 doi:10.20944/preprints202203.0331.v1

Article

Digital finance and corporate social responsibility

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Abstract: Based on the data of A-share listed companies in Shanghai and Shenzhen of China from 2011 to 2018 and the digital inclusive finance index of Peking University (2011-2018), this paper empirically tests the impact of digital finance development on corporate social responsibility in various provinces of China and its impact mechanism. The results show that: (1) the development of digital finance helps to promote the fulfillment of corporate social responsibility; (2) the influence mechanism of the development of digital finance to promote the fulfillment of corporate social responsibility lies in that it reduces the cost of debt financing and leads to the improvement of corporate social responsibility.(3) Further research shows that the positive relationship between digital finance and corporate social responsibility is more significant in private enterprises. At the same time, the impact is more significant in areas with poor market environment. The above research shows that the development of digital finance has a significant positive effect, which will improve the level of corporate social responsibility.

Keywords: digital finance; corporate social responsibility; debt financing cost

1. Introduction

Since the 1970s, the issue of corporate social responsibility has been advancing in both theoretical research and corporate practice, and the practice of corporate social responsibility in China has gradually stepped into the stage of standardized development. However, in the process of development, there are still a series of problems when Chinese enterprises fulfill their social responsibility. According to the statistics of ruling global, 800 listed companies have disclosed their social responsibility reports in 2019, but more than half of the reports are due disclosure, and the motivation of voluntary disclosure is weak; According to the "Blue Book of corporate social responsibility" compiled by the Chinese Academy of Social Sciences, the social responsibility development index of China's top 100 state-owned enterprises in 2019 is 54.6 points (full score of 100 points), and that of the top 100 private enterprises is 26 points, both of which have great room for improvement. In the practice of corporate social responsibility, corporate hypocrisy, political rent-seeking and other corporate social responsibility alienation phenomenon is particularly prominent [1]. Therefore, to enhance the willingness of Chinese enterprises to undertake social responsibility is a problem worthy of in-depth study and discussion.

At the same time, in the context of a new round of information technology revolution and industrial upgrading, the Internet and big data began to penetrate into the financial industry, forming a new format of digital finance and becoming a new direction of financial innovation and development. With the help of scientific and technological means, digital finance increases the connection between financial entities, uses big data for data processing, effectively reduces the financial access threshold, widens the content and boundary of financial services, alleviates the information asymmetry, and becomes an effective path to realize inclusive finance. At the micro level, some studies have shown that digital finance reduces the risk assessment cost of small and micro enterprises with the help of big data assessment, improves the investment efficiency of enterprises, makes

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the sustainable development of small and micro enterprises and promotes the innovation of enterprises; however, some studies have shown that there are stronger adverse selection and moral hazard problems in the online lending market [2], so in the face of economic downturn risk, it is very urgent and interesting to study the impact of digital Finance on corporate social responsibility in the context of financial globalization.

Based on this, this paper uses 2011-2018 A-share listed companies in China as samples to empirically test the impact of digital Finance on corporate social responsibility. The "China Digital finance inclusive development index" released by Peking University Digital finance research center is matched with enterprise data. The results show that the development of digital financial inclusion is conducive to corporate social responsibility. Next, we examine the role of corporate debt financing cost as an important mechanism in the impact of digital Finance on corporate social responsibility. This paper finds that the development of digital finance can improve corporate social responsibility by reducing the cost of debt financing. Further research shows that the positive relationship between digital finance and corporate social responsibility is more significant in private enterprises. At the same time, the positive relationship between digital finance and corporate social responsibility is more significant in the weak market environment. Policy makers should pay attention to the development of digital finance to prevent the financial crisis caused by the imbalance of capital structure and capital liquidity[3].

The possible contributions of this paper are mainly reflected in the following aspects: first, this paper uses the "digital finance inclusive index" provided by the digital finance research center of Peking University to explore the impact of digital Finance on corporate social responsibility. It is the first time that digital finance is included in the analysis framework of corporate social responsibility, which deepens the understanding of the factors influencing corporate social responsibility from a macro perspective. Secondly, this paper examines the mechanism of digital finance and corporate social responsibility, and finds that digital finance increases corporate social responsibility score by reducing corporate debt financing cost. Third, it is the first time to examine the impact of digital financial inclusion on corporate social responsibility in different property rights, technological level and institutional environment. The above results provide an important empirical basis for government departments to further develop digital finance[4].

This paper is divided into five parts. The first part is the introduction; the second part is the literature review and research hypothesis; the third part is the research design; the fourth part is the empirical analysis; the fifth part is the conclusion.

2. Literature review and theoretical hypothesis

2.1. Literature review

2.1.1. Research on the development of digital Finance

Digital Inclusive Finance is developed on the basis of traditional finance. In 2006, the concept of Inclusive Finance was introduced into China and began to develop and promote rapidly in various practical fields. Since then, inclusive finance has become an important concept in the development of China's financial industry. In 2016, as the chairman of the group of 20 (G20), China participated in and formulated the G20 high level principles of digital Inclusive Finance to encourage countries around the world to use digital technology to improve the level of financial services. The concept of digital inclusive finance came into being. Digital inclusive finance generally refers to all actions to promote inclusive finance through the use of digital financial services. It uses digital technology to provide a series of formal financial services in a responsible and affordable way for those who cannot obtain financial services. At present, the development of digital inclusive finance mainly has two stages: the first stage is the Internet of traditional financial business, mainly including mobile payment, mobile transfer, online lending and so on. This stage mainly depends on the payment systems of banks, so the coverage of Inclusive Finance is still limited. The second stage is financial service innovation under technology, which mainly relies on Internet technology, such as big data, block chain, cloud computing and so on, to innovate a wider range of financial products or services,

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so as to serve a wider range of people as much as possible, so as to achieve the purpose of financial inclusion.

