

Digital Finance and Corporate Social Responsibility: Empirical Evidence from Listed Companies in China

Li Junyan^a

School of Business, China University of Political Science and Law, Beijing 100020, China

^a1900109118@qq.com

Abstract. Digital finance is of great significance in promoting corporate social responsibility. This paper empirically investigates the relationship between digital finance and corporate social responsibility based on the Digital Inclusive Finance Index compiled by Peking University. It is found that the development of digital finance has a significant driving effect on the fulfilment of CSR, and this conclusion still holds after endogeneity treatment. The paper further explores its mechanism of action and finds that digital finance promotes CSR mainly by relaxing corporate financing constraints and enhancing corporate investment efficiency. In addition, the paper also finds that there is heterogeneity in the impact of digital finance on CSR, with more significant effects on encouraging CSR in provinces with a relatively low degree of marketisation and among non-state-owned enterprises.

Keywords: Digital finance, social responsibility, inclusive finance.

1. Introduction

Corporate social responsibility (CSR) is crucial to sustainable development. It emphasises that enterprises, while pursuing economic benefits, should actively take responsibility for the environment, society and stakeholders, and promote the coordinated development of the economy, society and the environment, which will help to reduce resource consumption, reduce environmental pollution, promote social harmony, and create a broader market and space for development for enterprises.

In developed countries, leading companies are increasingly focusing on corporate social responsibility (CSR) and integrating it into their long-term development strategies. Through the implementation of social responsibility programmes, these companies have achieved significant results in terms of employee welfare improvement, community support and environmental protection promotion. The Coca-Cola Company, for example, has set stringent environmental standards and utilised clean energy and energy-saving technologies to significantly reduce carbon emissions and energy consumption in its production processes. At the same time, they are also committed to public welfare, providing assistance to local communities in areas such as education and healthcare, and helping to improve the quality of life of their residents. The Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB) provide standards and frameworks for companies to prepare and report socially responsible information. The reports and guidelines issued by these organisations are widely adopted and help promote better corporate social responsibility. The report "Top 10 Trends in Corporate Social Responsibility (CSR) in China 2023", published by Business Gateway Consulting, points out that globally, corporate practices and disclosures on CSR are growing, especially in the ESG (environmental, social and governance) area. This indicates that companies are increasingly focusing on their social and environmental responsibilities and impacts. A new report from Bloomberg Intelligence (BI) suggests that global ESG assets could exceed \$41 trillion by the end of 2022 and \$50 trillion by 2025, representing one-third of total projected assets under management globally. And according to a report by Ernst & Young, 39 per cent of investors in 2021 are currently invested in ESG products - up from 33 per cent in 2020; one in five have decided not to invest, citing insufficient ESG integration on the project side.

By contrast, while some domestic companies have already focused on the importance of CSR and are actively exploring it in practice. These companies are focusing on employee welfare and career development to enhance employee satisfaction and loyalty, as well as environmental protection to

promote green production and the development of a circular economy. However, according to the China CSR Research Report, the CSR Development Index of the top 300 Chinese enterprises is still in its infancy, and they have yet to establish a complete social responsibility management system, and the disclosure of social responsibility indicators is fragmented. Therefore, how to encourage enterprises to actively fulfil their social responsibility and promote social welfare is an urgent problem.

In recent years, the development of the digital economy has penetrated into all areas of China's economic and social development, promoting profound changes in the mode of production, lifestyle and governance, in which digital finance has become an important force in domestic finance, reshaping the financial landscape and affecting the fulfilment of corporate social responsibility. The rapid development of digital finance has seen the emergence of innovative services such as mobile payment, digital credit and intelligent investment advice, providing users with convenient and efficient financial services. Mobile payment users exceeded 1 billion, leading the world in terms of penetration rate, digital credit has exploded in scale, digital RMB pilots are steadily advancing, and cross-border settlement applications are making progress. Through big data, cloud computing and other technologies, digital finance provides comprehensive and accurate corporate information, enhances investors' attention to social responsibility, and promotes the active fulfilment of corporate social responsibility. At the same time, digital finance reduces the cost of corporate social responsibility, improves efficiency, and promotes the greening and sustainable development of the financial sector. However, digital finance may also lead to enterprises pursuing short-term economic benefits too much and neglecting their social responsibilities, and regulatory gaps and risk hazards may also pose challenges. Therefore, in the context of the development of digital finance, enterprises need to balance economic interests and social responsibilities, and strengthen regulation and risk management.

This paper innovatively combines data from China's digital inclusive finance development index and listed companies' social responsibility reports to provide an in-depth analysis of how digital finance plays a role in corporate social responsibility from a micro perspective, which is verified by empirical tests. Compared with existing studies, the innovation and marginal contribution of this paper is mainly reflected in three aspects: first, based on the micro enterprise perspective, this paper explores the role of digital inclusive finance on CSR, provides relevant empirical evidence, relatively enhances the knowledge of the economic effect of digital inclusive finance, and enriches the relevant research on the influence factors of CSR. Secondly, this paper provides an in-depth analysis of the possible endogeneity between digital finance and CSR, adopting methods such as instrumental variables for the identification of causality, providing more reliable empirical support. Third, this paper further explores the path of digital finance's impact on CSR, expanding the perception of the mechanism of digital finance's impact on CSR. In addition, the findings of this paper have positive policy implications on how to promote enterprises to assume more social responsibility and achieve mutually beneficial and sustainable development of enterprises and society.

The remainder of this paper is structured as follows: Part II reviews the literature on CSR and digital finance; Part III describes the data used, the empirical design and the variables; Part IV discusses the results of the baseline regression and the robustness test; Part V analyses the mechanism by which digital finance affects CSR and conducts a heterogeneity analysis; and Part VI concludes the full paper and analyses the policy implications.

2. Literature Review and Theoretical Analysis

2.1. Corporate Social Responsibility

Corporate Social Responsibility (CSR) refers to the responsibility of enterprises for the subjects with which they have an interest in their business activities. The aspects for which enterprises should be responsible mainly include the consideration of their own profits and business conditions, and the inclusion of the consideration of the responsibility for employees, supply chain enterprises, customer groups, social organisations, subsidiaries, investors, shareholders, and partners and other subjects,

and also the consideration of the responsibility for the natural environment. Responsibility for the natural environment. In the modern economic system, social responsibility plays an increasingly important role in the development of enterprises.

