

Digital Finance and Corporate Financial Fraud

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Abstract: This paper examines the impact and mechanism of digital finance on financial fraud by constructing a theoretical framework of digital finance affecting corporate financial fraud. We use panel data of Chinese A-share listed companies from 2011 to 2018. The results that digital finance can significantly inhibit corporate financial fraud and improve the ability of financial institutions to identify financial statements. Thus, the incentive and opportunity for corporations to engage in financial fraud is directly reduced. The internal mechanism shows that digital finance can restrain corporate financial fraud by alleviating the financing constraints faced by enterprises, as well as reducing corporate financial fraud by reducing corporate leverage. These effects will reduce debt pressure, thus easing the motivation of corporate financial fraud. The results of heterogeneity analysis that digital finance has a significant inhibitory effect on financial fraud of enterprises with different scales and different property rights.

Keywords: Digital finance; Digital technology; Financial fraud; Financing constraints; Financial leverage

1.Introduction

In recent years, digital finance has developed rapidly in China. Digital finance promotes financial innovation, forming a financial format with wide coverage, high efficiency and low cost also affects the decision-making behavior of micro-enterprises. Digital finance is the product of the combination of digital technology and finance, and the empowering effect on the real economy can be divided into the contribution of digital technology and the contribution of financial development(Huang and Huang,2018;Hua and Huang, 2021). Most of the existing related research pays more attention to the financial development of digital finance and less attention to the role of digital technology(Kong et al.,2022).

Existing research mostly focuses on innovation, entrepreneurship, and total factor productivity, but the crux of these problems lies in the mismatch of financial supply caused by the relative lag of financial development(Jin et al., 2019;Song et al., 2021; Chen et al.,2021). The inclusiveness of digital finance solves the above problems. The role of digital finance in the dimension of financial development has received special attention in these studies, but the digital technology that digital finance depends has been ignored. This paper discusses the influence mechanism and effect of digital finance on corporate financial fraud from the perspective of internal and external information asymmetry of enterprises, which can directly identify the

important role of digital technology in the process of digital finance empowering the real economy.

The negative consequences of financial fraud can lead to the collapse of the company's stock price put the company in the risk of litigation, and cause investors to suffer huge losses (Palmrose et al., 2004; Firth et al., 2011; Zhou and Kapoor 2011, Kerr and Murthy,2013). Therefore, how to curb corporate financial fraud has been a hot issue of common concern in academia and industry. The causes of financial fraud have been extensively researched and attributed to three factors: motivation, opportunity, and pretext, which is known as "fraud triangle theory". Among the fraud triangle theory, motivation factors include financing demand, growth rate of enterprises, and option incentive in executive compensation(Suyanto,2009; Huang et al.,2017). Opportunity factors mainly involve the corporate governance and internal control level of enterprises including the size of the board of directors and the proportion of independent directors (Kuang and Lee,2017; Xu et al., 2018; Wang et al.,2022). Excuse factors refer to the factors that influence managers' attitude towards financial fraud, such as morality and values of management(Sun et al., 2010; Ho et al., 2015). In essence, the root cause of the repeated occurrence of corporate financial fraud lies in the constraints of technology and cost. external investors and financial institutions lack information on ways to evaluate the business ability and financial situation of enterprises besides financial statements(Cumming et al.,2016; Kuang and Lee,2017). Enterprise managers with information are able to exploit financing, salary, and stock price stabilization through financial fraud(Gam et al.,2021).

Digital finance can effectively relieve financial fraud for two reasons. First, digital financial institutions can use digital technologies such as big data and cloud computing to store and analyze the massive data left by enterprises on the Internet. From these data, digital financial institutions can discover information to replace or support the data of financial statements, which breaks the uniqueness of financial statements in reflecting the business ability and financial situation of enterprises. Reducing the importance of financial statements in credit evaluation models, reduces the motivation and opportunities for enterprise managers to commit financial fraud. Second, the financial innovation brought by digital finance lowers the threshold and service cost of financial services, alleviates the financing constraints faced by enterprises, and reduces the motivation of enterprises to commit financial fraud trying to fulfill financing needs. The reduction of enterprise leverage ratio brought about by easing financing constraints will also alleviate financial fraud to some extent. Unfortunately, the existing related literature has not paid attention to the above logic. This paper takes China's A-share listed companies as the research object, examines the influence mechanism of digital finance on corporate financial fraud, and makes an

empirical test on this mechanism.