In recent years, with the rapid development of digital finance in China, the Internet of financial system has significantly reduced the financial transaction cost, improved the efficiency of financial resource allocation and reduced the information asymmetry of the market[5]. On the whole, although there are many literatures on digital finance, people's attention mainly focuses on the impact of digital Finance on macro factors such as economic development and rural finance, the impact of policy regulatory factors, and the impact on bank operation [4,5,6]. The research on the micro impact of digital Finance on enterprises is rare, which mainly focuses on the sustainable development of small and micro enterprises, as well as investment, innovation, entrepreneurship and other factors [7,8,9].

2.1.2. Research on the factors influencing corporate social responsibility

Sheldon (1924) put forward the concept of corporate social responsibility for the first time. Then, the connotation and extension of corporate social responsibility are constantly developing and changing. So far, no consensus has been reached. Through literature review, this paper defines corporate social responsibility as: to increase social welfare purposes, beyond the clear interests of business transactions outside the non-legal enforcement of corporate behavior. In 1972, the declaration of the United Nations Conference on the human environment stressed for the first time that human beings should bear the responsibility and obligation to protect nature. In 1999, UN Secretary General Annan put forward the "global agreement", advocating that enterprises should bear more environmental and social responsibilities[10].

The existing literature on the influencing factors of corporate social responsibility mainly from the individual level, enterprise level and national system level. On the individual level, it mainly includes the influence of management self-confidence, management ability, narcissism of state-owned enterprise chairman, knowledge-based human capital, marital status and family children on corporate social responsibility[11,12,13,14,15]. The influencing factors at the enterprise level mainly focus on different perspectives of property rights structure, pledge of controlling shareholders' equity, institutional shareholding ratio and economic resources[16,17,18,19]. At the level of national system, the information disclosure of corporate social responsibility can be divided into formal system and informal system. Formal system mainly refers to the laws and regulations related to corporate social responsibility information disclosure and the rules and regulations issued by regulatory agencies. Informal system mainly includes customs, cultural traditions, moral norms, public opinion and so on. It is found that the impact of administrative hierarchy distance on Chinese enterprises' environmental behavior presents an inverted U-shaped relationship. The implementation of environmental information disclosure system is helpful for enterprises to fulfill their social responsibilities. And the heavy pollution industry bears more public opinion pressure than the non-heavy pollution industry, and its level of environmental information disclosure is higher.[20,21,22]. Although the existing literature has laid the foundation for this study, there are still the following deficiencies: first, from the micro perspective of enterprises, there are few literatures on the impact of digital Finance on corporate social responsibility; Second, there are few studies on the impact mechanism of digital Finance on corporate social responsibility, especially on the cost of corporate debt financing. This paper attempts to analyze the relationship between digital finance and corporate social responsibility information disclosure under the unique development background of China, in order to better understand the role of digital finance in the process of China's economic development.

2.2. Theoretical analysis and hypothesis

Digital finance generally refers to traditional financial institutions and Internet companies using digital technology to achieve financing, payment investment and other

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new financial business models. Based on cloud computing, big data, block chain, artificial intelligence and other emerging technologies, digital finance breaks through the constraints of traditional finance, transcends the constraints of time and space, expands the coverage of financial services, reduces the cost of financial services, reduces the cost of financial transactions, expands the scope of financial services and provides a huge space for development[23,24]. Digital finance has opened up the cooperation chain between enterprises and financial service institutions. Relying on the industry support and resource accumulation of financial service institutions, it introduces the customer flow and application scenarios of enterprises, which makes the new financial business model have unlimited possibilities.

According to Porter's competitive strategy theory, fulfilling social responsibility is beneficial for enterprises to solve social problems, enhance competitive advantage and realize sustainable development[25]. Porter hypothesis further clarifies that enterprises can not only actively fulfill their social responsibilities, pay attention to people's value and contribute to the environment and society, but also enhance their profitability and earn profits through legal channels. Different from the traditional financial model, digital finance uses big data to evaluate enterprises, and digital economy enterprises represented by Alibaba carry out loan business with credit as the core. Enterprises perform more social responsibilities, and the higher the credit in the society, the easier it is to obtain loans from digital economy enterprises. According to stakeholder theory, corporate social responsibility can create a good social image for the enterprise, thus reducing the cost of capital, obtaining better market evaluation and employee support, and affecting the reputation of the enterprise[26].If the development level of digital finance in a region is high, digital finance can rely on the Internet and big data for data analysis and calculation, break through the geographical restrictions and physical network dependence, and can quickly and reasonably evaluate the reputation and credit of enterprises all over the country. So when enterprises fulfill their social responsibility, they will be more eager to get the attention of the outside world, so they will attach great importance to social responsibility activities, and obtain the recognition and praise of external stakeholders by undertaking social responsibility as much as possible. Especially in the context of the current corporate social responsibility activities in full swing in China, which are widely concerned by the government, the media and the public. According to signaling theory, enterprises can improve their reputation by actively fulfilling their social responsibilities and transmitting positive information with good development trend[27].Empirical studies show that companies that disclose social responsibility information can not only reduce the cost of equity capital, but also enhance the trust of investors in enterprises, and meet the social responsibility preferences of creditors and investors[28,29].Zhai Huayun (2010) studies show that listed companies will actively disclose social responsibility information in order to obtain more financing support[30]. Therefore, this paper proposes hypothesis H1

H1: when other conditions remain unchanged, the development of digital finance helps to promote enterprises to fulfill their social responsibilities.