There are different factors influencing CSR, and from a micro perspective, the nature of the enterprise's property rights, managerial factors and governance structure are the main factors. Wang Haimei et al. (2014) empirically found that foreign equity participation and institutional shareholding have a significant positive impact on enterprises' commitment to corporate social responsibility, while executive shareholding has a significant negative impact on enterprises' commitment to corporate social responsibility. Zhou Jian et al. (2021) examined the effect of tone characteristics of management discussion and analysis (MD&A) in the annual reports of listed companies on corporate social responsibility (CSR) based on unstructured textual information of listed companies in China and found that the tone of management discussion and analysis (MD&A) can help to enhance the level of CSR fulfilment. Zhang Xiumin et al. (2019) study the relationship between the use of modifying language and the fulfilment of social responsibility, based on impression management and principal-agent theory, bias is stronger under voluntary disclosure motives and the nature of non-state-owned property rights, and effective corporate governance mechanisms can constrain this biased rhetoric, and the financial performance of the enterprise plays an intermediary role in this process, which provides in-depth reference to regulate the disclosure of corporate social responsibility information. Using Heckman's two-stage regression method, Zhu Le and Chen Cheng (2020) found that the age heterogeneity of the executive team has a significant negative effect on CSR performance, while the heterogeneity of the executive team in terms of gender, education, and tenure has a significant positive effect on CSR performance. Feng Yuting et al. (2021) found that institutional investors' shareholding can promote listed companies to fulfil their social responsibility, and that catering to social needs and obtaining "insurance-like" effects are the main mechanisms for institutional investors to promote corporate social responsibility. Jin Xiao Cui (2017), on the other hand, discussed the impact of social responsibility under different enterprise ownership and operating conditions from the perspective of enterprise culture, and the study found that enterprise culture can promote enterprises to undertake social responsibility, and the effect is more significant in non-state-owned enterprises, and, the authors also found that, when the operating conditions of the enterprise deteriorate, a good enterprise culture can still play a role in guiding and regulating the role, but if the operating conditions continue to deteriorate to a loss, the enterprise However, if the business situation continues to deteriorate to the point of loss, the corporate culture can no longer play a role. Yang Lu et al. (2018) comprehensively discussed the impact of internal corporate governance mechanisms and external governance environment on social responsibility, and found that the actual controller being a central institution and equity concentration were significantly positively related to social responsibility, debt financing was significantly negatively related to social responsibility, and independent directors and so on did not have a significant impact on social responsibility. Zhang Zhengyong et al. (2012) argued that the improvement of corporate governance mechanism is the institutional basis for improving the level of corporate social responsibility information disclosure, which provides a new perspective of research for understanding the situation of improving social responsibility information disclosure in China. Wang Haibing (2015) found that financial performance and internal control have a positive effect on CSR undertaking and that internal control can positively regulate the relationship between financial performance and CSR.

In addition to the internal influencing factors of enterprises, the external market environment also affects enterprises to undertake social responsibility, and some scholars also study the impact of the social environment on the undertaking of corporate social responsibility from a macro perspective. Li Xinrong et al. (2022) explored the impact of geographic distance between enterprises and government regulatory agencies on CSR decision-making, and found that geographic distance has a negative impact on CSR performance, but a good institutional environment and high speed rail lines can alleviate this relationship. Tian Lihui and Wang Kodi (2017) used PSM-DID method and found that mandatory disclosure policy significantly increased the crash risk, but the positive relationship

between social responsibility disclosure and stock price crash risk was no longer significant when shareholders' and managers' interests were aligned, the monitoring mechanism was sound, or the financial information was transparent. Li Xiuyu et al. (2019) investigated the mechanism of the role of media supervision on the forensics of social responsibility reports and found that media supervision has a significant positive effect on the forensics of social responsibility reports, while the performance of corporate social responsibility plays a mediating role in the relationship. Based on stakeholder theory, Lu Yue and Liu Chunlin (2018) study that when the actual performance of the enterprise is inconsistent with the expected performance, which in turn forms the subsequent strategic decision-making motivation, and the motivation and the actual performance level of the enterprise together have an impact on the fulfilment of the enterprise's social responsibility. Li Zhenren et al. (2020) combined with the impression management theory, proposed the compensation mechanism of social responsibility, explored the impact of negative records on corporate social responsibility and performance analysis, and concluded that social responsibility can effectively compensate for the negative impacts brought to the enterprise due to negative records. Zhang Xiumin et al. (2019) study the relationship between the use of modifying language and the fulfilment of social responsibility, based on impression management and principal-agent theory, bias is stronger under voluntary disclosure motives and the nature of non-state-owned property rights, and effective corporate governance mechanisms can constrain this biased rhetoric, and the financial performance of the enterprise plays an intermediary role in this process, which provides in-depth reference to regulate the disclosure of corporate social responsibility information.

2.2. Digital Finance

The proposal of digital finance originates from the concept of digital economy that has emerged in recent years, and digital finance refers to the use of digital technology by traditional financial institutions and Internet companies to achieve financing, payment, investment and other new financial business models.

With the rapid development of digital finance, the research on digital finance has become a hotspot and frontier in recent years, and some scholars have found that the development of digital finance has a wide range of impacts on the financial ecosystem, bringing new opportunities and challenges for the financial industry. In terms of economic consequences, scholars mainly develop from the macro and micro perspectives.

At the macro level, inclusiveness is the most notable feature of digital finance in China, which effectively reduces transaction costs and financial service thresholds, a function that is manifested in many ways. For example, Zhang Xun et al. (2019) combine China's Digital Inclusive Finance Index with data from the China Family Tracking Survey (CFPS) to assess the impact of the development of digital finance driven by the Internet revolution on inclusive growth, and find that China's digital finance develops faster in backward areas, helps to boost household incomes, contributes to inclusive growth in China, and promotes the entrepreneurial behaviours of rural residents, and a further heterogeneity test finds that digital finance is more significant in promoting the entrepreneurial behaviour of households with low material or social capital. Zhang Xun et al. (2020) constructed a general equilibrium theoretical framework, proved that digital financial development increases consumption by shortening residents' shopping time from the perspective of payment convenience, and found through empirical research that digital financial development significantly enhances residents' consumption, and also put forward the urgency of breaking up the urban-rural division. Huang Zhuo and Shen Yan (2019) examined the role of digital financial development in promoting innovation and entrepreneurship in China, using instrumental variables for causal identification, and found that improvements in the breadth of digital financial coverage, depth of use, and digitisation were all conducive to an increase in the number of entrepreneurial firms, which contributed to high-quality economic growth. Teng Lei and Ma Degong (2020) verified the positive contribution of digital finance to high-quality development, and further found that digital finance enhances the level of regional innovation and openness to the outside world by alleviating the financing constraints of

enterprises. Tian Ge and Zhang Xun (2022) used the "Broadband China" policy as a proxy variable for the development of the digital economy, combined it with the data from the China Family Tracking Survey (CFPS), and found that the digital economy can significantly promote non-farm employment, and explored the internal mechanism of the digital economy to promote non-farm employment of rural labour force based on the two core connotations of the consumer Internet and the industrial Internet. It also explores the internal mechanism of digital economy to promote rural non-farm employment based on the two core connotations of consumer Internet and industrial Internet, and confirms the role of digital economy development in promoting economic structural transformation. Huang Yiping and Huang Zhuo (2018) provide an overview of relevant studies on digital entry in China from three perspectives: the development of China's digital inclusive finance and its support for the real economy, the impact of China's digital finance on the traditional financial market, and the characteristics and risks of China's P2P online lending market, and point out that China's digital finance can reduce the threshold of financial services and the cost of services, improve the financing environment of small and medium-sized micro-enterprises, and more effectively serve the main body of inclusive finance. There is also a technology spillover effect of digital finance in China, and its development will significantly increase the total factor productivity of commercial banks, but there is heterogeneity in the impact: joint-stock commercial banks have the greatest improvement, followed by urban commercial banks, while large banks have less change. In recent years, the micro effects of digital finance have also become the focus of scholars' research, mostly focusing on its impact on enterprise financing, investment, and innovation, as well as conducting empirical research on digital finance on the accessibility of financial services to residents. Fu Qiuzi and Huang Yiping (2018) found that the improvement of the overall level of digital finance reduces the probability of rural productive formal credit demand, but increases the probability of rural consumption formal credit demand, in which smartphone users and groups with high education levels and online shopping habits are more affected, indicating that digital finance improves efficiency and promotes consumption. Wu Yu et al. (2020) studied the impact of digital financial development on Chinese households' traditional private borrowing behaviour, and the authors reduced households' demand for traditional private borrowing through the "substitution effect of funding channels" and the "income effect". Wu Yu et al. (2021) showed that digital financial development enhances the effectiveness of household financial asset portfolios mainly by increasing the convenience of investment, facilitating access to financial information, and enhancing the level of risk-taking, and further found that digital financial development is conducive to increasing the diversity of household financial asset portfolios and reduces the likelihood of extreme risky investment by households. Heterogeneity analysis finds that the enhancing effect of digital financial development on household financial asset portfolio effectiveness is more obvious in developed regions and advantaged households. Tang Song et al. (2020) discussed the impact of digital financial development on enterprise technological innovation and its internal mechanism, and found that under reasonable financial regulatory constraints, the "structural" driving effect of digital financial development on enterprise technological innovation is more significant, and it can effectively solve the problem of "difficult and expensive financing". Tang Song et al. It is found that under reasonable financial regulatory constraints, the development of digital finance has a more significant "structural" driving effect on technological innovation of enterprises, and can effectively solve the problem of "difficult and expensive financing".