The contribution of digital finance to the real economy lies not only in the promotion of inclusive finance and the solution to the financing difficulties of enterprises, but also in the solution to the information asymmetry that is common in economic life driven by digital technology. However, the existing related research rarely separates digital technology from digital finance and separately examines its empowering effect on the real economy. Past studies have been mostly limited to the problems of insufficient financial supply and mismatch caused by the lagging development of the traditional financial system makes extracting the unique effects of digital technology in digital finance difficult. This paper takes corporate financial fraud as the research object, examines the role of digital finance in solving the problem of internal and external information asymmetry of enterprises, and makes an in-depth analysis and empirical test of the influencing mechanism, so as to directly separate the empowering role of digital technology in the real economy and fill the gap in the existing research field of digital finance. The research on the internal mechanism of the influence of digital finance on corporate financial fraud enriches the research fields of the causes and governance of financial fraud.

2. Theoretical analysis and hypothesis

External financing demand is one of the important motivations of financial fraud (Richardson et al., 2003, An and Zhang, 2018). Under the constraints of technology and cost, the credit evaluation model of traditional financial institutions only pays attention to financial information such as the borrower's income, credit record and assets. Therefore, these key information carriers become an important reference for traditional financial institutions, such as banks, to judge whether to provide loans to potential credit recipients. In the process of credit granting, there is information asymmetry between banks and enterprises. Enterprises have information advantages over banks, so enterprises have the motivation and opportunity to commit financial fraud in order to integrate sufficient funds at a lower cost.

The credit evaluation model of digital financial institutions is different from that of traditional financial institutions. Digital financial institutions use digital technologies such as big data, cloud computing, and artificial intelligence to mine the data about personal behavior preferences and transaction records left by borrowers on the Internet. This information is of great commercial value because it constructs an extremely accurate credit evaluation model, greatly reducing the information asymmetry between borrowers and lenders, and effectively controlling credit risks. Digital financial institutions can also use big data technology to analyze the operation data of other enterprises in the same industrial chain as the target enterprise, as well as the behavior data of enterprise managers and employees on the Internet, so as to build

an evaluation model of enterprise performance, and compare it with the evaluation model based on enterprise financial statements. This significantly reduces the degree of information asymmetry inside and outside the enterprise, and greatly improves the ability of digital financial institutions to judge the authenticity of enterprise financial data. In this case, enterprise managers have fewer opportunities for financial fraud.

Digital financial institutions can use digital technology to analyze the massive soft information data of potential borrowers, which can be used to support enterprise financial statements, improving the efficiency of external supervision for enterprise managers and reducing the opportunities for enterprise managers to commit financial fraud. With the support of digital technology, massive soft information data about potential borrowers has become the main basis for building credit evaluation models, and the dependence of digital financial institutions on financial statement data provided by enterprises is decreasing. Therefore, the motivation of enterprise managers to commit financial fraud because of financing needs is weakened. Based on the above analysis, this paper puts forward the following hypotheses.

Hypothesis 1: Digital finance can inhibit corporate financial fraud.

The power of potential financing customers, such as asset size and profitability, is the main basis for traditional financial institutions to judge whether to provide financing for them. Under the constraints of technology and cost, it is difficult for traditional financial institutions to have a more comprehensive and in-depth understanding of enterprises through other channels other than financial statements. As a party with superior information, enterprises have the motivation to improve the financing scale and reduce the financing cost by whitewashing financial data. As time goes by, financial fraud will become known by financial institutions and will trigger adverse selection that will compromise many high-quality enterprises by mistake. The whole financial market will fall into the predicament of financial mismatch, resulting in financing constraints. However, enterprises caught in financing constraints will further whitewash their financial data in anticipation of obtaining financing, thus falling into a vicious circle. While internal and external information asymmetry of firms is the root cause of the financing constraint problem (An et al., 2018), digital finance can alleviate the financing constraint problem by relieving information asymmetry and mitigate financial fraud of firms. With the popularity of online life, the transaction records and daily behaviors of enterprises and individuals will remain on the Internet and generate a huge amount of data. Digital financial institutions can use digital technologies, such as big data and cloud computing, to mine valuable information from these data and use it to assess the credit level of potential financiers. This information improves credit risk management capabilities, provides financing for enterprises that have been excluded from the traditional financial system, and lowers

the threshold of financial services. In short, with the support of digital technology, digital financial institutions can mine more comprehensive corporate information, ease the degree of information asymmetry, reduce the transaction costs in the credit process, expand the coverage of financial services, relieve the financing constraints faced by enterprises, and reduce the motivation of enterprises to commit financial fraud.

Hypothesis 2: Digital finance suppresses corporate financial fraud by alleviating the financing constraints faced by enterprises.