In recent years, the increasingly saturated market demand leads to overcapacity of enterprises, the rate of return on investment gradually declines, and the financing pressure gradually increases. The development of digital finance eases the financing constraints and significantly reduces the financing cost. With the support of digital technology, finance can make a difference in improving the information asymmetry and reducing the principal-agent cost of enterprises[31], so as to optimize the ownership structure of enterprises and improve the accessibility of information. The debt financing cost of a company is mainly affected by its performance ability, the degree of information asymmetry and the ability to obtain credit resources [32]. Therefore, the development of digital finance can significantly reduce the cost of debt financing. At the same time, in China, the emergence of Internet Financial platforms such as ant financial services, Weizhong bank and Jingdong finance has reduced the threshold of financial services, simplified the access to information, shortened the service distance, and improved the approval speed, thus greatly reducing

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the cost of debt financing. According to the theory of social exchange, society is the result of the exchange of individual actions and behaviours. According to the theory of resource dependence, the demand of enterprises for resources is the key to the survival and development of enterprises. Obtaining key resources constitutes the external dependence of enterprises. Therefore, enterprises will take positive actions to exchange resources. A large number of studies show that corporate social responsibility will significantly reduce the cost of debt financing. Li Wei'an et al. (2015) found that charitable donation can significantly reduce the cost of debt financing[33]; Shi Min et al. (2017) found that social responsibility can effectively reduce the cost of debt financing, achieve mutual benefit and win-win between enterprises and stakeholders, and effectively ease the financing constraints[34]; Cheng et al(2014) found that fulfilling social responsibility can reduce agency costs, which makes enterprises face more smooth financing channels and reduce debt financing costs. With the development of digital finance, the reduction of enterprise financing cost will force enterprises to perform corporate social responsibility more actively to reduce more enterprise debt financing cost[35].

H2: the cost of debt financing plays a mediating role in the positive effect of digital Finance on corporate social responsibility. That is to say, the development of digital finance will reduce the cost of debt financing, and then promote enterprises to fulfill their social responsibilities.

3. Research Design

3.1. Data sources

This paper selects all Shanghai and Shenzhen A-share listed companies from 2011 to 2018 as the initial research sample, and selects Peking University Digital inclusive finance index (2011-2018) to match with enterprise data to test the impact of digital Finance on corporate social responsibility. We have carried on the following screening measures to the sample: (1) excluding the financial and insurance listed companies. (2) Remove the data of enterprises with missing financial data and St enterprises. All data in this paper came from csmar and Wind database, and Winsorize was used to process the continuity variables at the 1% level. After the above processing, annual observations of 18508 companies were obtained. Stata 16.0 software is used to process and analyse the related data.

3.2. Model

In order to verify the research hypothesis, this paper constructs the following model:

$$CSR_{i,t} = \beta_0 + \beta_1 \times \text{Digitalfin}_{j,t} + \beta_2 \times Control_{i,t} + \sum year + \sum IND + \varepsilon_{i,t} \quad (1)$$

$$\text{DCOST}_{i,t} = \beta_0 + \beta_1 \times \text{Digitalfin}_{j,t} + \beta_2 \times Control_{i,t} + \sum year + \sum IND + \varepsilon_{i,t} \quad (2)$$

$$\text{CSR}_{i,t} = \beta_0 + \beta_1 \times \text{Digitalfin}_{j,t} + \beta_2 \times DCOST_{i,t} + \beta_3 \times Control_{i,t} + \sum year + \sum IND + \varepsilon_{i,t} \quad (3)$$

In the above model, represents the industry, represents the year, and represents the random disturbance. If in model (1), it means that digital finance will promote corporate social responsibility. According to the research hypothesis 1, is expected to be significantly positive.Models (2) and (3) are used to test hypothesis 2 in this paper. In formula (3),is expected to be significantly positive, is expected to be significantly negative.

Corporate social responsibility. Based on the research method of Li Lanyun et al. (2019), this paper selects the total score of 2011-2018 corporate social responsibility rating released by hexun.com to measure the performance level of corporate social responsibility. Its advantages are as follows: first, the score covers five first level indicators, 13 second level indicators and 37 third level indicators, including shareholder responsibility, employee responsibility, supplier, customer and consumer rights and interest responsibility, environmental responsibility and social responsibility. It is scientific and comprehensive, and has been recognized by scholars. It has become the main indicator to measure corporate social responsibility in China [36,37,38]. It is scientific and comprehensive, and has been

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recognized by scholars. It has become the main indicator to measure corporate social responsibility in China [38,39,40]. Second, compared with the data provided by Rankins CSR Ratings, Hexun evaluated the social responsibility level of all listed companies, and the sample coverage is wide, which can effectively avoid the selective error of the sample. The higher the total score of corporate social responsibility rating, the higher the level of corporate social responsibility, and the higher the enthusiasm of corporate social responsibility.

Digital finance. This paper uses the digital fin index of Peking University and its sub dimension index coverage（Digitalfincov）and use depth (Digitalfindep) to reflect the development level of digital Inclusive Finance in each province. The index focuses on measuring the development of digital Inclusive Finance from the perspective of innovative digital finance, and depicts the development level of digital Inclusive Finance in different provinces, cities and counties around the coverage and use depth of digital finance. At the same time, referring to the existing studies[7], this paper divides the digital inclusive finance index by 100 to solve the problem that the index value is relatively large.

The cost of debt financing. Based on the research of Yao Lijie (2018) and Zhao Qing (2020), this paper measures the cost of debt financing by dividing the sum of the company's interest expenses plus handling charges and other financial expenses by the company's total liabilities[38,39].

The scalar control refers to the existing literature[7], and the specific variable definition and calculation are shown in Table 1.