2.3. Digital Finance and Corporate Social Responsibility

Although existing studies have examined the influencing factors of corporate social responsibility (CSR) from various aspects, the research on digital finance and CSR is still not very adequate. As a new form of economy, digital finance has a more profound impact on the overall development of economy and society. Xu Zhiyong and Deng Chao (2019) selected Chinese non-financial listed companies as a sample from 2008-2016, divided CSR disclosure into four aspects: shareholders, creditors, employees and consumers, and analysed the impact of corporate financialisation on CSR

disclosure, and found that corporate financialisation could not significantly affect disclosure of shareholders' rights and interests. Liu Xiliang and Wenwen Yang (2019), starting from the existing environmental pollution problems in China, combined corporate social responsibility and green growth theory, argued that financial institutions should assume environmental responsibility, proving that financial institutions' credit decisions can significantly affect the quality of economic growth.

3. Data, Empirical Design and Description of Variables

3.1. Data

There are three sources of data for this paper. First, Hexun.com's Social Responsibility Report for Listed Companies, which provides data on CSR scores for listed companies in China. Second, the digital financial inclusion index constructed by the Digital Finance Research Centre of Peking University, which is used to measure the degree of digital financial development. Third, the financial data of listed companies are obtained from the Cathay Pacific CSMAR database of listed companies in China, which is used to construct corporate finance constraint indicators and a series of control variables based on the financial information of listed companies.

3.2. Empirical Design

The baseline regression equation for this paper is:

$$CSR_{it} = \beta_0 + \beta_1 DF_{it} + \theta X + u_i + \varepsilon_{it} \quad (1)$$

where CSR_{it} represents the CSR score of firm i in year t . DF_{it} represents the extent of digital finance development in region d where the firm is located in year t . Regions are categorised into provincial level and prefecture level respectively. X represents a set of control variables; the paper also controls for individual fixed effects and year fixed effects.

3.3. Description of Variables

①Corporate Social Responsibility: CSR_{it} stands for the score of corporate social responsibility of company i in year t . In this paper, when measuring corporate social responsibility, the companies listed on Hexun.com are selected to measure the level of corporate social responsibility commitment by the total score of social responsibility reports of listed companies on Hexun.com. The data of this assessment system is taken from the social responsibility reports and annual reports released by the listed companies on SSE and SZSE through their official websites, and the scores are made from five items: shareholders' responsibility, employees' responsibility, suppliers', customers' and consumers' rights and interests' responsibility, environmental responsibility, and social responsibility, and the weighting ratios of the five first-level indexes are adjusted according to the industries, so as to get the accurate scores. The higher the total score, the better the CSR performance.

②Digital Financial Inclusion (DFI): DF_{it} stands for the extent of digital financial development in region d , where the firm is located in year t . In this paper, we measure the development of digital finance in each region of China using the provincial-level China Digital Inclusion Financial Development Index, which is compiled by the Digital Finance Research Centre of Peking University (Guo Feng et al., 2020). The index uses Ant Gold's transaction account big data, which is quite representative and authentic, and is also widely used by existing studies on digital finance and financial inclusion. The database constructs the digital inclusive finance system from the three dimensions of the breadth of coverage, depth of use and digital support services of digital financial services, which consists of 10 secondary dimensions and 26 specific indicators.

③Mechanism variable 1: Financing constraints. The financing constraint is calculated with reference to the representative study of Yang Jiayu (2012), from five dimensions of endogenous financial constraints, commercial credit financial constraints, exogenous financial constraints, foreign capital participation, investment opportunities and profitability, and a number of financial indicators

of the enterprise are specifically selected, including the enterprise cash stock ratio, the commercial credit ratio, the size of the enterprise, the net tangible asset ratio, the liquidity ratio, the asset return, and net sales margin. Assign a value to this indicator based on the company's position in the industry for that year. Take return on assets as an example, rank the ROA of all companies in the same industry for the same year from smallest to largest, and assign scores of 1, 2, 3, 4, and 5 for 0-20%, 20%-40%, 40%-60%, 60%-80%, and 80%-100%, respectively. The company's scores on all nine metrics for the year are calculated and summed to give the company's level of financing constraints for the year.

④Mechanism variable 2: investment efficiency. This paper adopts the method of Richardson (2006), Chen Yunsen and Huang Jianqiao (2019) to measure the investment efficiency of enterprises, the specific equations are as follows:

$$Inv_{it} = \alpha_0 + \alpha_1 Inv_{it-1} + \alpha_1 asset_{it-1} + \alpha_1 cash_{it-1} + \alpha_1 leve_{it-1} + \alpha_1 roa_{it-1} + \alpha_1 ficc_{it-1} + u_i + e_t + \varepsilon_{it} \quad (2)$$

Specifically, Inv_{it} represents the investment level of firm f in industry i in year t , which is obtained by subtracting the firm's expenditures on constructing fixed, intangible, and other long-term assets from the firm's revenues from disposing of fixed, intangible, and other long-term assets, and dividing by the firm's total assets. Inv_{it-1} represents the investment level of the firm in the lagged period, $asset_{it-1}$ is the total assets of the firm in the lagged period, $cash_{it-1}$ is a lagging issue of corporate monetary funds, $leve_{it-1}$ is a lagging issue of corporate asset debt, roa_{it-1} is the lagged return on assets of the enterprise, and $ficc_{it-1}$ is the lagged free cash flow. The idea of this measure is to regress the amount of corporate investment on the variables affecting the normal investment of the firm, so as to obtain the amount of corporate investment fitted by the model. And the difference between the firm's actual investment amount and the model fit, i.e., the residual term of the model, is the extent to which the firm deviates from the optimal investment level. Finally, this paper takes the absolute value (eff) of this residual term as a measure of enterprise investment efficiency, and the larger this indicator is, the higher the level of inefficient enterprise investment and the lower the investment efficiency.

