real enterprises, i denotes province, and t denotes year. x reflects the level of development of inclusive digital finance in each region, including digital inclusive finance index (Index) and segmentation dimension variables: breadth of coverage (Breath), depth of use (Depth), and digitization level (Dig). control is the set of control variables, choosing the level of investment (Inv), environmental regulation (Er), infrastructure development (Ic), technological factors (Te), and economic growth level (Ec) are the control variables. α_i and π_t denotes firm fixed effects and year fixed effects, respectively, and ε_it is a random disturbance term.

To examine the transmission mechanism of fintech on the cost rate of real enterprises, four variables, namely, asset-liability ratio (Al), innovation capability (Ia), financing constraint (Fi), and financial regulation (Fr), are chosen to be introduced on the basis of equation (1) with the cross product term of the explanatory variable X. The model is designed as follows.

$$CER_{it} = \beta_0 + \beta_1 X_{it} + \tau_1 X_{it} * D_{it} + \alpha_i + \pi_t + \eta Control_{it} + \varepsilon_{it} \quad (2)$$

3.2 Variable Definitions

3.2.1 Explanatory Variables

The explanatory variables in this paper are the cost of the entity enterprises above the scale, which is reflected by the cost expense ratio of industrial enterprises above the scale, and the ratio of the main business cost to the main business revenue of the enterprise is taken to measure the cost expense ratio of the enterprise. The cost rate reflects the cost burden of industrial enterprises above the scale, the larger the value, the heavier the cost burden of the entity enterprises.

3.2.2 Core Explanatory Variables

In this paper, financial technology is the central explanatory variable, and the digital financial index (DIGFIN) is used to approximate the development status of financial technology, drawing on the measurement of financial technology by Du Jinmin et al. (2021)[8]. The China Digital Financial Inclusion Index (DIGFIN) for 30 Chinese provinces from 2011 to 2020 (Tibet and Hong Kong, Macao and Taiwan data are not included considering the missing cases) developed by the Digital Finance Research Center of Peking University is used to represent the degree of fintech development in each region. The index uses digital information technology to show the level of China's digital financial development in a number of different directions and comprehensively reflects the overall development trend of integration of finance and information technology. In this context, it is important to construct a digital finance evaluation system. The article further subdivides digital finance in different dimensions, and measures three dimensions of digitalization, such as the breadth of coverage and depth of utilization of digital financial services, respectively. Among them, the breadth of coverage of digital finance is the basis, the realistic application of digital finance is the depth of use, and the degree of digitization can be regarded as a potential condition[12].

3.2.3 Control Variables

With reference to existing studies, the following variables are controlled, specifically: the level of investment (Inv) is proxied by the ratio of investment in fixed assets to GDP, the level of environmental regulation (Er) is measured by the ratio of investment in industrial pollution control to industrial value added, infrastructure development (Ic) is chosen as the ratio of road mileage plus total railroad mileage and to the national territory of each place, representing the traffic density to reflect the infrastructure development, technology (Te) is measured by the natural log of the number of applications for domestic patents received, and economic growth level (Ec) is measured by the natural logarithm of GDP per capita, representing the economic growth development of each province.

3.3 Data

The panel data of 30 Chinese provinces from 2011 to 2020 are selected as the base sample (considering data availability, Tibet and Hong Kong, Macao and Taiwan are not included in the empirical data). The data of industrial enterprises above the scale of main business cost, main business income, investment level, environmental regulation, infrastructure construction, technological factors, economic growth level, asset-liability ratio, innovation capacity, financing constraints, and financial regulation are mainly obtained from China Statistical Yearbook and EPS statistical data platform. We use the Peking University Digital Inclusive Finance Index (2011-2020) published by the Digital Finance Research Center of Peking University to obtain the index for digital finance.

3.4 Descriptive Statistics of Data

The descriptive statistics of the main variables in Table 1 show that the development of financial technology surged during 2011-2020, and the highest mean value of digitalization can be seen from the results of descriptive statistics of sub-indicators, indicating that the level of digitalization has significantly contributed to the improvement of the total index.