Table 1. Variable definition table

Variable type	Variable definition	Variable symbol	Variable definition
Explained variable	Corporate social responsibility score	CSR	The corporate social responsibility rating issued by Hexun always gets the natural logarithm
Explanatory variable	Digital financial index	Digitalfin	"China Digital finance inclusive development index" released by Peking University Digital Finance Research Center
Mediating variables	Cost of debt financing	Dcost	(interest expense + financial expense + service charge) / total liabilities
control variable	Enterprise scale	Size	Natural logarithm of total assets at the end of the period

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	financial leverage	Lev	Total liabilities / total assets
	Growth rate of operating revenue	Growth	(current year operating revenue - previous year operating revenue) / previous year operating revenue
	Return on total assets	ROA	Net profit / average total assets
	Ownership concentration	Top1	Shareholding ratio of the largest shareholder
	Board size	Board	Natural logarithm of the number of directors
	Proportion of independent directors	Indep	Number of independent directors / board of directors
	Operating net cash flow	CFO	Annual net operating cash flow of the company / total assets at the end of the period
	Nature of property rights	Soe	The value of state-owned enterprises is 1, and that of non-state-owned enterprises is 0
	year	Year	Fixed effect of control year
	industry	Ind	Controlling fixed effect of industry

4. Empirical Analysis

4.1. Descriptive Statistics

Table 2 reports the descriptive statistical results of the main variables involved. Among them, the average value of corporate social responsibility (CSR) is 3.072, the maximum value is 4.323, and the minimum value is 0. 231.It shows that there are great differences and heterogeneity in the level of social responsibility performance among enterprises, and the level of social responsibility performance of Chinese enterprises needs to be improved. The average value of Digital financial(Digitalfin) is 2.192, the maximum value is 3.777, and the

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minimum value is 0. 284.It shows that there is a big gap in the development level of digital finance between different provinces in China, and the digital financial environment of different enterprises is different. The average value of debt financing cost (Dcost) is 0.005, the maximum value is as high as 0.067, and the minimum value is -0.216, which indicates that there is a great difference in debt financing cost among listed companies, and some listed companies do not have debt financing cost. In terms of control variables, there are great differences in enterprise size(Size) and financial leverage(LEV). It shows that the control variables have significant influence on the explained variables, and basically conform to the characteristics of normal distribution.

Table 2. Descriptive Statistics

Variable	N	mean	p25	p50	p75	sd	min	max
CSR	18508	3.072	2.841	3.114	3.345	0.681	0.231	4.323
Digitalfin	18508	2.192	1.598	2.288	2.840	0.865	0.284	3.777
Dcost	18508	0.0050	-0.004	0.0120	0.0270	0.0410	-0.216	0.0670
SIZE	18508	22.16	21.23	21.99	22.90	1.294	19.60	26.06
LEV	18508	0.423	0.253	0.415	0.582	0.209	0.0490	0.915
Growth	18508	0.208	-0.003	0.120	0.284	0.479	-0.561	3.273
roa	18508	0.0470	0.0170	0.0400	0.0710	0.0510	-0.183	0.224
Board	18508	2.138	1.946	2.197	2.197	0.198	1.609	2.708
Indep	18508	0.375	0.333	0.333	0.429	0.0530	0.333	0.571
CFO	18508	0.0430	0.0050	0.0430	0.0840	0.0690	-0.167	0.239

4.2. Correlation Analysis

Table 3 reports the person correlation coefficients between the explained variables and other variables. The correlation coefficient between any variables is less than 0.8, which indicates that the multicollinearity between variables is not serious and can be regressed by multiple linear regression.

Table 3. Correlation Analysis

	CSR	*Digitalfin*	*Dcost*	*SIZE*	*LEV*	*GROWTH*	*Roa*	*Board*	*Indep*	*CFO*
CSR	1									
Digitalfin	-0.099***	1								
Dcost	-0.123***	0.052***	1							
SIZE	0.244***	0.117***	0.261***	1						
LEV	-0.073***	-0.067***	0.507***	0.525***	1					
GROWTH	0.064***	0.0110	0.026***	0.028***	0.046***	1				
Roa	0.500***	0.026***	-0.239***	-0.059***	-0.377***	0.180***	1			
Board	0.098***	-0.121***	0.089***	0.263***	0.151***	-0.033***	-0.014*	1		
Indep	-0.015**	0.054***	-0.024***	0.014*	-0.00200	0.00100	-0.020***	-0.531***	1	
CFO	0.199***	0.053***	-0.039***	0.055***	-0.146***	-0.022***	0.381***	0.053***	-0.019***	1

Note: The values in parentheses are t-values; ***, ** and * indicate significance at levels of 0.01, 0.05 and 0.1, respectively.

4.3. Regression Analysis

This paper uses stata16.0 software to test the panel data of China's A-share listed companies from 2011 to 2018. Before constructing the econometric model, further tests

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show that the VIf value is less than 10, which shows that there is no multicollinearity between variables. The regression results are shown in Table 4.

Table 4 reports the regression results of digital finance and corporate social responsibility. The first table shows that the regression coefficient of digital finance(Digitalfin) is positively correlated with corporate social responsibility (CSR) at the significance level of 1%, indicating that the higher the development level of digital finance, the higher the corporate social responsibility. The hypothesis H1 is verified. The main reasons are as follows: (1) with the help of emerging technologies such as big data, digital finance improves the ability of risk screening, so that financial institutions can effectively identify, analyze and tap the social reputation of enterprises, so as to promote the flow of financial resources to enterprises with high corporate social responsibility and good reputation. The development of digital finance forces enterprises to fulfill more social responsibility. (2) As a kind of financial infrastructure, the development of institutional environment can also promote the fulfillment of corporate social responsibility.

Table 4. Digital finance and corporate social responsibility

	(1)
VARIABLES	*CSR*
Digitalfin	0.097***
	(6.87)
SIZE	0.165***
	(11.37)
LEV	-0.299***
	(-7.36)
Growth	-0.043***
	(-4.36)
Roa	6.725***
	(28.87)
Board	0.052*
	(1.76)
Indep	0.053
	(0.49)
CFO	-0.081
	(-0.94)
Constant	-0.946***
	(-2.80)
Observations	18,508
R-squared	0.394
Pseudo R2	0.393

Note: The values in parentheses are t-values; ***, ** and * indicate significance at levels of 0.01, 0.05 and 0.1, respectively.