The relationship between debt contracts and corporate financial fraud has long been concerned by scholars (Dechow and Skinner, 2000). When the leverage ratio of enterprises is high, the strict requirements of debt contracts will increase managers' motivation to whitewash financial data. Such companies are often accompanied by a high incidence of financial fraud (Richardson et al., 2003). Digital finance can curb financial fraud by alleviating the high leverage pressure on companies in three ways. First, digital finance can relieve the financing constraints of enterprises, create new enterprises in the expectation of ample funds, increase the credit transactions and capital turnover rate among enterprises, and reduce the leverage ratio across the whole industrial chain. Second, equity crowdfunding in digital finance provides equity financing for enterprises, increases the proportion of owner's equity in the balance sheet, and reduces the leverage ratio of enterprises. Finally, Internet financial management under digital finance has increased the extra income from enterprises' idle funds and reduced the leverage ratio of enterprises. With the reduction of the leverage ratio of enterprises, the pressure of debts carried by enterprises will also be reduced, easing the motivation of financial fraud.

Hypothesis 3: Digital finance suppresses corporate financial fraud by reducing corporate leverage.

3.Method

3.1 Research samples and data sources

This paper takes China's A-share listed companies as the research object from 2011 to 2018. After excluding financial enterprises, enterprises marked as ST and samples with missing related data, a total of 14,321 companies were selected with annual observations. The digital inclusive finance index used to measure the development level of digital finance comes from the Institute of Digital Finance Peking University. Relevant data at the regional level come from China Statistical Yearbook. Enterprise financial data come from CSMAR database. To avoid the influence of extreme values on the empirical results, the relevant data are used on a logarithmic scale.

3.2 Variables

3.2.1 Dependent Variable: Digital finance

The Institute of Digital Finance Peking University, in conjunction with Ant Financial Service Group has collected digital finance data, and since 2011, it has published the "Digital Finance Inclusive Index" every year. The data covers the provincial, municipal and county levels in China, providing reliable data for the research of digital finance in China. The logarithm of the digital financial inclusion index (*dig*) at the municipal level from 2011-2018 is the core measure of digital financial development level. We also adopt the breadth of coverage (*bre*) and depth of use (*dep*) of digital inclusive finance to measure the level of digital finance development and to ensure the robustness of the empirical results.

3.2.2 Key Explanatory Variable: Financial fraud

Irregularities marked as "Fictitious assets", "Fictitious profits", "False statements", "Delayed disclosure" and "Major omissions" in the enterprise violation database are the financial fraud variables, which define the financial fraud indicators (*fdum*) by constructing dummy variables. The *fdum* value is 1 if a company's financial data disclosure behavior has at least one of the above five situations in a certain year, and it is recognized as illegal disclosure by at least one of either the stock exchange, China Banking and Insurance Regulatory Commission, or the Ministry of Finance; otherwise, it is 0.

In addition, we also construct an *fddeg* value according to the punishment level of enterprise's illegal behavior. If a company is not punished for financial fraud in a certain year, the *fddeg* value is 0. If only the executives are punished, but the enterprise is not punished, or the punishment type is "other", the *fddeg* value is 1. If the punishment type is criticism or condemnation, the *fddeg* value is 2. If the type of punishment is warning, fine or confiscation of illegal gains, the *fddeg* value is 3. If a company is punished for various violations in a certain year, the one with the highest degree of punishment shall prevail.

3.2.3 Mediation Variable

This paper involves two mediators: **financing constraints** and **corporate financial leverage**. Although the degree of financing constraints of enterprises cannot be directly obtained, it can be constructed using various data of enterprises. Referring to the practice(White and Wu,2006;Kong et.,2022), the *ww* index measures the degree of financing constraints of enterprises. The larger the index, the greater the financing constraints faced by enterprises. The enterprise asset-liability ratio (*lev*) measures corporate financial leverage.

3.2.4 Controlled variable

Enterprise level calculations include the following variables. Enterprise size (*size*), which is the logarithm of the total assets of the enterprise at the end of the year

plus 1. Return on total assets (*roa*) is the total assets from a database. Book-to-market ratio (*btm*) is the ratio of total assets at year-end to total market value at year-end. Property right nature (*soe*) is the actual controller of the enterprise is the state-owned property right, represented by a value of 1; otherwise, it is 0 for not being a state-owned property right. The shareholding ratio of the largest shareholder (*first*) is the shareholding ratio of the largest shareholder of the enterprise. *dual* is 2 when the chairman and CEO are separate people, the value is 1 if the chairman and CEO are the same person, and the value is 0 for all other cases. Enterprise listing period(*ipo*) is the duration the enterprise has operate. If the selected accounting firm hired by the company is one of the Big Four international accounting firms (*big*), the value is 1; otherwise, it is 0. Regional level calculations include the regional economic development level (*mgdp*), which is measured by the per capita GDP of the city with comparable price (the unit is 10,000 yuan), and the level of regional financial development (*fdindex*).