Table 1. Descriptive statistics of the main variables

Variable Name	Observations	Mean	Standard Deviation	Minimum Value	Maximum Value
CER	300	83.056	3.320	71.566	89.266
DIGFIN	300	217.246	96.968	18.330	431.928
Breath	300	198.010	96.334	1.960	397.002
Depth	300	212.036	98.106	6.760	488.683
Dig	300	290.238	117.644	7.580	462.228
Inv	300	77.881	25.032	18.725	147.955
Er	300	0.315	0.302	0.009	2.804
Ic	300	9740.711	5176.072	916.240	22227.180
Te	300	101506.000	143628.500	732.000	967204.000
Ec	300	56385.680	27306.500	16413.000	164889.000

4. Analysis of Empirical Results

4.1 Baseline Estimation Results

To test how fintech acts on the cost of real firms, the article uses stepwise regression to observe the digital finance coefficients. The results are shown in Table 2, which reports the estimation results of the benchmark regression model. Column (1) reports the inclusion of only the investment level control variable. Columns (2)-(4) report the regression results after the introduction of environmental regulation, infrastructure development, technology factors, and economic growth level control

variables based on column (1). Among them, in the basic regression using the total digital finance index, the results of the basic regression do not change after introducing the control variables, i.e., the coefficient of digital finance is always significantly negative, indicating the high robustness of the empirical results. The above regression results initially suggest that fintech significantly reduces the costs of real businesses. This may be due to the use of fintech, which efficiently integrates digital technology and financial services, and thus the technological overlay promotes the improvement of transaction efficiency and effectively reduces the transaction costs of enterprises; and the use of fintech increases the funding channels for real businesses, alleviates the financing constraints of enterprises, reduces the financial costs and innovation cost pressure of real enterprises, stimulates the innovation and R&D of enterprises, thus providing impetus for the real enterprises' high-quality development.

Table 2. Baseline regression results for the total sample

	CER(1)	CER(2)	CER(3)	CER(4)
DIGFIN	-0.032*** (-2.666)	-0.032*** (-2.642)	-0.036*** (-2.962)	-0.034** (-2.452)
Inv	0.049*** (6.679)	0.049*** (6.665)	0.056*** (7.245)	0.056*** (7.221)
Er		-0.0587 (-0.139)	-0.172 (-0.410)	-0.182 (-0.430)
Ic			-0.486 (-0.263)	-0.383 (-0.200)
Te			-1.080** (-2.523)	-1.071** (-2.486)
Ec				-0.217 (-0.214)
Time effect	Yes	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes	Yes
Constant term	80.034*** (111.015)	80.044*** (110.216)	94.821*** (6.168)	96.042*** (5.847)
R2	0.329	0.329	0.349	0.349
Obs	300	300	300	300

Note: (1) ***, ***, and * denote 1%, 5%, and 10% significant levels, respectively; (2) Values in parentheses are t-values. Same as below.

4.2 Estimation Results of Sub-dimensions

The results are shown in Table 3. The two dimensions of digital financial usage depth and digitalization have significant negative effects on the cost of real enterprises, while the coverage depth does not pass the significance test. It indicates that the inhibiting effect of fintech on the cost of real businesses is achieved primarily through depth of use and degree of digitisation. The reason may be that the higher the depth of use and the degree of digitization of digital finance, the higher the creditworthiness and convenience, which greatly reduces the threshold of financial services, and enterprises are supported by more digital financial products and services, which improves the efficiency of capital financing, thus reducing transaction costs and financing costs, and thus promoting enterprise High-quality development. However, the inhibiting effect of coverage breadth on the cost of real enterprises is weak, probably due to the limited coverage of digital finance at present, the impact of fintech on SMEs is relatively weak and not obvious enough, resulting in the inhibiting effect of coverage breadth on the cost of real enterprises is not obvious enough.

Table 3. Regression results of digital finance sub-dimensions

	CER(1)	CER(2)	CER(3)
Breath	-0.023 (-1.083)		
Depth		-0.012* (-1.726)	
Dig			-0.011** (-2.176)
Inv	0.055*** (7.060)	0.055*** (7.096)	0.056*** (7.231)
Er	-0.288 (-0.679)	-0.213 (-0.500)	-0.220 (-0.521)
Ic	0.854 (0.456)	-0.065 (-0.034)	-0.215 (-0.112)
Te	-0.924** (-2.119)	-1.041** (-2.403)	-1.140** (-2.613)
Ec	-0.820 (-0.769)	-1.028 (-1.119)	-0.770 (-0.823)
Time effect	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes
Constant term	89.478*** (5.004)	100.681*** (6.037)	100.144*** (6.055)
R2	0.337	0.342	0.346
Obs	300	300	300

4.3 Heterogeneity Analysis

In recent years, China's fintech development has progressed and innovated in an environment where China's fintech infrastructure, investment level, and talent pool have continued to develop and grow. However, due to the differences in the level of economic development between regions in China and the different degrees of infrastructure support between regions, the development of fintech in China also has significant regional heterogeneity[8]. Therefore, it is necessary to dissect the regional differences in fintech development affecting the costs of real enterprises, and in this context, this paper explores regional heterogeneity. Drawing on existing studies on regional partitioning methods, the business genera are divided into eastern, central and western regions to reveal the impact of regional differences in the development of FinTech on the costs of real firms in the region.