Table 5 reports the mediating effect of digital Finance on corporate social responsibility. The first column explores the impact of digital Finance(Digitalfin) on corporate social responsibility (CSR). The regression coefficient is 0.097, which is significant at the 1% confidence level, indicating that the development of digital finance will lead to the increase of corporate social responsibility. Hypothesis 1 is also verified.

 doi:10.20944/preprints202203.0331.v1

The second column explores the impact of digital Finance(Digitalfin) on the cost of debt financing (Dcost). From the second column, we can see that the regression coefficient of digital finance is -0.003, which is negatively correlated with the cost of debt financing at the significance level of 1%, indicating that the development of digital finance will lead to the reduction of the cost of debt financing. It shows that the development of digital finance can alleviate the financing cost of enterprises and the problem of financing difficulty and expensive.

The third column explores the impact of digital finance, debt financing cost and corporate social responsibility(CSR).The regression coefficients of digital finance(Digitalfin) and debt financing (Dcost)are 0.096 and -0.489 respectively, which are significantly related to corporate social responsibility (CSR) at the level of 1%.It shows that the decrease of Dcost will also lead to the increase of CSR.

From the test results of the above three columns, it can be seen that with the development of digital finance, the debt financing cost of enterprises has also decreased, and the financing cost of enterprises has decreased, which will encourage enterprises to undertake social responsibility. Based on the practice of Wen Zhongli and Zhang Lei (2004), this paper tests the mediating effect of debt financing cost. The regression results in the first column show that there is a significant correlation between digital finance(Digitalfin) and corporate social responsibility (CSR), which is consistent with the first step hypothesis of the mediating effect causality test; the regression results in the second column show that there is a significant correlation between digital finance(Digitalfin) and debt financing cost (Dcost), which is consistent with the second step hypothesis of the mediating effect causality test; the regression results in the second column show that there is a significant correlation between digital finance(Digitalfin) and debt financing cost (Dcost)The regression results of the three columns show that the regression coefficients of Digitalfin and Dcost are 0.096 and -0.489 respectively, which are significant at 1% confidence level. This shows that the cost of debt financing plays a part of mediating role in the process of the impact of digital Finance on corporate social responsibility. Therefore, hypothesis H2 is valid.

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Table 5. The mediating effect of digital Finance on corporate social responsibility

	(1)	(2)	(3)
VARIABLES	*CSR*	*Dcost1*	*CSR*
Digitalfin	0.097***	-0.003***	0.096***
	(6.87)	(-3.18)	(6.74)
Dcost			-0.489***
			(-3.34)
SIZE	0.165***	-0.001***	0.165***
	(11.37)	(-2.92)	(11.38)
LEV	-0.299***	0.107***	-0.247***
	(-7.36)	(12.88)	(-5.10)
Growth	-0.043***	0.001**	-0.042***
	(-4.36)	(2.52)	(-4.34)
Roa	6.725***	-0.049***	6.702***
	(28.87)	(-6.71)	(29.22)
Board	0.052*	0.000	0.052*
	(1.76)	(0.14)	(1.74)
Indep	0.053	-0.013***	0.046
	(0.49)	(-3.34)	(0.42)
CFO	-0.081	0.013***	-0.075
	(-0.94)	(2.83)	(-0.87)
Constant	-0.946***	-0.004	-0.948***
	(-2.80)	(-0.50)	(-2.81)
Observations	18,508	18,508	18,508
R-squared	0.394	0.318	0.394
Pseudo R2	0.393	0.317	0.393

Note: The values in parentheses are t-values; ***, ** and * indicate significance at levels of 0.01, 0.05 and 0.1, respectively.

4.4. Robustness Test

In order to improve the credibility of this study and test the robustness of the research conclusions, this paper uses other measurement methods of digital finance and controls the development level of marketization to test the robustness, and uses dynamic GMM method and instrumental variable method to test the endogenous. The results are consistent with the main conclusions of this paper.

4.4.1. Robustness test

In order to further ensure the robustness and correctness of the core content of this study, this study reconstructs the digital financial indicators. According to the "inclusive financial index of digital finance" of Peking University, this paper uses its sub dimensions of digital finance coverage (Digitalfincov) and digital finance usage depth (Digitalfindep) to replace the inclusive financial index of digital finance, and carries on the regression test again. Columns (1) and (2) of table 6 report the research results. It is found that both breadth and depth indicators of digital finance have a positive impact on corporate social responsibility, and the impact is significant at the 1% level, which is similar to the previous

 doi:10.20944/preprints202203.0331.v1

research conclusion. Therefore, after the dimensionality reduction and decomposition of the core explanatory variables, the relevant core conclusions remain robust.

At the same time, this paper considers controlling the level of market-oriented development, which often affects the channels for enterprises to obtain external financing. In areas with relatively perfect financial development, it may be more convenient for enterprises to obtain financing, which may affect the promotion effect of digital financial inclusion on the level of corporate social responsibility. Based on this, this paper uses Fan Gang's marketization index to measure the development level of marketization. According to the median, the development level of marketization is regarded as dummy variable (dumf). If the level of marketization (dumf) is higher than the median, take 1; otherwise, take 0, and conduct regression test again. The results in column (3) of table 6 show that after controlling the impact of Regional Marketization, the impact of digital financial inclusion on corporate social responsibility still has a significant role in *promoting.*

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Table 6. Robustness test

	(1)	(2)	(3)
VARIABLES	*CSR*	*CSR*	*CSR*
Digitalfincov	0.090***		
	(7.05)		
Digitalfindep		0.055***	
		(4.95)	
Digitalfin			0.097***
			(6.87)
SIZE	0.165***	0.166***	0.165***
	(11.36)	(11.35)	(11.40)
LEV	-0.297***	-0.305***	-0.299***
	(-7.28)	(-7.48)	(-7.35)
Growth	-0.043***	-0.043***	-0.043***
	(-4.39)	(-4.37)	(-4.37)
Roa	6.724***	6.728***	6.738***
	(28.85)	(28.86)	(28.88)
Board	0.052*	0.050*	0.052*
	(1.77)	(1.73)	(1.76)
Indep	0.050	0.055	0.055
	(0.46)	(0.51)	(0.50)
CFO	-0.078	-0.085	-0.089
	(-0.90)	(-0.99)	(-1.05)
dumf			1.805***
			(26.92)
Constant	-0.929***	-0.946***	-2.750***
	(-2.75)	(-2.81)	(-9.32)
Observations	18,508	18,508	18,508
R-squared	0.394	0.393	0.394
Pseudo R2	0.393	0.392	0.393

Note: The values in parentheses are t-values; ***, ** and * indicate significance at levels of 0.01, 0.05 and 0.1, respectively.