The descriptive statistical results of the main variables are given in Table 1. Among them, the mean value of *fdum* is 0.134, which means that financial fraud is still common in listed companies in China. The standard deviation of the two indicators measures the financial fraud degree of enterprises and is relatively large. The difference between the standard deviation and the maximum value of the three indicators represents the development level of regional green finance, which demonstrates that the samples selected in this paper are suitable for comparative analysis. In addition, the descriptive statistical results of other variables are within a reasonable range.

Table 1 Descriptive statistical results of major variables

Variable	Sample size	Mean	Std.	Min	Max
<i>fdum</i>	14321	0.134	0.341	0.000	1.000
<i>fdeg</i>	14312	0.226	0.598	0.000	3.000
<i>dig</i>	14321	5.189	0.410	3.103	5.717
<i>bre</i>	14321	5.189	0.399	1.808	5.674
<i>dep</i>	14321	5.170	0.423	2.602	5.789
<i>ww</i>	13713	-0.033	0.040	-0.334	0.437
<i>lev</i>	14321	0.419	0.213	0.035	0.994
<i>size</i>	14321	22.106	1.325	19.033	26.553
<i>roa</i>	14321	0.045	0.062	-0.305	0.269
<i>btm</i>	14321	0.617	0.241	0.089	1.190
<i>soe</i>	14321	0.462	0.499	0.000	1.000
<i>first</i>	14321	35.208	15.029	7.440	80.250
<i>dual</i>	14321	0.282	0.450	0.000	1.000

<i>ipo</i>	14321	9.393	7.178	0.000	28.000
<i>big</i>	14321	0.450	0.498	0.000	1.000
<i>mgdp</i>	14321	1.046	0.869	0.011	3.633
<i>fdindex</i>	14321	3.744	1.682	1.528	8.131

3.3 Models

3.3.1 Basic Models

First, this paper uses model (1) to test hypothesis 1.

$$fraud_{i,j,t} = \beta_0 + \beta_1 dig_{j,t} + \sum \beta_k controls_{i,j,t} + Year_{dum} + Ind_{dum} + \varepsilon_{i,j,t}$$

(1)

Where subscripts i , j , and t represent firms, cities, and years respectively. The variable *fraud* represents financial fraud, and is measured by *fdum* and *fdeg*. The value *dig* is the digital finance development level, which is measured by the total digital inclusive finance index compiled by the Institute of Digital Finance Peking University. If hypothesis 1 holds true, then its regression coefficient $\beta < 0$. The variable *controls* are the set of control variables. The variables *Year_{dum}* and *Ind_{dum}* represent annual fixed effects and industry fixed effects. The variable ε is the random disturbance term.

3.3.2 Mediation Model to Test Hypothesis 2

Second, this paper constructs model (2) and model (3) to test hypothesis 2.

$$ww_{i,j,t} = \beta_0 + \beta_2 dig_{j,t} + \sum \beta_k controls_{i,j,t} + Year_{dum} + Ind_{dum} + \varepsilon_{i,j,t}$$

(2)

$$fraud_{i,j,t} = \beta_0 + \beta_3 dig_{j,t} + \beta_4 ww_{i,j,t} + \sum \beta_k controls_{i,j,t} + Year_{dum} + Ind_{dum} + \varepsilon_{i,j,t}$$

(3)

Model (2) examines the role of digital finance in alleviating corporate financing constraints. If digital finance can ease the financing constraints of enterprises, $\beta_2 < 0$. Model (3) examines the impact of corporate financing constraints on corporate financial fraud. According to the expectation of the theoretical analysis, β_4 should be greater than 0.

3.3.3 Mediation Model to Test Hypothesis 3

Finally, this paper constructs model (4) and model (5) to test hypothesis 3.

$$lev_{i,j,t} = \beta_0 + \beta_5 dig_{j,t} + \sum \beta_k controls_{i,j,t} + Year_{dum} + Ind_{dum} + \varepsilon_{i,j,t}$$

(4)

$$fraud_{i,j,t} = \beta_0 + \beta_6 dig_{j,t} + \beta_7 lev_{i,j,t} + \sum \beta_k controls_{i,j,t} + Year_{dum} + Ind_{dum} + \varepsilon_{i,j,t}$$

(5)

Model (4) examines the impact of digital finance on corporate financial leverage. According to the inference from the theoretical analysis, β_5 should be less than 0. Model (5) examines the impact of corporate financial leverage on corporate financial fraud. If β_7 is greater than 0, a high leverage ratio will aggravate the occurrence of corporate financial fraud.