⑤Control variables. The following control variables are selected in this paper: (1) Enterprise Size (Size), measured by the natural logarithm of the total assets of the enterprise at the end of the year; (2) Asset-liability ratio (Lev), measured by the ratio of total liabilities to total assets at the end of the year; (3) Profitability (ROA), expressed as the ratio of total profits to total assets; (4) Growth of the enterprise, measured by the ratio of the growth of the enterprise's total assets at the end of the year to the total assets at the beginning of the year; (5) Enterprise value (TobinQ), measured by the ratio of enterprise stock market value to the replacement cost of assets represented by the stock; (6) Property rights (SOE), (7) FirmAge, expressed as the difference between the year observed and the year established. At the same time, this paper also controls the industry effect and the province effect to control the change of the policy level and other factors.

3.4. Descriptive Statistics

Table 1 provides statistical information on the main variables in the study of the relationship between digital finance and CSR impacts. The sample data mainly includes 17,413 observations covering variables such as provincial and municipal digital finance development, firm size, financial leverage, return on assets, growth, board size, Tobin's Q, and firm age. Among them, the mean value of the social responsibility score is 23.35 with a standard deviation of about 15.65, which indicates that there are significant differences in social responsibility commitment among different firms, and it is necessary to have an in-depth discussion on corporate social responsibility commitment behavior. And the mean value of provincial digital financial development is 229.94, with a standard deviation of about 91.73, and the mean value of municipal digital financial development is 202.16, with a standard deviation of 68.20, which indicates that there is also a significant difference in the level of digital financial development in different regions.

Table 1 Descriptive statistics of main variables

Variable	Obs	Mean	Std. dev.	Min	Max
csrscore	17,413	23.34772	15.64551	-18.45	90.87
df_prov	17,413	229.9369	91.73412	16.22	387.49
df_city	17,413	202.1557	68.20985	23.88	321.65
Size	17,047	22.06073	1.234427	19.52454	26.39511
Lev	17,047	0.4205725	0.2094803	0.0310333	0.9246132
ROA	17,046	0.0414772	0.0663385	-0.414743	0.22223
Growth	16,096	0.182793	0.4663342	-0.623477	4.805832
Board	17,042	2.129285	0.1979935	1.609438	2.70805
TobinQ	16,648	2.042186	1.443939	0.815302	17.67593
FirmAge	17,047	2.832059	0.3549029	1.386294	3.555348

4. Regression results

4.1. Benchmark Regression Results

Table 2 shows the regression results of digital finance affecting CSR, this paper utilizes the regression of digital finance *df_prov* at the provincial level and the digital finance index *df_city* at the prefecture level respectively, and introduces industry fixed effects and time fixed effects to control for other possible potential influencing factors. Columns 1 and 2 report the regression results of the provincial-level digital finance index on CSR, while columns 3 and 4 report the regression of the prefecture-level digital finance index on CSR. The results show that digital finance has a significant effect on CSR in all cases, from the regression coefficient of digital finance at the provincial level, the coefficient is 0.03530 and is significant at the 1% significance level; and from the coefficient of the effect of digital finance on CSR at the prefecture level, it is also significant and positive, with a coefficient of 0.0327. This suggests that digital finance can promote CSR.

The reasons for this regression result are: firstly, digital finance is inclusive: the popularization and development of digital finance improves the coverage and efficiency of financial services, breaks the geographical restrictions, and enables more enterprises to enjoy convenient and efficient financial services. This inclusiveness helps enterprises operate and develop better and fulfill their social responsibility; second, digital finance provides more refined services that can meet the needs of local enterprises, solve capital problems, and promote the fulfillment of corporate social responsibility; third, digital finance reduces the asymmetry of information between enterprises and investors, improves market transparency and fairness, and provides investors and regulators with more accurate, comprehensive information for investors and regulators, which prompts enterprises to pay more attention to their social responsibility performance and maintain a good reputation; fourth, digital finance also promotes the innovation of financial products and services, providing more ways and tools to fulfill their social responsibility; finally, digital finance promotes cooperation and communication among governments, enterprises and the society, and jointly promotes the fulfillment of social responsibility and builds a good social environment and ecology.

Table 2 Benchmark Regression Results

VARIABLES	(1) csr	(2) csr	(3) csr	(4) csr
df_prov	0.0489*** (9.53)	0.0353*** (7.50)		
df_city			0.0471*** (8.24)	0.0327*** (6.26)
Size		4.3158*** (36.87)		4.2840*** (36.62)
Lev		-7.7845*** (-11.69)		-7.9753*** (-11.98)
ROA		91.6651*** (51.42)		91.8988*** (51.55)
Growth		-0.7577*** (-3.25)		-0.7594*** (-3.25)
Board		1.1012** (2.01)		1.0874** (1.99)
TobinQ		0.2855*** (3.37)		0.2665*** (3.15)
FirmAge		1.5213*** (4.58)		1.5308*** (4.59)
Constant	12.0949*** (10.19)	-87.3336*** (-29.23)	13.8239*** (11.91)	-84.9885*** (-28.86)
Observations	17,413	15,698	17,413	15,698
R-squared	0.099	0.358	0.097	0.357
Industey FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.2. Endogenous treatment: an instrumental variables approach

The above benchmark regressions suggest that digital finance helps promote CSR, but this finding may still be confounded by endogeneity issues. Among the many influences on CSR, the control variables covered by the available data may make it difficult to comprehensively capture all relevant variables, and thus there is a possibility of omitted variables. In addition, there may be a reverse causality between digital finance and social responsibility, where the advancement of digital finance plays a positive role in promoting CSR, and at the same time, the enhancement of CSR creates favorable conditions for the further development of digital finance.

In order to identify the causal relationship between digital finance and CSR more precisely, this paper adopts the instrumental variable approach to address these potential endogeneity issues. Specifically, with reference to Nunn and Qian (2014), this paper constructs the new variable obtained by cross-multiplying the number of post offices per million people in each city in 1984 with the amount of national Internet investment in the previous year and taking the natural logarithm, which serves as an instrumental variable for the degree of Internet development. Similar to this treatment, Huang Qunhui et al. (2019) and Zhao Tao et al. (2020) also used the historical data of post and telecommunications of each city in 1984 as the instrumental variable of the degree of Internet development and the comprehensive index of digital economy development. Referring to the ideas of existing literature, this paper selects the number of fixed-line telephones (dh) and the number of postal and telegraph offices (yj) per million people in 1984 in individual cities as instrumental variables for digital finance, and adopts the two-stage least squares (2SLS) method for regression processing.

These instrumental variables are both highly correlated with the level of digital finance development and not directly related to CSR, thus allowing for the avoidance of endogeneity issues. In addition, the paper controls for industry and year fixed effects to eliminate the interference of industry characteristics and time trends in the results. For space considerations, this paper focuses on reporting the results of the second-stage regression, in which the paper finds that the level of digital financial development is still significantly positive for CSR, both at the provincial level and at the prefecture level. This indicates that the regression results of this paper still hold after dealing with endogeneity issues.