4.4.1.Endogeneity test

In order to avoid the endogenous problems caused by missing variables or measurement errors of digital finance, this paper uses the research method of Zhang youtang (2020) for reference, uses the proportion of higher education in the total number of Chinese provinces (edu) as the instrumental variable, and uses 2SLS (two stages) for regression analysis. On the one hand, the higher the proportion of higher education in the total number of people, the better the effect of using digital finance[7];On the other hand, the proportion of higher education in the total number has little impact on corporate social responsibility. The results of column (1) and column (2) in Table 7 show that the regression coefficient of the proportion of higher education in the total number (EDU) is significantly positive, which meets the basic requirements of instrumental variables. Furthermore, the second stage regression results of column (2) show that the coefficient of digital finance is

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0.117, which is significantly positive at the level of 1%, indicating that digital finance significantly improves corporate social responsibility, which is completely consistent with the previous results.

Table 7. Endogeneity test

	2sls	
VARIABLES	(1)	(2)
Digitalfin1		0.117***
		(5.23)
IV(edu)	1.953***	
	(131.63)	
SIZE	-0.009***	0.172***
	(-6.56)	(44.01)
LEV	-0.036***	-0.191***
	(-4.17)	(-7.61)
Growth	-0.004	-0.042***
	(-1.21)	(-4.89)
Roa	0.282***	6.831***
	(8.79)	(72.16)
Board	-0.068***	0.043*
	(-7.86)	(1.68)
Indep	-0.136***	0.057
	(-4.48)	(0.64)
CFO	0.001	-0.181***
	(0.04)	(-2.87)
Constant	0.700***	-1.008***
	(21.60)	(-10.54)
Observations	18,508	18,508
R-squared	0.955	0.375
Pseudo R2	0.955	0.374

Note: The values in parentheses are t-values; ***, ** and * indicate significance at levels of 0.01, 0.05 and 0.1, respectively.

5. Further Analysis

5.1. Nature of property rights

First, we examine the impact of digital Finance on corporate social responsibility in state-owned enterprises and non-state-owned enterprises. The system background of our country determines that the analysis of state-owned enterprises and non-state-owned enterprises is very important. In theory, because of the government background, the financial system is dominated by the government, the state-owned enterprises and the state-owned banks have a natural political connection, and have obvious advantages in obtaining credit resources. The state-owned enterprises have more opportunities to obtain credit preferences and long-term loans, so the development of digital finance may have less impact on the state-owned enterprises. Therefore, compared with private enterprises, the development of digital finance may have less impact on state-owned enterprises, so the

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motivation of increasing social responsibility of state-owned enterprises may be weak, so the impact of digital Finance on corporate social responsibility may be more significant in private enterprises. Columns (1) and (2) of table 8 report the differences in the impact of digital Finance on corporate social responsibility between state-owned enterprises and non-state-owned enterprises. It can be seen that digital finance is significant at the level of 1% in private enterprises, which indicates that private enterprises are more eager to provide funds for digital finance and will enhance the level of corporate social responsibility in order to obtain the support of digital finance. However, it is significant at the level of 5% in state-owned enterprises, which indicates that the impact of digital Finance on corporate social responsibility of state-owned enterprises is not as great as that of private enterprises.

5.2. Market environment

Finally, we investigate the impact of digital Finance on corporate social responsibility in different market-oriented environments. The more market-oriented environment in a region tends to be market-oriented, the higher the market-oriented index, the more stable the society in the region. The region is more closely linked with the national and even global trade, credit and capital markets, so the bank's credit level and policy are more perfect. Digital finance affects the level of corporate social responsibility by expanding the financial coverage and depth of use. Then the areas that formal financial institutions failed to reach in the past can enjoy the services of modern financial system through digital finance. Therefore, the development of digital finance is a kind of "carbon in the snow" behavior, and the impact of digital Finance on the level of corporate social responsibility is more and more significant. The areas with good market-oriented environment are basically located in developed areas. Traditional financial institutions have many outlets, and the financial infrastructure is perfect, the role of digital finance may not be so prominent, so the development of digital finance is a kind of behavior of "icing on the cake". Therefore, this paper expects that the impact of digital Finance on corporate social responsibility may be more significant in areas with weak market environment.

The institutional environment of this paper is measured by the marketization index compiled by Fan Gang. If it is higher than the median, it is the area with better marketization environment. If it is lower than the median, it is the area with weaker marketization environment. Columns (3) and (4) of table 8 report the differences in the impact of digital Finance on corporate social responsibility between enterprises with good and weak market environment. It can be seen that digital finance is significant at the level of 1% when the market environment is weak, but it is not significant in the areas with good market environment, which indicates that in the areas with weak market environment, the development of digital finance will promote the improvement of corporate social responsibility level, and it has a stronger power to obtain cash by disclosing corporate social responsibility and reducing information asymmetry Modern financial system provides more credit support and fulfills related social responsibilities.