4. Analysis of regression results

4.1 Basic regression results

Columns (1) and (2) of Table 2 give the basic regression results of digital finance on corporate financial fraud. After controlling other factors that may have an impact on corporate financial fraud, the results show when *fdum* and *fdeg* are taken as the explanatory variables and *dig* is taken as the explanatory variable, the regression coefficients of *dig* are -1.105 and -0.967 respectively, both of which are significant at $P < 0.01$, which indicates digital finance can indeed inhibit the occurrence of corporate financial fraud. The results are consistent with the expectation of hypothesis 1.

Digital finance suppression of corporate financial fraud is explained by three possible reasons. First, the application of digital technology directly inhibits corporate financial fraud by reducing the asymmetry of internal and external information. Digital financial institutions use digital technology to digitize soft and hard information about enterprises other than the financial statements of enterprises. By analyzing digital data, institutions can extract information of great commercial value. Digital financial institutions can know the most accurate financial situations and operating performance of enterprises through other ways than the their financial statements. Digital data weakens the importance of financial statements in the process of financing evaluation, thus reducing the motivation of enterprise managers to commit financial fraud. The analysis of soft and hard information instead of financial statements is helpful for digital financial institutions to identify the authenticity of financial statements provided by enterprises, which is equivalent to perfecting the external supervision environment of enterprise financial information disclosure and reducing the opportunities for enterprise managers to make financial fraud. Second, digital finance reduces the motivation of financial fraud by alleviating the financing constraints of enterprises, thus indirectly alleviating the incidence of financial fraud. Third, by reducing the leverage ratio of enterprises, digital finance reduces the pressure from debt contracts on enterprises and indirectly reduces the motivation of enterprises to commit financial fraud. The mechanism of the influence of digital finance on corporate financial fraud needs to be further examined.

4.2 Robustness test

Using coverage breadth (*bre*) and depth of use (*dep*) of digital inclusive finance

we measured the development level of digital finance and made a new regression estimation. Columns (3)-(6) of Table 2 report the regression results where *bre* and *dep* are used as explanatory variables, respectively. Results show T the regression coefficients of *bre* and *dep* are both significantly negative at $P < 0.01$, indicating the *bre* and *dep* of digital finance inhibit corporate financial fraud. The regression results also show the empirical conclusion of this paper is robust, thus, digital finance can alleviate corporate financial fraud.

Table 2 Regression results of the influence of digital finance on corporate financial fraud

Variable	Basic regression		Robustness test 1		Robustness test 2	
	(1)	(2)	(3)	(4)	(5)	(6)
	<i>fdum</i>	<i>fdeg</i>	<i>fdum</i>	<i>fdeg</i>	<i>fdum</i>	<i>fdeg</i>
<i>dig</i>	-1.105*** (-4.28)	-0.967*** (-4.23)				
<i>bre</i>			-0.700*** (-4.18)	-0.538*** (-3.58)		
<i>dep</i>					-0.875*** (-4.55)	-1.086*** (-6.02)
<i>size</i>	-0.076** (-2.38)	-0.068** (-2.27)	-0.077** (-2.39)	-0.068** (-2.27)	-0.079** (-2.25)	-0.071** (-2.36)
<i>roa</i>	-5.640*** (-11.21)	-6.173*** (-12.93)	-5.646*** (-11.22)	-6.183*** (-12.95)	-5.616*** (-11.67)	-6.133*** (-12.86)
<i>btm</i>	-0.271 (-1.64)	0.083 (0.54)	-0.270 (-1.63)	0.084 (0.55)	-0.262 (0.80)	0.094 (0.61)
<i>soe</i>	-0.531*** (-7.05)	-0.426*** (-6.09)	-0.523*** (-6.96)	-0.416*** (-5.97)	-0.544*** (-6.68)	-0.453*** (-6.43)
<i>first</i>	-0.008*** (-3.99)	-0.009*** (-5.21)	-0.008*** (-4.02)	-0.010*** (-5.23)	-0.009*** (-4.15)	-0.009*** (-5.17)
<i>dual</i>	0.026 (0.45)	0.086 (1.58)	0.026 (0.44)	0.085 (1.57)	0.027 (0.48)	0.088 (1.61)
<i>ipo</i>	0.017*** (3.09)	0.008 (1.54)	0.017*** (3.08)	0.008 (1.53)	0.017*** (3.15)	0.009 (1.63)
<i>big</i>	-0.130** (-2.36)	-0.055 (-1.08)	-0.131** (-2.38)	-0.056 (-1.11)	-0.130** (-2.37)	-0.054 (-1.07)
<i>mgdp</i>	0.096*** (2.73)	0.084*** (2.60)	0.095*** (2.66)	0.074** (2.27)	0.059* (1.84)	0.064** (2.20)
<i>fdindex</i>	0.016 (0.88)	-0.030* (-1.76)	0.011 (0.61)	-0.037** (-2.18)	-0.015 (0.87)	-0.022 (-1.30)
Cons	5.367*** (4.33)		3.727*** (3.92)		5.849*** (5.29)	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Ods	14312	14321	14312	14321	14312	14321

Note: Z values are in brackets, ***, ** and * are significant at 1%, 5% and 10% levels respectively. The following are similar.