According to the results of the tests in columns (1)- (3) of Table 4, the estimated coefficients on digital finance are significantly negative in the East region, while the coefficients of digital finance for real enterprises in the central and western regions are not significant, which indicates that fintech significantly reduces the cost of real enterprises in the eastern region, but has no significant effect on the cost of real enterprises in the central and western regions. Perhaps this is due to the fact that, the eastern coastal region has a better policy and industrial system, such as the economic circle of Guangdong, Hong Kong, Macao and the Greater Bay Area, Yangtze River Delta, Beijing, Tianjin and Hebei, which attracts a large number of financial institutions and brings more financial products and services, while the urgent need for investment by competitive enterprises makes it urgent to further improve the efficiency of financial services and improve the funding system between business entities and financial institutions. The addition of fintech largely solves the situation, thus reducing the financing cost and information cost of real enterprises and promoting the high-quality development of real enterprises; however, because the policies and system construction supporting the development of fintech in the central and western regions are not perfect, and the industry is not sound, the scale effect is not outstanding, so it is difficult to play a driving role in fintech, and because traditional industries in the central and western regions still hold a significant share of the population and do not understand or even reject fintech, the impact on the cost reduction of real enterprises in

the central and western regions is not significant. Moreover, the above findings fully capture the regional heterogeneity in the impact of fintech on the cost of real firms.

Table 4. Heterogeneity test results

	East(1)	Middle(2)	West(3)
DIGFIN	-0.047*** (-2.929)	-0.026 (-0.525)	0.042 (1.061)
Inv	0.026*** (3.199)	0.052*** (3.085)	0.064*** (3.818)
Er	-0.176 (-0.297)	3.798 (1.535)	-0.346 (-0.594)
Ic	-2.359 (-1.032)	-3.800 (-0.947)	-7.459 (-1.656)
Te	-0.0001 (-0.0001)	-2.707*** (-2.913)	-1.646** (-2.092)
Ec	0.124 (0.116)	1.900 (0.544)	-3.760* (-1.934)
Time effect	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes
Constant term	106.695*** (5.170)	120.735*** (2.846)	187.612*** (4.712)
R2	0.575	0.492	0.518
Obs	110	80	110

4.4 Analysis of Moderating Effect

To further examine the moderating effect of fintech on the cost impact of real enterprises, this paper introduces the cross-multiplier terms of corporate gearing, innovation capability, financing constraint, and financial regulation in model (2) for analysis. Among them, our measure of gearing is the ratio of liabilities to assets, we use the ratio of liabilities to assets as a measure of gearing, we measure innovativeness using the natural log of the number of patent applications, the financing constraint is measured using the ratio of various loans (balances) of banking financial institutions to GDP, and the financial regulation is measured using the value of expenditure on financial regulation and other services.

Table 5 reports the regression results of the test of the mechanism of the impact of fintech on the cost of real enterprises, and the results find that there is a significant positive interaction term between digital finance and gearing, indicating that fintech weakly suppresses the cost of real enterprises in enterprises with a high level of indebtedness, probably due to the high level of debt of real enterprises, although they can obtain credit and thus extend their debt through digital finance platforms, both in the long and short term It increases the cost pressure of real enterprises and does not help to change their development status. There is a significant negative interaction term between digital finance and innovation capability, indicating that the cost suppression effect of fintech is more pronounced for firms with strong innovation capability, probably due to their strong innovation capability, which provides a continuous innovation energy for their development, thus improving their cost and increasing their efficiency. The interaction term of digital finance and financing constraints is significantly negative, indicating that fintech can play a better role in suppressing the cost of real enterprises in regions with high level of financial development. This may be due to the fact that regions with high level of financial development have better policy system and infrastructure, better local industrial ecology, and local enterprises are more knowledgeable about fintech, which can make fintech work better and help enterprises alleviate their burden for high-quality development. The interaction term between digital finance and financial regulation is not significant, indicating that the inhibitory effect of fintech on the cost of real enterprises is weakened under government regulation, suggesting that some unreasonable government interventions and other financial regulatory behaviors further distort the impact of fintech on the cost of real enterprises.