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Table 8. Sub sample regression

VARIABLES	(1) private enterprise	(2) state-owned enterprise	(3) Good market environment	(4) Weak market environment
Digitalfin1	0.095***	0.082**	0.037	0.168***
	(3.41)	(4.26)	(0.98)	(5.92)
SIZE	0.171***	0.147***	0.160***	0.169***
	(25.14)	(27.99)	(27.69)	(30.43)
LEV	-0.395***	-0.252***	-0.178***	-0.383***
	(-8.29)	(-8.37)	(-4.84)	(-10.59)
Growth	-0.022	-0.045***	-0.072***	-0.025**
	(-1.40)	(-4.68)	(-5.61)	(-2.18)
Roa	7.273***	6.472***	6.631***	6.773***
	(39.52)	(61.66)	(49.87)	(51.27)
Board	0.041	0.025	-0.045	0.121***
	(0.99)	(0.77)	(-1.19)	(3.56)
Indep	0.022	0.006	-0.200	0.257**
	(0.15)	(0.05)	(-1.57)	(2.11)
CFO	-0.250**	-0.017	-0.189**	0.028
	(-2.14)	(-0.23)	(-2.10)	(0.31)
Constant	-1.159***	-0.388***	-0.588***	-1.253***
	(-7.07)	(-2.74)	(-3.67)	(-9.04)
Observations	7,137	11,371	8,417	10,091
R-squared	0.398	0.404	0.392	0.397
Pseudo R2	0.395	0.402	0.390	0.395

Note: The values in parentheses are t-values; ***, ** and * indicate significance at levels of 0.01, 0.05 and 0.1, respectively.

6. Conclusions

In the context of China's high-quality economic development, it is of great practical significance to investigate the impact of China's digital financial development on corporate social responsibility. This paper explores the influence mechanism of digital Finance on corporate social responsibility. Taking the cost of debt financing as the intermediary variable, this paper constructs the logical relationship of "digital Finance - cost of debt financing - corporate social responsibility", and explores how digital finance affects corporate social responsibility based on the data of A-share listed companies from 2011 to 2018 and the "China Digital finance universal development index (2011-2018)" released by the digital finance research center of Peking University. The conclusions are as follows: (1) the development of digital finance significantly promotes the performance level of corporate social responsibility, which indicates that the development of digital finance will encourage enterprises to perform social responsibility more actively. (2) The cost of debt financing plays an intermediary role between digital finance and corporate social respon-

 doi:10.20944/preprints202203.0331.v1

sibility. That is to say, digital finance improves the performance of corporate social responsibility by reducing the cost of debt financing. It shows that the development of digital finance reduces the debt financing cost of enterprises, and in order to obtain more reduction of financing cost and better reputation, enterprises are more active in fulfilling their social responsibilities.(3) Through further research, this paper finds that the positive relationship between digital finance and corporate social responsibility is more significant in private enterprises, indicating that they are faced with more serious financing constraints, and they are more motivated to actively fulfill their social responsibility. The development of digital finance has a more significant impact on their social responsibility. In the regions with different marketization levels, the impact of digital Finance on corporate social responsibility is more obvious in the regions with weak marketization level, which indicates that corporate financing is more difficult in the regions with weak marketization level. The development of digital finance is a kind of "sending charcoal in the snow" behavior, and the impact of digital Finance on corporate social responsibility is more significant. (4) The results show that the government should continue to play an active guiding role, further combine with the new situation of domestic digital finance development, improve the relevant laws and regulations and policy system, and expand the use depth and coverage of digital finance. Reducing the cost of debt financing forces enterprises to fulfill their social responsibilities more actively and fully mobilize their enthusiasm to fulfill their social responsibilities.

Author Contributions: W.Y. conceived the paper's framework and developed the objectives of the paper; Z.Y. collected the case study data, conducted the data analysis and wrote the manuscript; Y.Y. reviewed this research. All authors have read and agreed to the published version of the manuscript.

Funding: The study was supported by "Scientific research project of Hainan Provincial Department of Education"(GrantNo. Hnky2021-60)、"2017 Guangxi philosophy and social science planning research project " (GrantNo. 17FGL005).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Gu L, Guo J, Wang H. Corporate Social Responsibility, Financing Constraints, and the Financialization of Enterprises .*J. Journ Fina Res*, **2020**, 02, 109-127.
2. Liao L, Zhang W. Empirical research on P2P network lending: a literature review .*J. Jour Tsing Univer (Philosophy and Social Sciences)*,**2017** , 32 , 186-196+199.
3. Xu D, Tang S, Guttman D. China's campaign-style Internet finance governance: Causes, effects, and lessons learned for new information-based approaches to governance .*J. Comp Law Secur Rev*, **2019**, 35, 3-14.
4. Hou X, Gao Z, Wang Q. Internet finance development and banking market discipline: Evidence from China .*J. Jour finan stab*, **2016**, 22, 88-100.
5. Fu Q, Huang Y. The heterogeneous impact of digital Finance on rural financial demand: evidence from China Household Finance Survey and Peking University Digital inclusive finance index .*J. Jour Finan Rese*, **2018**, 11, 68-84.
6. Qiu H, Huang Y, Ji Y. The impact of financial technology on traditional banking behavior -- from the perspective of Internet Finance .*J. Jour Finan Resea*, **2018**, 11, 17-29.
7. Yang L, Zhang Y. Digital Financial Inclusion and Sustainable Growth of Small and Micro Enterprises—Evidence Based on China's New Third Board Market Listed Companies .*J. Sustain*, **2020**, 12, 3733.
8. Zhang Y, Chang Y. An empirical test of the impact of digital Finance on the investment efficiency of science and technology enterprises.J. Stati Decis,**2020**, 36, 16, 179-183.
9. Li C, Yan X, Song M, et al. Fintech and Corporate Innovation——Evidence from Chinese NEEQ-Listed Companies .*J. Chi Indus Econ*, **2020**, 01, 81-98.
10. Xie X, Shen Y, Zhang H, et al. Can digital finance promote entrepreneurship? -- Evidence from China .*J. Chi Econ Quart*, **2018**, 17, 1557-1580.
11. Qi H, Liu Y. Does the Managers' Confidence Affect Corporate Social Responsibility? Does the Managers' Confidence Affect Corporate Social Responsibility? .*J. Busi Mana Jour*, **2018,** 40, 141-156.