4.2 The mechanism of digital finance to restrain corporate financial fraud

4.2.1 Indirect function test based on alleviating financing constraints

Table 3 exhibits regression analysis results of the indirect inhibitory effect of digital finance on corporate financial fraud by alleviating the financing constraints faced by enterprises. The results show when *ww* index is used to measure financing constraints, the regression coefficients of the three indicators used to measure the development level of digital finance are all significantly negative (See columns (1), (4), and (7) of Table 3). Results suggest digital finance can indeed curb the financing constraints faced by companies. The regression coefficients of *ww* on both indicators representing the extent of corporate financial fraud are significantly positive (see columns (2) and (3), (5) and (6), (8) and (9) of Table 3), indicating the problem of financing constraints exacerbates the incidence of corporate financial fraud. Regression results indicate financing constraints are mediating variables for digital finance to inhibit corporate financial fraud. There is an indirect path for digital finance to influence corporate financial fraud based on the alleviation of financing constraints. With the support of digital technology, digital finance, alleviates the problem of internal and external information asymmetry of enterprises and improves the ability of credit risk management. Digital technology breaks through the restriction of physical space and expands the coverage of financial services. This enriches the channels for enterprises to obtain financing, reduces the financing cost, and overall alleviates financing constraint. This can also reduce the motivation of enterprises to engage in financial fraud, and inhibit the occurrence of financial fraud.

Table 3 Indirect effect test based on financing constraints

Variable	Digital Financial			Coverage of Digital Finance			depth of digital finance		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	<i>ww</i>	<i>fdum</i>	<i>fddeg</i>	<i>ww</i>	<i>fdum</i>	<i>fddeg</i>	<i>ww</i>	<i>fdum</i>	<i>fddeg</i>
<i>dig</i>	-0.009*** (-2.85)	-1.088*** (-4.16)	-1.015*** (-4.38)						
<i>bre</i>				-0.003* (-1.71)	-0.689*** (-4.09)	-0.552*** (-3.64)			
<i>dep</i>							-0.009*** (-3.68)	-0.821*** (-4.20)	-1.110*** (-6.05)
<i>ww</i>		3.452*** (3.92)	3.278*** (3.99)		3.494*** (3.96)	3.327*** (4.04)		3.433*** (3.89)	3.219*** (3.92)
Cons	0.081*** (5.62)	5.480*** (4.36)		0.060*** (5.50)	3.857*** (4.02)		0.082*** (6.63)	4.414*** (4.25)	
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ods	13713	13704	13713	13713	13704	13713	13713	13704	13713

4.2.2 Indirect effect test based on reducing corporate leverage level

Table 4 reports the regression results of the indirect effect of digital finance on financial fraud by reducing the financial leverage of enterprises, thus alleviating the pressure of debt contracts. The results show the regression coefficients of the total index of digital financial development and the depth of digital financial use to corporate financial leverage are both significantly negative (see columns (1) and (7) of Table 4). The regression coefficients of digital financial coverage to corporate financial leverage are negative, but not statistically significant (see column (4) of Table 4). This suggests the development of digital finance to some extent can reduce the leverage ratio of enterprises. The leverage ratio of enterprises can promote the incidence and severity of financial fraud (see columns (2) and (3), (5) and (6), (9) and (10) in Table 4). The debt pressure caused by high leverage is one of the causes of financial fraud. The above regression results indicate leverage as a mediating variable for digital finance to inhibit corporate financial fraud. Digital finance can inhibit corporate financial fraud by reducing corporate leverage, which supports hypothesis 3 of this paper. Digital finance alleviates the financing constraints faced by enterprises, creates a relaxed financing environment, reduces the transaction friction between enterprises, and increases the proportion of credit transactions, thus reducing the leverage ratio of enterprises. Internet crowdfunding under digital finance has increased the proportion of equity financing in corporate financing structure, thus reducing the leverage ratio. Internet financial management improves the return on investment of idle funds of enterprises, and also reduces the leverage ratio of enterprises to a certain extent. The reduction of the leverage ratio reduces the debt pressure of enterprises, thus reducing the motivation of financial fraud.