Table 3 Endogenous Processing Results

	Using the Post Office IV		Use of telephone IV	
VARIABLES	(1) csr	(2) csr	(3) csr	(4) csr
df_prov	0.1140* (1.77)		0.1196*** (4.78)	
df_city		0.0360* (1.78)		0.1113*** (4.78)
Size	5.5760*** (30.03)	5.4737*** (31.39)	5.5814*** (31.54)	5.4873*** (31.32)
Lev	-7.0111*** (-6.85)	-7.5300*** (-7.78)	-6.9828*** (-7.12)	-7.4182*** (-7.63)
ROA	117.8204*** (28.65)	121.2043*** (36.96)	117.5981*** (34.73)	118.9068*** (35.90)
Growth	-1.4203*** (-4.77)	-1.4616*** (-4.96)	-1.4180*** (-4.78)	-1.4481*** (-4.89)
Board	1.8314** (2.02)	1.2700 (1.60)	1.8706** (2.32)	1.7472** (2.18)
TobinQ	0.4712*** (4.33)	0.4364*** (4.08)	0.4728*** (4.39)	0.4289*** (3.99)
FirmAge	2.8593*** (4.92)	2.4633*** (5.09)	2.8888*** (5.88)	2.8789*** (5.87)
Constant	-115.0018*** (-10.34)	-102.0839*** (-20.25)	-115.9102*** (-20.32)	-113.3842*** (-21.24)
Observations	9,192	9,192	9,192	9,192
R-squared	0.337	0.344	0.336	0.338
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.3. Additional Robustness Tests

In order to analyze the above regression results with robustness, this paper refers to Qiu Han et al. (2018) and further provides the results of the robustness test on the breadth (coverage_breadth_prov) and depth (usage_depth_prov, usage_depth_city) of digital finance, which are shown in Table 4. The regression results show that that the provincial coverage of digital finance has a significant positive effect on CSR, with a coefficient of 0.0340 and significant at the 1% significance level. This indicates that the wider the coverage of digital finance at the provincial level, the greater the social responsibility of enterprises. The depth of use of digital finance at the provincial and municipal levels also has a significant positive effect on CSR, with coefficients of 0.0211 and 0.0274, respectively, which are significant at the 1% significance level. This indicates that the greater the depth of use of digital finance within the prefecture-level city, the greater the social responsibility of the enterprise.

The coefficients of the breadth and depth robustness tests are consistent with the baseline regression, and both are significantly positive at the 1% significance level, indicating that the conclusions have good robustness.

Table 4 Robustness Test Results

VARIABLES	(1) csr	(2) csr	(3) csr	(4) csr
coverage_breadth_prov	0.0340*** (7.80)			
coverage_breadth_city		0.0234*** (5.99)		
usage_depth_prov			0.0211*** (6.58)	
usage_depth_city				0.0274*** (5.87)
Size	4.3103*** (36.84)	4.2758*** (36.55)	4.3123*** (36.81)	4.2954*** (36.69)
Lev	-7.7619*** (-11.66)	-7.9937*** (-12.00)	-7.8241*** (-11.75)	-7.8962*** (-11.86)
ROA	91.7128*** (51.47)	92.0389*** (51.65)	91.6820*** (51.38)	91.7691*** (51.41)
Growth	-0.7641*** (-3.27)	-0.7668*** (-3.28)	-0.7506*** (-3.21)	-0.7492*** (-3.21)
Board	1.1257** (2.06)	1.0788** (1.97)	1.0520* (1.92)	1.0494* (1.92)
TobinQ	0.2840*** (3.36)	0.2625*** (3.10)	0.2832*** (3.34)	0.2754*** (3.25)
FirmAge	1.5273*** (4.59)	1.5105*** (4.54)	1.5011*** (4.51)	1.5171*** (4.55)
Constant	-86.2704*** (-29.70)	-82.7928*** (-29.32)	-83.8149*** (-29.44)	-83.9815*** (-28.88)
Observations	15,698	15,698	15,698	15,698
R-squared	0.358	0.357	0.358	0.357
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5. Mechanistic versus Heterogeneous Analysis

5.1. Mechanism Analysis: Financing Constraints

Digital finance may affect social responsibility by relaxing corporate financing constraints and improving corporate financing. This paper examines the extent to which digital finance affects social responsibility through the improvement effect of financing constraints by building a regression model for mechanism analysis of financing constraints. Referring to the operational suggestions of Jiangboat (2022) on the analysis of the impact mechanism, this paper constructs the following model to further examine the impact of digital finance development on financing constraints, and the meanings of the variables in the model are consistent with those in the previous paper.

$$FC_{it} = \beta_0 + \beta_1 DF_{it} + \theta X + u_i + \varepsilon_{it} \quad (3)$$

The regression results are shown in Table 5, the first column demonstrates the effect of digital financial development index (FC) on financing constraints (df_prov) with a coefficient of 0.0038. The second column demonstrates the effect of digital financial development index (FC) on financing constraints (df_city) with a coefficient of 0.0048. The coefficients of these two columns are both significantly positive at the significance level of 0.01, which It indicates that the development of digital finance can significantly relax the degree of financing constraints of firms. The regression conclusion suggests that digital finance promotes corporate social responsibility by improving corporate financing and reducing corporate financing constraints. In other words, as the index of digital finance development increases, the financing difficulties of enterprises are eased, which provides solid financial support for enterprises to undertake social responsibility, thus promoting the positive implementation of social responsibility.

Digital finance has improved the coverage and efficiency of financial services through big data, cloud computing and other information technology means, enabling more enterprises to access financial services, especially those in remote areas. This has broadened financing channels and lowered financing thresholds, helping to alleviate enterprise financing constraints. Digital finance also reduces the cost of financial services, improves the efficiency of financing, and enhances the universality of financial services, breaking down geographical constraints so that more SMEs can enjoy financial services. In addition, the innovativeness and flexibility of digital finance enable it to develop financial products and services that are more in line with the market according to the needs of enterprises, and satisfy the diversified financing needs of enterprises, further alleviating financing constraints.

The alleviation of financing constraints gives enterprises more funds and resources to better fulfill their social responsibilities. When funds are tight, enterprises may reduce their social responsibility investment and focus on their core business. When financing constraints are eased, enterprises have more financial flexibility to invest in long-term socially beneficial projects, such as environmental protection and community development. In addition, this helps reduce financial risks and enhances the ability to fulfill social responsibilities. Eased financing constraints also promote CSR fulfillment through increased transparency and reputation. When it is easier for companies to obtain financing, they are more likely to report openly and transparently on their social responsibility activities, enhancing their reputation and brand image. At the same time, eased financing constraints provide incentives for enterprises to be more actively involved in solving social and environmental problems, such as developing environmentally friendly products and promoting social welfare, which not only promotes social progress and environmental protection, but also brings long-term growth opportunities and brand value to enterprises.

Table 5 Financing Constraints and Corporate Social Responsibility

VARIABLES	(1) FC	(2) FC	(3) FC	(4) FC
df_prov	0.0038*** (20.35)	0.0019*** (13.05)		
df_city			0.0048*** (22.98)	0.0031*** (19.79)
Size		0.1044*** (29.21)		0.1034*** (29.15)
Lev		-0.6410*** (-31.53)		-0.6518*** (-32.30)
ROA		4.2440*** (77.97)		4.2296*** (78.29)
Growth		0.0266*** (3.73)		0.0269*** (3.80)
Board		-0.0173 (-1.04)		-0.0072 (-0.43)
TobinQ		0.0124*** (4.79)		0.0113*** (4.41)
FirmAge		-0.1416*** (-13.95)		-0.1327*** (-13.14)
Constant	2.1068*** (48.82)	0.7481*** (8.20)	2.0191*** (48.00)	0.5289*** (5.93)
Observations	17,413	15,698	17,413	15,698
R-squared	0.027	0.464	0.033	0.471
Industey FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.2. Mechanism Analysis: Investment Efficiency

As a new type of financial model, digital finance may have a positive impact on corporate investment efficiency, thereby improving corporate investment performance, optimizing resource allocation, and thus devoting more resources to social responsibility. In order to explore this issue in depth, this paper analyzes the mechanism of investment efficiency and quantifies the specific degree of impact of digital finance on CSR through the effect of investment efficiency improvement.