12. Jin X, Zheng B. Narcissistic Chairmen of State-owned Enterprises and Corporate Social Responsibility .*J. Mana Rev*, **2020**, 32, 229-244.
13. Zhang C, Wang X, Cai M. Human capital, information technology and corporate social responsibility of knowledge workers .*J. Frie Accoun*, **2020**, 23, 88-95.
14. Hegde S P, Mishra D R. Married CEOs and corporate social responsibility .*J. Jour Corp Fina*, **2019**, 58,226-246.
15. Cronqvist H, Yu F. Shaped by their daughters: Executives, female socialization, and corporate social responsibility .*J. Jour Finan Econ*, **2017**, 126, 543-562.
16. Yu Wei, Zheng Y, Xin L. Influencing Factors of the Disclosure of Corporate Responsibility Report: A Perspective from Holding Shareholders and Foreign Shareholders .*J. Jour Audit Econ*, **2017**, 32, 78-87.
17. Mo Y, Liu X. Share pledge of controlling shareholders and corporate social responsibility .*J. Shan Fina*, **2020**, 22-30.
18. Dyck A, Lins K V, Roth L, et al. Do institutional investors drive corporate social responsibility? International evidence .*J. Jour Fina Econ*, **2019**, 131, 693-714.
19. Sun X, Gunia B C. Economic resources and corporate social responsibility .*J. Jour Corp Fina*, **2018**, 51, 332-351.
20. Wang, Ruxi, Wijen, et al. Government's green grip: Multifaceted state influence on corporate environmental actions in China .*J. Strate Manag Jour*, **2018**, 39, 404-428.
21. Calveras A, Ganuza J J. The role of public information in corporate social responsibility .*J. Jour Econ Manag Stra*, **2016**, 25, 990-1017.
22. Wang Jianming. Research on the Correlation among Environmental Information Disclosure, Industry Differences and Supervisory System .*J. Accoun Rese*, **2008**, 54-62+95.
23. Huang Y, Huang Z. The development of digital finance in China: present and future .*J. China Econ Quart*, **2018**, 17, 1489-1502.
24. Xie P, Zou C. Research on Internet financial model .*J. Journ Finan Rese*, **2012**, 11-22.
25. Porter M E, Kramer M R. The link between competitive advantage and corporate social responsibility .*J. Harv Busi Rev*, **2006**, 84, 78-92.
26. Wu H, Zhang A, Tang Q. The Influence of Corporate Social Performance on Organizational Stigma Management? Based on the Perspective of Attribution Theory .*J. Manag Rev*, **2018**, 30, 218-230.
27. Oikonomou I, Brooks C, Pavelin S. The Effects of Corporate Social Performance on the Cost of Corporate Debt and Credit Ratings .*J. Finan Rev*, **2014**, 49, 49–75.
28. Dhaliwal D S, Li O Z, Tsang A, et al. Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting .*J. Soci Scie Elect Pub*, **2011**, 86, 59-100.
29. Yongtae, Kim, Myung, et al. Is Earnings Quality Associated with Corporate Social Responsibility? .*J. Accou Rev*, **2012**, 87,761-796.
30. Zhai Huayun. The Impact of External Financing Needs on Social Responsibility Disclosure Under Soft Budget Constraint .*J. Chi Popu, Resou Envir*, **2010**, 20, 107-113.
31. Wang J, Zhu W. Can the development of digital finance correct the inefficient investment of enterprises? .*J. Fina Econ*, **2020**, 14-25.
32. Ni J, Peng K, Hu Y. The Role of "Social People" in Interlock Directors and Debt Financing Costs .*J. Chi Sof Scie*, **2019**, 93-109.
33. Li W, Wang P, Xu Y. Philanthropy, Political Connection and Debt Finance: Reciprocal Behavior of Governments and Private Enterprises .*J. Nank Bus Rev*, **2015**, 18, 4-14.
34. Shi M, Cai X, Geng X. Corporate Social Responsibility, R&D Investment and the Cost of Debt Financing in Dynamic Environment——The Empirical Study Based on China's Private Listed Companies in Manufacturing Industry .*J. Jour Shanxi Unive Fin Econ*, **2017**, 39, 111-124.
35. Cheng B, Ioannou I, Serafeim G. Corporate Social Responsibility and Access to Finance .*J. Stra Mana Jour*, **2014**, 35, 1–23.
36. Chen Y, Jin B, Ren Y. Impact mechanism of corporate social responsibility on technological innovation performance: The mediating effect based on social capital .*J. Scien Rese Mana*, **2020**, 41, 87-98.
37. Shen Lu, Liao X. Reform and Innovation of Green Finance and Fulfillment of Corporate Social Responsibility ——Evidence from the Green Finance Pilot Zones .*J. Fina For*, **2020**, 25, 69-80.
38. Yao L, Fu F, Cheng X. Tax Avoidance, Financing Ability of Debt and Cost of Debt .*J. Chi Sof Scie*, **2018**, 117-135.
39. Zhao Q, Lan J. Does Share Repurchase Affect the Financing Cost of Corporate Debt? .*J. Jour Fina Deve Rese*, **2020**, 38-47.
40. Guo F, Wang J, Wang F, et al. China Economic Quarterly .*J. Chi Econ Quart*, **2020**, 19, 1401-1418.
41. Wen Z, Zhang L, Hou J, et al. The procedure of mediating effect test and its application .*J. Acta Psy Sin*, **2004**, 614-620.