Table 4 Indirect effect test based on enterprise financial leverage

Variable	digital financial			the coverage of digital finance			depth of digital finance		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	<i>lev</i>	<i>fdum</i>	<i>fdeg</i>	<i>lev</i>	<i>fdum</i>	<i>fdeg</i>	<i>lev</i>	<i>fdum</i>	<i>fdeg</i>
<i>dig</i>	-0.041*** (-3.17)	-1.105*** (-4.28)	-0.967*** (-4.23)						
<i>bra</i>				-0.012 (-1.36)	-0.700*** (-4.18)	-0.538*** (-3.58)			
<i>dep</i>							-0.050*** (-4.86)	-0.875*** (-4.55)	-1.086*** (-6.02)
<i>lev</i>		1.116*** (6.34)	0.920*** (5.60)		1.128*** (6.41)	0.932*** (5.67)		1.106*** (6.27)	0.900*** (5.46)
Cons	-1.012*** (-16.50)	5.367*** (4.33)		-1.131*** (-24.04)	3.727*** (3.92)		-0.970*** (-18.14)	4.452*** (4.36)	
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ods	14321	14312	14321	14321	14312	14321	14321	14312	14321

4.3 Heterogeneity Analysis

4.3.1 Heterogeneity analysis based on enterprise scale

This paper divides the samples into large-scale enterprise groups and small-scale enterprise groups according to the whole sample average of enterprise scale, and makes a regression analysis. The regression results are shown in columns (1)-(4) of Table 5. The results show the regression coefficient of *dig* is significantly negative at $P < 0.01$ in small-scale enterprise groups and large-scale enterprise groups, indicating the inhibition effect of digital finance on corporate financial fraud is significant in enterprises of all sizes. Financial fraud suppression by digital technology relied on by digital finance fundamentally solved the problem of information asymmetry and improved the information environment of the financial market.

4.3.2 Heterogeneity analysis based on the nature of enterprise property rights

We divided the samples into private enterprise groups and state-owned enterprise groups according to the nature of enterprise property rights and makes regression analysis respectively. The regression results are shown in columns (5)-(8) of Table 5. The results show the regression coefficient of *dig* is significantly negative in different property right enterprise groups. With the help of digital technology, digital finance solves the problem of information asymmetry, breaks the information monopoly position of enterprise managers, and reduces the opportunities for enterprise managers to commit financial fraud. In this process, both state-owned enterprises and private enterprises benefit.

Table 5 Heterogeneity analysis results

Variable	Small-scale		Large-scale		Private enterprise		State-owned	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>fdum</i>	<i>fddeg</i>	<i>fdum</i>	<i>fddeg</i>	<i>fdum</i>	<i>fddeg</i>	<i>fdum</i>	<i>fddeg</i>
<i>dig</i>	-1.173*** (-3.35)	-1.070*** (-3.50)	-1.052*** (-2.73)	-0.916*** (-2.64)	-1.080*** (-3.18)	-0.848*** (-2.73)	-0.800* (-1.92)	-0.860** (-2.40)
Cons	2.725 (1.25)		9.115*** (4.83)		2.407 (1.45)		6.507*** (3.18)	
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Ods	7226	7236	7053	7085	8269	8273	6006	6048
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5. Conclusions and policy recommendations

Taking China's A-share listed companies from 2011 to 2018 as a sample with the help of the Digital Inclusive Finance Index compiled by the Institute of Digital Finance Peking University, this paper examines the influence mechanism and effect of digital finance on corporate financial fraud. Results found digital finance can restrain the occurrence of corporate financial fraud. Theoretically speaking, fraud inhibition can be separated into three aspects. First, digital finance can collect and process massive data left by enterprises and their managers on the Internet with the help of digital technology. Analysis of data can reduce the degree of internal and external information asymmetry of enterprises, thus weakening the importance of financial statements in the credit evaluation model and identifying the authenticity of financial statements more effectively. This reduces the motivation and opportunity of enterprise managers to commit financial fraud and reduces the incidence of financial fraud. Second, digital finance alleviates the financing constraints faced by enterprises, thus reducing the financial fraud motivation of enterprises facing financing difficulties. Third, digital finance generally reduces the financial leverage of enterprises, alleviates the motivation of financial fraud caused by debt pressure, and thus indirectly inhibits financial fraud.