Table 5. Results of the test for moderating effects

	CER(1)	CER(2)	CER(3)	CER(4)
DIGFIN	-0.042*** (-3.000)	0.013 (0.758)	-0.024 (-1.609)	-0.033** (-2.334)
DIGFIN* Liability	0.0003*** (2.665)			
DIGFIN* Innovation		-0.003*** (-4.400)		
DIGFIN* Financing constraints			-0.0003* (-1.804)	
DIGFIN* Financial Regulation				0.00003 (-1.499)
Inv	0.056*** (7.391)	0.053*** (7.141)	0.055*** (7.105)	0.055*** (7.198)
Er	-0.196 (-0.468)	0.154 (0.370)	-0.270 (-0.637)	-0.121 (-0.287)
Ic	-1.129 (-0.591)	-2.901 (-1.500)	-0.366 (-0.192)	-0.520 (-0.273)
Te	-1.172*** (-2.743)	-1.157*** (-2.778)	-0.961** (-2.218)	-1.121** (-2.602)
Ec	0.611 (0.582)	0.502 (0.505)	-1.290 (-1.101)	-0.395 (-0.387)
Time effect	Yes	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes	Yes
Constant term	94.519*** (5.819)	110.834*** (6.834)	105.916*** (6.141)	99.571*** (6.014)
R2	0.367	0.395	0.357	0.355
Obs	300	300	300	300

4.5 Robustness Test

In order to ensure the reliability of the benchmark regression results, in this paper we adopt the following methods for conducting robustness tests.

(1) Considering the lag effect, the digital financial index variable is lagged and the total digital financial index with one and two lags is used to replace the current period digital financial index. The reason is that it takes time for policies to have an impact on a country or local economy. The estimation results are presented in columns (1)-(2) of Table 6. The empirical study finds that there is still a significant negative coefficient for digital finance, indicating that there is a significant negative impact of fintech on real business costs.

(2) Instrumental variables approach. To weaken the problem of endogeneity arising from the existence of bias in model estimation, this paper draws on the treatment of Han Pioneer et al. (2019)[12], the instrumental variables are selected to lag the total digital finance index by one period and robustness test is performed, and the two-stage least squares method is used to estimate, and the estimation results are shown in column (3) of Table 6. The test results show that the Cragg-Donald Wald F-value of 180.079 is greater than 10 and the instrumental variables are not underidentified and weak instrumental variables. And the digital finance coefficient is still significantly negative, which means that fintech can still significantly reduce the cost of real enterprises after considering the possible endogeneity of fintech and real enterprise costs. The national digital finance index does not significantly affect the cost-to-cost ratio of real enterprises in a particular province, so the change in

the national digital finance index is relatively exogenous to the cost-to-cost ratio of real enterprises in a particular province, which is largely consistent with the instrumental variable requirement.

Overall, both sets of different robustness tests indicate that the above regression results are reliable and suggest that fintech significantly reduces the cost of real enterprises.

Table 6. Robustness test results

	One-lagged period(1)	Two-lagged period(2)	Instrumental variable method(3)
DIGFIN	-0.041*** (-2.964)	-0.066*** (-4.503)	-0.060** (-2.511)
Inv	0.047*** (6.670)	0.043*** (6.582)	0.050*** (6.854)
Er	-0.185 (-0.479)	-0.279 (-0.767)	-0.221 (-0.592)
Ic	-0.640 (-0.359)	-0.127 (-0.075)	-1.715 (-1.089)
Te	-1.191*** (-2.895)	-1.320*** (-3.233)	-1.182*** (-2.767)
Ec	0.553 (0.605)	1.204 (1.444)	1.644 (1.322)
Time effect	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes
Constant term	92.940*** (5.895)	85.134*** (5.531)	102.457*** (7.016)
Cragg			180.079
R2	0.363	0.439	0.872
Obs	270	240	270

5. Conclusion and Recommendations

5.1 Conclusion

In recent years due to the rapid development of advanced information technology and financial integration empowerment, both emerging fintech companies and technology service providers, as well as traditional financial institutions, are undergoing a profound change[8]. Along with the continuous integration of Internet technology, artificial intelligence and other new generation science and technology in the financial field, financial products and service models are continuously innovated and upgraded, financial services are more convenient and efficient, financial industry integration is further deepened, fintech is continuously promoted and penetrated, breaking through the original traditional application scenarios of real enterprises, and playing an essential role in the high-quality development of China's real economy. Using panel data from 30 Chinese provinces between 2011 and 2020, the article investigates the impact of fintech on the cost of real enterprises and tries to reveal and depict the logical and empirical economic explanation. The main conclusions are obtained as follows.