As can be seen from Table 6, the first and second columns are the regression results of the digital finance index at the provincial level, while the third and fourth columns are the regression results of the digital finance index at the prefectural level. Regardless of the regression of what kind of level and whether or not to control variables, the regression coefficients of the digital finance are all significantly positive at the significance level of 1%, which suggests that the improvement of the level of the development of the digital finance can reduce the inefficient investment of the enterprises, promote the actual investment level close to the optimal investment level, and improve the investment efficiency of enterprises.

Digital finance provides financing facilities for enterprises through diversified channels, effectively eases financing constraints, reduces financing costs, and thus enhances investment efficiency. In addition, digital finance uses data and networked means to optimize the enterprise investment decision-making process, reduce information asymmetry, reduce investment risk and enhance the accuracy of investment decisions. At the same time, digital finance also provides enterprises with diversified financial products and services, optimizes asset allocation and improves

the efficiency of asset use. With the rapid development of digital finance, the competition among enterprises has become increasingly fierce, which further pushes enterprises to emphasize and improve investment efficiency. The improvement of enterprise investment efficiency means that enterprises can achieve the same operating results with less capital, i.e., enterprises have more capital that can be invested in socially responsible behavior, improve their image in the product market and capital market, and promote corporate social responsibility.

Table 6 Investment Efficiency and Corporate Social Responsibility

VARIABLES	(1) eff	(2) eff	(3) eff	(4) eff
df_prov	-0.0000*** (-7.04)	-0.0000*** (-4.32)		
df_city			-0.0000*** (-7.67)	-0.0000*** (-5.37)
Size		-0.0017*** (-5.37)		-0.0016*** (-5.15)
Lev		0.0174*** (9.25)		0.0172*** (9.20)
ROA		0.0315*** (6.02)		0.0312*** (5.97)
Growth		0.0005 (0.64)		0.0005 (0.72)
Board		-0.0056*** (-3.89)		-0.0059*** (-4.07)
TobinQ		-0.0001 (-0.31)		-0.0001 (-0.26)
FirmAge		-0.0025*** (-2.69)		-0.0023** (-2.50)
Constant	0.0397*** (39.43)	0.0846*** (12.29)	0.0414*** (36.13)	0.0850*** (12.37)
Observations	11,465	11,127	11,465	11,127
R-squared	0.027	0.039	0.028	0.039
Industey FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.3. Heterogeneity Analysis: Regional Heterogeneity in Degree of Marketization

There may be potential heterogeneity in the impact of digital finance on CSR. First, this paper examines the regionally heterogeneous impact of digital finance on CSR. The degree of marketization in different regions can have a significant impact on the prevalence of digital finance and the operating environment of firms, which, in turn, may make a difference in the way and effect of CSR. For example, regions with a higher degree of marketization tend to have better financial infrastructures and legal systems, which may facilitate the development of digital finance and provide more opportunities and channels for enterprises to fulfill their social responsibilities. In addition, regions with a higher degree of marketization may also have higher expectations and requirements for corporate social responsibility performance, which may incentivize corporations to be more active in fulfilling their social responsibilities.

This paper starts with group regression and the regression results are shown in Table 7. Columns 1 and 2 show the regression results for the group of highly marketized regions, and columns 3 and 4 show the regression results for regions with relatively low marketization. The results show that, after

conducting group regression, we find that digital finance has a positive impact on CSR in both highly marketized and low marketized regions, but the degree of impact varies. Therefore, we further introduced the cross term between digital finance and the degree of regional marketization for regression, and the regression results are shown in Columns 5 and 6. The results show that the coefficient of the cross term of digital finance and CSR is 0.0298 and significant at 1% level. The cross term regression is significantly positive, which means that the higher the degree of marketization, the greater the positive impact of digital finance on CSR. As analyzed in the previous section, high marketization regions usually have more complete regulatory systems, property rights protection systems and more efficient administrative service systems, which provide a good environment for the development of digital finance. In addition, high-marketization regions attract more talents, including technical and managerial talents, which is conducive to the better use of digital finance by enterprises and the enhancement of CSR performance. Meanwhile, market competition in high-marketized regions is more intense, and enterprises need to continuously optimize their management and improve efficiency in order to gain a competitive advantage. Digital finance can provide technical and management support for enterprises to help them realize sustainable development and thus improve their social responsibility performance. Therefore, the positive impact of digital finance on CSR is greater in regions with a higher degree of marketization.

Table 7 Regression Results for Heterogeneity in the Degree of Regional Marketization

	High Marketization Areas		Low Marketization Areas		Full Sample	
VARIABLES	(1) csr	(2) csr	(3) csr	(4) csr	(5) csr	(6) csr
df_prov	0.0040 (0.34)		0.0536*** (5.56)		0.0349*** (4.91)	
df_city		0.0276*** (2.68)		0.0294** (2.57)		0.0298*** (3.93)
df_prov*market					0.0040*** (2.63)	
df_city*market						0.0049*** (2.92)
Size	5.1124*** (23.68)	5.1150*** (23.72)	6.6231*** (27.52)	6.5745*** (27.27)	5.8570*** (36.11)	5.8305*** (35.96)
Lev	-6.2144*** (-5.21)	-6.2802*** (-5.27)	-8.9772*** (-6.74)	-9.3509*** (-7.01)	-7.5496*** (-8.42)	-7.7547*** (-8.66)
ROA	121.5215*** (30.87)	121.0407*** (30.79)	121.1358*** (26.58)	122.5665*** (26.89)	121.6017*** (40.33)	122.0235*** (40.51)
Growth	-1.5138*** (-4.03)	-1.4995*** (-3.99)	-1.4130*** (-3.39)	-1.4641*** (-3.50)	-1.4814*** (-5.26)	-1.4877*** (-5.28)
Board	-0.4174 (-0.44)	-0.2907 (-0.31)	3.3879*** (3.04)	3.0550*** (2.74)	1.4502** (1.98)	1.4156* (1.93)
TobinQ	0.5316*** (3.65)	0.5353*** (3.68)	0.6711*** (4.51)	0.6384*** (4.29)	0.5754*** (5.52)	0.5587*** (5.36)
FirmAge	0.4801 (0.82)	0.6326 (1.08)	3.4542*** (5.71)	3.2728*** (5.40)	2.1062*** (5.00)	2.1065*** (4.99)
Constant	-93.3787*** (-16.60)	-98.6115*** (-18.44)	-147.1423*** (-25.31)	-140.3637*** (-24.27)	-122.5510*** (-30.59)	-120.3853*** (-30.52)
Observations	5,436	5,436	5,673	5,673	11,109	11,109
R-squared	0.355	0.355	0.344	0.342	0.346	0.345
Industry FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.4. Heterogeneity Analysis: Heterogeneity Across Ownership Firms

In general, Chinese state-owned enterprises (SOEs) tend to undertake many social functions, and differences in ownership may also lead to heterogeneous effects of digital finance on CSR-taking behavior. Therefore, this paper analyzes ownership heterogeneity. First, we conduct group regression, columns 1 and 2 are samples of SOEs, and columns 3 and 4 are samples of non-SOEs, and the results are shown in Table 8, which shows that for both SOEs and non-SOEs, the development of digital

finance has a positive impact on CSR. Therefore, we further introduce the cross term of the ownership dummy variable with the digital finance index for the study, and Columns 5 and 6 demonstrate the regression results of the cross term, which show that the coefficient of the interaction term is -0.0026, which is significantly negative at the 5% level. This indicates that the positive impact of digital financial development on the social responsibility of SOEs is relatively small and the impact on the social responsibility of non-SOEs is relatively larger.