Based on the above conclusions, digital financial institutions can effectively alleviate the problem of information asymmetry in the financial system with the help of digital technology. This is the core of digital finance and is key to improving the efficiency of financial supply. Therefore, to improve the efficiency of our financial system for serving the economy, traditional financial institutions should introduce digital technology into various businesses of enterprises as soon as possible. From the perspective of corporate governance, the application of digital technology in the financial field actually improves the external governance level of enterprises, thus improving the quality of enterprise accounting information. Digital technology could play an important role in intern governance if applied by enterprise manager and potentially improve corporate governance.

Reference

- Huang, Y., and Z., Huang. (2018). The Development of Digital Finance in China: Present and Future. *China Economic Quarterly*, 17(4),205–218.
- Hua., X. and Y., Huang.(2021).Understanding China's fintech sector: development, impacts and risks. *European Journal of Finance*, 27(5),321-333.
- Song, H., M. Li, and K. Yu.(2021). Big data analytics in digital platforms: How do financial service providers customise supply chain finance. *International Journal of Operations & Production Management*, 41(4), 410-435.
- Chen, H., and S., S. Yoon.(2021). Does Technology innovation in finance alleviate financing constraints and reduce debt-financing costs? evidence from China. *Asia Pacific Business Review* (1),1-26.
- Palmrose, Z. V., Richardson, V. J., and Scholz., S.(2004). Determinants of market reactions to restatement announcements. *Journal of Accounting and Economics*,37(1),59-89.
- Firth, M., Rui, Oliver. M., and Wu, W. F.(2011).Cooking the books: Recipes and costs of falsified financial statements in China. *Journal of Corporate Finance*, 17(2), 371-390.
- Kerr, D. S., and Murthy, U. S.(2013). The importance of the CobiT framework IT processes for effective internal control over financial reporting in organizations: An international survey. *Information & Management*, 50(7),590-597.
- Zhou, W., and Kapoor, G.(2011). Detecting evolutionary financial statement fraud. *Decision Support Systems*, 50(3), 570–575.
- Huang, S. Y., Lin, C. C., and Chiu. A., A.(2017). Fraud detection using fraud triangle risk factors. *Information systems frontiers*, 19(6),1343-1356.
- Suyanto.(2009). Fraudulent Financial Statement: Evidence from Statement on Auditing Standard. *Gadjah Mada International Journal of Business*,11(1),117–144.
- Yu. F. Kuang., and Gladys, Lee.(2017).Corporate fraud and external social connectedness of independent directors. *Journal of Corporate Finance*,45(8),401-427.
- Xu, Y. H., L., Zhang, and Chen., H. H.(2018). Board age and corporate financial fraud: An interactionist view. *Long Range Planning*, 51(6), 815-830.
- Wang, Y., M. Yu., and Gao., S.(2022). Gender diversity and financial statement fraud. *Journal of Accounting and Public Policy*,41,106903.
- Sun, N., Salama, A., Hussainey, K., and Habbash, M.(2010).Corporate environmental disclosure, corporate governance and earnings management. *Managerial Auditing Journal*,25 (7), 679–

700.

- Ho, S.S., Li, A.Y., Tam, K., and Zhang, F.(2015). CEO gender, ethical leadership, and accounting conservatism. *Journal of Business Ethics*,127 (2), 351–370.
- Cumming, D., W., Hou, and E., Lee.(2016). Business Ethics and Finance in Greater China: Synthesis and Future Directions in Sustainability, CSR, and Fraud. *Journal of Business Ethics*,138,601–626.
- Gam, Y., K. Paramita, G., and H., Shin.(2021) .Evasive shareholder meetings and corporate fraud. *Journal of Corporate Finance*,66(01),101807.
- Richardson, S. A., Tuna, I., and Wu, M.(2002). Predicting earnings management: the case of earnings restatements. Unpublished working paper, University of Pennsylvania.
- Dechow, P. M., and Skinner, D.(2000). Earnings Management:Reconciling the Views of Accounting Academics, Practitioners, and Regulators. *Accounting Horizons*, 14(2),235—250.
- An, W., W. Y., Xu, and J. Q., Zhang. (2018). Resource constraints, innovation capability and corporate financial fraud in entrepreneurial firms. *Chinese Management Studies*, 12(1), 2-18.
- White, T., and G. Wu. 2006. Financial constraints risk. *Review of Financial Studies* ,19 (2),531–59.
- Kong, T., R. Sun., and G. L. Sun., and Y., T .Song(2022).Effects of Digital Finance on Green Innovation considering Information Asymmetry: An Empirical Study Based on Chinese Listed Firms. *Emerging Markets Finance and Trade*,online, <https://doi.org/10.1080/1540496X>.
- Jin, W., H. Q. Zhang, and S.S. Liu.(2019).Technological innovation, environmental regulation, and green total factor efficiency of industrial water resources. *Journal of Cleaner Production*, 2(11),61-69.