First, the results of the benchmark regression indicate that fintech has a significant cost-reducing effect on real firms, and the higher the digital finance index, the lower the cost-to-cost ratio of real firms, and this conclusion still holds after considering the endogeneity issue and introducing control variables, and the results are very robust. The results of the regression analysis by dimension show that the cost-reducing effect of fintech on the cost rate of real enterprises is primarily reflected in the depth of use and degree of digitalisation; under the dimension of the breadth of digital finance coverage, the cost reduction effect of real enterprises is not obvious.

Second, the heterogeneity regression results show that effects of fintech on the cost of real enterprises is heterogeneous at the regional level. Fintech significantly reduces the cost of real enterprises in the eastern region, but has a non-significant effect on the cost reduction of real enterprises in the central and western regions.

Finally, The results of the moderating effect test indicate that financial regulation, financing constraints, innovation capacity, and gearing are the moderating variables of the role of fintech on the cost of real enterprises. The effects of the different moderator variables differ somewhat: from the two external factors of financial regulation and financing constraints, external financial regulation distorts the cost-reducing effect of fintech on real enterprises; in regions with low financing constraints, the cost-inhibiting effect of fintech on real enterprises is more significant. From the two internal factors of enterprise innovation ability and asset-liability ratio, fintech has a more significant cost-reducing effect on enterprises with high innovation ability; for enterprises with high asset-liability ratio, fintech will aggravate the burden of enterprises.

5.2 Recommendations

This study aims to reduce the burden of real enterprises, which in turn injects source power for high-quality development. This has important policy implications and meanings in promoting high quality development of the real economy, to promote the development of deep integration between fintech and real-world enterprises, and to promote optimization of the fintech environment. The key revelations of this paper are as follows.

First, accelerate the high-quality development of financial technology. Strengthen the cooperation and exchange between the financial industry and emerging fields such as Internet platforms and artificial intelligence to enhance its comprehensive strength and core competitiveness in the new industry. Improve the application function of digital technology such as big data in the input and output port financial scenarios, and accelerate the change of data-based thinking mode of financial institutions. With the continuous innovation and upgrading of financial products and services model, it is more important to strengthen the support of science and technology. For example, by using new financial technologies such as blockchain to optimize payment and clearing business processes and so on, information storage and value transfer are quickly realized to provide users with efficient financial service experience at low prices[13]. The government should further strengthen the support for fintech and improve the financial system. Further improve the fintech infrastructure. It should also improve and standardize fintech-related regulations as soon as possible to protect investors' rights and interests and maintain financial market stability[14].

Second, promote the deep integration of digital finance and real businesses. Further enhance the effectiveness of fintech services, broaden the depth and breadth of the financial industry, and empower real enterprises. It is necessary to promote the financial digital transformation of traditional Chinese enterprises, further expand the scope of the financial quadrant, and further expand the financial quadrant area toward more refinement to standardization. Take advantage of the innovative advantages of fintech technology providers to achieve technological integration and to enhance resource allocation efficiency, expand the scope of enterprise purchase, production and marketing, risk control and other business application scenarios and functional optimization by implanting core technologies and digital construction[8].

Third, optimize the fintech environment. There is a need to improve the construction of digital infrastructures such as the Internet and information technology, and increase the Internet coverage; at the same time, the basic knowledge of the functions of the financial system and the services of financial institutions must be promoted among relevant practitioners to enhance their initiative in the demand for financial services[15]. It is necessary to improve and perfect the regulation of financial technology, integrate innovative financial services and products, and promote digital transformation. However, the original rule system framework is difficult to effectively identify risks and accurately regulate. The current fintech regulation mainly suffers from low data fragmentation and sharing, lack

of uniform standards and low regulatory efficiency. For this reason, a targeted fintech regulatory system should be built[8].

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