Due to their political and social attributes, SOEs are motivated to fulfill their social responsibility mainly by political and social pressures rather than the pursuit of commercial interests. In contrast, non-SOEs are more focused on business interests, and the development of digital finance provides them with more financing opportunities, thus helping them to better fulfill their social responsibilities. SOEs usually have more financing channels and resources, and have more advantages in obtaining capital and policy support, so the improvement of their financing efficiency and cost by the development of digital finance may be relatively limited. On the other hand, non-state-owned enterprises have relatively fewer financing channels, and the development of digital finance improves their financing efficiency more significantly, which helps them improve their social responsibility performance. In addition, SOEs may be affected by more government intervention and policy orientation in their business decisions, and their social responsibility behavior is based more on policy requirements than on market mechanisms. On the contrary, non-state-owned enterprises have more autonomy in their business decisions, and the development of digital finance provides them with more flexible financing options, which helps them better fulfill their social responsibility.

Table 8 Regression Results on Heterogeneity of Firms with Different Ownership

	SOE		Non-SOE		Full Sample	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	csr	csr	csr	csr	csr	csr
df_prov	0.0433*** (4.10)		0.0245*** (4.81)		0.0339*** (7.15)	
df_city		0.0304*** (2.74)		0.0271*** (4.81)		0.0322*** (6.16)
df_prov*SOE					-0.0026** (-2.52)	
df_city*SOE						-0.0028** (-2.38)
Size	5.2935*** (23.77)	5.2857*** (23.66)	3.5257*** (25.71)	3.5212*** (25.69)	4.3607*** (36.83)	4.3293*** (36.53)
Lev	-12.5024*** (-9.34)	-12.8416*** (-9.62)	-4.6051*** (-6.22)	-4.6929*** (-6.33)	-7.7277*** (-11.60)	-7.9003*** (-11.85)
ROA	113.3968*** (24.91)	114.3704*** (25.16)	88.1243*** (49.46)	88.0837*** (49.42)	91.5882*** (51.38)	91.7884*** (51.48)
Growth	-0.4535 (-0.88)	-0.4741 (-0.92)	-0.8009*** (-3.27)	-0.8054*** (-3.29)	-0.8020*** (-3.43)	-0.8020*** (-3.42)
Board	0.3477 (0.32)	0.4006 (0.37)	1.1015* (1.81)	1.1823* (1.93)	1.2877** (2.33)	1.2728** (2.30)
TobinQ	0.8750*** (4.09)	0.8762*** (4.10)	0.0025 (0.03)	-0.0125 (-0.14)	0.2803*** (3.31)	0.2627*** (3.10)
FirmAge	-1.0003 (-1.22)	-0.7421 (-0.90)	1.8189*** (5.29)	1.8449*** (5.35)	1.6466*** (4.90)	1.6549*** (4.91)
Constant	-99.8202*** (-16.74)	-97.0051*** (-16.36)	-69.6072*** (-20.15)	-69.4577*** (-20.19)	-88.5589*** (-29.26)	-86.4618*** (-28.74)
Observations	5,468	5,468	10,230	10,230	15,698	15,698
R-squared	0.383	0.382	0.362	0.362	0.358	0.358
Industry FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6. Conclusions and policy implications

Corporate Social Responsibility (CSR) is an important part of sustainable social development, and the increasing development of digital finance may have a profound impact on CSR. This paper conducts an empirical study around this issue. It is found that the development of digital finance promotes to a large extent the enhancement of the ability of enterprises to fulfill their social responsibility, and this conclusion still holds after a series of robustness tests such as endogeneity treatment. Further in-depth exploration of its mechanism of action reveals that digital finance frees up more resources for enterprises by innovating financial services, especially optimizing the financing environment of enterprises, effectively alleviating their financing difficulties, and enhancing their investment efficiency. This enables enterprises to pay more attention to investment in social responsibility, such as environmental protection, community construction and employee well-being, while pursuing economic benefits, thus strongly promoting the overall progress of corporate social responsibility. In addition, the study also finds that there is significant heterogeneity in the impact of digital finance, and the degree of marketization has an enhancing effect on the effect of digital finance on CSR. In regions with a higher degree of marketization, the digital financial system is more mature, providing a more efficient resource docking mechanism for enterprises, which further motivates enterprises to fulfill their social responsibility more consciously and deeply in the process of enhancing their competitiveness. Moreover, the impact of digital finance on non-state-owned enterprises is more significant.

The research of this paper has strong policy implications and practical value, based on the findings of this paper, this paper puts forward the following policy recommendations.

First, build inclusive digital financial system to strengthen corporate social responsibility. In the face of the current regional differences in the development of digital finance in China, the primary policy recommendation lies in building a comprehensive digital financial infrastructure to ensure that enterprises in less developed regions also have access to equal financial service opportunities. The government should focus on investing in expanding the coverage of digital networks to enhance the accessibility and convenience of financial services, especially in areas where SMEs and non-state-owned enterprises are concentrated. At the same time, through the introduction of a series of inclusive policies, such as the establishment of special support funds, the provision of low-interest loans or subsidies, and other measures, it should encourage and guide various types of enterprises to apply digital financial technology to improve their financing plight, in particular to apply such financial tools to green projects, public welfare undertakings, and other areas of social responsibility, so as to drive them to respond positively to social and environmental needs while pursuing economic benefits. In order to further enhance the skills and awareness of enterprises in the application of digital finance, systematic education and training activities should be organized to enable enterprise managers and practitioners to become familiar with the use of digital financial products and understand how to apply these tools to the financing and management of socially responsible projects. At the policy level, the use of digital financial tools by enterprises in fulfilling their social responsibility should be incorporated into the regulatory and assessment system, and the power of social supervision should be strengthened through transparency and information disclosure mechanisms, so as to encourage enterprises to strike a balance between economic performance and social benefits when utilizing digital financial resources.

Second, legislative reform and regulatory innovation to promote a responsible digital finance ecosystem. In order to ensure that enterprises effectively fulfill their social responsibility in embracing digital finance, policymakers need to strengthen the legal system and regulatory innovation. First, social responsibility provisions related to digital finance should be added to the existing financial regulatory framework, clearly stipulating that enterprises must comply with the principles of sustainable development and social responsibility when conducting online financial business, with particular attention to issues such as data security, protection of consumers' rights and interests, and fair trade. Second, promote the digital upgrading of the CSR reporting system, requiring enterprises to regularly publish their specific actions, inputs and achievements in social responsibility

through digital platforms, so as to facilitate timely tracking and evaluation of corporate behavior by stakeholders. It is also crucial to establish incentive-compatible mechanisms, i.e., to positively guide enterprises to pay more attention to and practice social responsibility in market competition by granting corresponding policy concessions, such as tax breaks and upgraded credit ratings, to enterprises that have performed well in the field of digital finance and have actively fulfilled their social responsibility.

Third, cross-sectoral collaborative governance and standardization will lead to the healthy development of the industry. To realize the effective integration of digital finance and CSR, it is necessary for the government, industry associations and all sectors of society to participate in the formation of a cross-sectoral collaborative governance system. Financial regulators should work closely with other social administrations to jointly design and implement a set of comprehensive and scientific evaluation indexes, taking into account the characteristics of digital finance, and incorporate the performance of corporate social responsibility into the quality and risk assessment system of digital financial services. In view of the rapid development of the digital finance industry, it is necessary to establish a strict market access and exit mechanism, and to make the past performance of enterprises in terms of social responsibility one of the criteria for measuring whether or not they have good operational qualifications. In addition, industry associations and leading enterprises are encouraged and supported to initiate and implement industry self-regulation and standardization, establish and disseminate best practice models for the integration of digital finance and social responsibility, and gradually shape a new digital finance ecosystem that can promote economic transformation and upgrading as well as deeply practice social responsibility. Through the above measures, it is expected that a CSR system closely integrated with digital finance will be generally established in all regions and types of enterprises in China, promoting the sustainable and harmonious development of China's economy and society.

References

- [1] Wang Haimei, Lv Xiaojing, Lin Lianfa. The impact of foreign equity participation and executive and institutional shareholding on corporate social responsibility--an empirical study based on Chinese A-share listed companies [J]. Accounting Research, 2014, (08): 81-87+97.
- [2] Zhou, J., Yuan, D. L., Ma, Y. F. Does the tone of MDA influence the fulfilment of CSR by corporations? --Based on the perspective of information increment and impression management [J]. Journal of Management, 2021, 34(06): 88-107. DOI: 10.19808/j.cnki.41-1408/F.2021.0046.
- [3] Zhang Xiumin, Yang Lianxing, Gao Yunxia et al. What affects the use of rhetorical language in social responsibility reports? [J]. Accounting Research, 2019, (06): 20-26.
- [4] Zhu Le, Chen Cheng. Research on the impact of executive team heterogeneity on corporate social responsibility performance under the perspective of relational embeddedness [J]. Journal of Management, 2020, 17(09): 1318-1326.
- [5] Feng Yuting, Li Junlin, Guo Xuemeng et al. "The Impact of Institutional Investors' Shareholding on Corporate Social Responsibility [J]. Finance and Economy, 2021(06): 75-83. DOI: 10.19622/j.cnki.cn36-1005/f.2021.06.009.
- [6] Jin Xiao Cui. Does corporate culture affect CSR? --Empirical evidence from Chinese listed companies in Shanghai [J]. Accounting Research, 2017, (02): 56-62+97.
- [7] Yang Lu, Zhenyan Liu, Tongli Ding. Research on the impact of corporate governance on corporate social responsibility [J]. Business Accounting, 2018, (24): 44-49.
- [8] Zhang Zhengyong, Jili, Mao Hongtao. Does Corporate Governance Affect Social Responsibility Information Disclosure? --Empirical Evidence from Social Responsibility Reports of Listed Companies in China [J]. Economic Jingwei, 2012, (06): 107-111. DOI: 10.15931/j.cnki.1006-1096.2012.06.021.
- [9] Wang Haibing, Liu Sha, Han Bin. The Impact of Internal Control, Financial Performance on Corporate Social Responsibility - An Empirical Analysis Based on A-share Listed Companies [J]. Taxation and Economy, 2015, (06): 1-9.

- [10] Li Xinrong, Meng Mengmeng, Lei Jiachuan. Research on the impact of geographical distance on corporate social responsibility [J]. Journal of Management, 2022,19(02): 254-262.
- [11] Tian Lihui, Wang Kodi. The "Masking Effect" of Social Responsibility Disclosure and Crash Risk of Listed Companies: A DID-PSM Analysis from Chinese Stock Market[J]. Management World, 2017, (11): 146-157. DOI: 10.19744/j.cnki.11-1235/f.2017.11.011.
- [12] Li Xiuyu, Li Qianwen, Shi Yaya. A study on the impact of media monitoring on social responsibility report forensics [J]. Economic and Management Review, 2019, 35(06): 81-92. DOI: 10.13962/j.cnki.37-1486/f.2019.06.008.
- [13] Lu Yue, Liu Chunlin. Impact of Expected Performance Feedback on Corporate Social Responsibility Behaviour - Based on Stakeholder Perspective [J]. Economic and Management Research, 2018, 39(05): 78-89. DOI: 10.13502/j.cnki.issn1000-7636.2018.05.008.
- [14] Li Zhenren, Wang Yanyu, Shi Wenhua. The Impact and Performance Analysis of Negative Records on Corporate Social Responsibility [J]. Management Review, 2020, 32(09): 239-250. DOI: 10.14120/j.cnki.cn11-5057/f.20200914.006.
- [15] Zhang Xiumin, Yang Lianxing, Gao Yunxia et al. What affects the use of rhetorical language in social responsibility reports? [J]. Accounting Research, 2019, (06): 20-26.
- [16] Zhang Xun, Wan Guanghua, Zhang Jiajia et al. Digital economy, inclusive finance and inclusive growth [J]. Economic Research, 2019, 54(08): 71-86.
- [17] Zhang Xun, Yang Tong, Wang Chen et al. Digital financial development and residents' consumption growth: theory and practice in China [J]. Management World, 2020, 36(11): 48-63. DOI:10.19744/j.cnki.11-1235/f.2020.0168.
- [18] Huang Zhuo, Shen Yan. Digital financial innovation promotes high-quality economic growth [J]. New Finance Review, 2019, (04): 108-124.
- [19] Teng Lei, Ma Degong. Can digital finance promote high-quality development? [J]. Statistical Research, 2020, 37(11): 80-92. DOI: 10.19343/j.cnki.11-1302/c.2020.11.007.
- [20] Tian Ge, Zhang Xun. Digital economy, non-farm employment and social division of labour [J]. Management World, 2022, 38(05): 72-84. DOI: 10.19744/j.cnki.11-1235/f.2022.0069.
- [21] Huang Yiping, Huang Zhuo. Digital financial development in China: present and future[J]. Economics (Quarterly), 2018,17(04): 1489-1502. DOI: 10.13821/j.cnki.ceq.2018.03.09.
- [22] Fu Qiuzi, Huang Yiping. The Heterogeneous Impact of Digital Finance on Rural Financial Demand-Evidence from China Household Finance Survey and Peking University's Digital Financial Inclusion Index [J]. Financial Research, 2018, (11): 68-84.
- [23] Wu Yu, Li Chengshun, Li Xiao et al. Research on the impact and mechanism of digital financial development on traditional private lending market [J]. Management World, 2020, 36(10): 53-64+138+65. DOI: 10.19744/j.cnki.11-1235/f.2020.0153.
- [24] Wu Yu, Li Xiao, Li Jie et al. Digital financial development and household financial asset portfolio effectiveness [J]. Management World, 2021, 37(07): 92-104+7. DOI: 10.19744/j.cnki.11-1235/f.2021.0094.