The Impact of Corporate ESG Performance on the Cost of Debt Financing -- An Empirical Test Based on A-Share Listed Firms

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Abstract. With the transformation of China's economy from high-speed development to high-quality development, green development has become a basic requirement for high-quality economic development, and ESG has gradually become an important indicator for measuring corporate sustainable development. Based on the annual data of 1970 listed companies in Shanghai and Shenzhen A-shares from 2015-2022, this paper empirically examines the impact of firms' ESG performance on the cost of debt financing. The results show that companies with better ESG performance have lower debt financing costs. Further analysis shows that the impact of ESG performance on debt financing costs is more significant for non-state-owned enterprises.

Keywords: ESG performance, Cost of debt, Non-governmental company.

1. Introduction

1.1. Background

The ESG concept originated in the 1970s, when the challenges facing the international community and the sustainability of environmental resources prompted international organizations to focus on it. Against this backdrop, the United Nations Environment Programme Finance Initiative (UNEP FI) emerged, emphasizing the central role of environmental, social and corporate governance (ESG) factors in the valuation of companies in the capital markets. Subsequently, international organizations and investment institutions have continued to explore and expand ESG concepts, and introduced diverse valuation criteria and investment tools. These efforts have made ESG an important reference for mainstream investment institutions, such as national sovereign investment funds and pension funds, when formulating investment strategies. Under the ESG investment framework, investors actively fulfil their social responsibilities while pursuing economic returns, contributing to the sustainable progress and development of society.

In recent years, the change of the main contradiction in Chinese society has promoted the close intertwining of the construction of ecological civilisation and economic development, and the Chinese government has adhered to the orientation of green development, focusing on promoting the modernization of the national governance system and capacity. Driven by this shift, China's economy has achieved a smooth transition from high-speed growth to high-quality development. In addition, in order to further implement the fundamental principle of sustainable development and the long-term vision of building a community of human destiny, the Chinese government has set an ambitious goal of reaching peak carbon and carbon neutrality by 2020, which marks a major shift in the country's overall development strategy. In order to achieve this goal, the financial market has been given an important mission to play a guiding role in resource allocation by promoting enterprises to improve their governance structure, compliance and green and low-carbon development. At the same time, this transformation also requires enterprises to actively introduce and learn from new development concepts and adopt new models in environmental protection and social responsibility. By adopting new technologies and processes, optimising production processes and reducing pollution emissions, enterprises can not only enhance their competitiveness, but also contribute to society and the environment.

Therefore, the ESG concept coincides with China's sustainable development strategy of innovative development, co-ordination and progress, green environmental protection, openness and co-operation,

and win-win sharing, and is in line with the national strategic layout of accelerating the realization of the "dual-carbon" goal. This consistency is not only reflected in the macro policy direction, but also provides a quantifiable and operable management framework for enterprises to achieve low-carbon transformation. If an enterprise's ESG performance is poor, it may exacerbate its risk exposure and even threaten its survival and long-term development. In this scenario, will banks, as representatives of creditors, seek higher risk premiums as compensation for such ESG deficiencies?

Analyzed from the theoretical level, the impact of ESG performance on the cost of debt financing is uncertain. Based on stakeholder theory and resource dependence theory, enterprises actively fulfilling their social and environmental responsibilities are conducive to reducing debt financing costs. According to stakeholder theory, enterprises should comprehensively consider the interests of multiple stakeholders in the course of operation, rather than merely pursuing the maximization of shareholder wealth. In addition, enterprises also need to focus on their social benefits and pursue the harmonious symbiosis of economic benefits and social responsibility [1]. Enterprises that pay sufficient attention to environmental and social responsibility generally have a lower propensity for moral hazard and adverse selection, a posture that greatly enhances the trust and confidence of stakeholders. This deep relationship of trust not only helps to reduce the potential risk of corporate default, but also effectively alleviates the limitations and constraints in the financing process. Therefore, the importance of corporate environmental and social responsibility not only helps to build its brand image and reputation, but also positively affects the economic performance and financing environment. Further, based on the resource dependence theory, increased corporate investment in social and environmental responsibility can fulfil the expectations and needs of stakeholders, including creditors. This strategy helps firms to build strong partnerships and thus obtain more favourable debt financing conditions [2, 3]. In this way, enterprises can further reduce the cost of debt financing and achieve sustainable development goals.

However, trade-off and agency theories suggest an alternative view, which argues that excessive investment by firms in environmental and social responsibility may have a negative impact on their financial performance, thereby exacerbating the constraints and increasing the cost of debt financing, and posing an obstacle to corporate debt financing. The trade-off theory emphasizes that firms need to fully weigh the different levels of interest when allocating resources in order to achieve the optimal allocation of resources. If an enterprise over-invests resources in social and environmental responsibility, it is likely to lead to the crowding out of resources for the enterprise's core projects, which in turn weakens its market competitiveness, reduces profitability, and leads to an increase in the cost of capital [4]. According to agency theory, there may be an inconsistency of interests between management and owners of the enterprise. In this case, management may overinvest in CSR and environmental responsibility projects for various personal motives. Controlling shareholders may use the pursuit of CSR and environmental responsibility as a front, but in fact engage in improper transfer of corporate assets to satisfy their personal or group interests. Such behaviour not only undermines the truthfulness and transparency of corporate accounting information, but also weakens the solvency of the enterprise, which undoubtedly exacerbates the concerns of creditors and leads to a further rise in the cost of debt financing.

In the current empirical research, a large amount of literature [5-7] focuses on exploring the impact of a single dimension of E (environment), S (society) or G (governance) on the cost of corporate debt financing, and only a few studies [8-10] combine the three dimensions to comprehensively assess their impact on the cost of corporate debt financing. In addition, the construction of China's ESG indicator system is still at an early stage. This status quo has led to the existing research literature focusing mainly on samples of firms from developed countries in Europe and the United States, while in-depth exploration of the relationship between Chinese firms' ESG performance and the cost of debt financing is still insufficient. The shortcomings in this area of research limit our comprehensive understanding of the impact of CSR and ESG practices on the cost of finance in China.

Based on the annual data of China's Shanghai and Shenzhen A-share listed enterprises from 2015 to 2022, excluding financial enterprises and samples with incomplete or abnormal financial data as

the initial research scope, this paper empirically explores the relationship between enterprises' ESG performance and their cost of debt financing by using a two-way fixed-effects regression model. To further deepen the understanding, this paper conducts a heterogeneity test from the perspective of the nature of property rights to make further analyses.

1.2. Significance

Firstly, from the perspective of enterprises, this paper studies in depth the intrinsic correlation between ESG performance and the cost of debt financing, aiming to provide a solid theoretical basis for enterprises' ESG practice. This study not only helps enterprises to comprehensively enhance their own value and reduce potential risks, but also enhances their market attractiveness and attracts more investors' attention, thus effectively alleviating the constraints and challenges faced by enterprises in the financing process.

Secondly, from the perspective of financial institutions, the practice of ESG concepts is of great significance in addressing climate risks and promoting low-carbon financing. By incorporating ESG factors in their decision-making process, investment financial institutions are able to flexibly adjust their investment structure in accordance with carbon neutral targets, actively implement low-carbon investment strategies and increase investment support for green industries. This will motivate enterprises to actively fulfil their environmental responsibility, social responsibility and corporate governance in order to obtain more financial support and lower debt financing costs, thus giving full play to the central role of the capital market in achieving carbon neutrality.

Thirdly, from the national policy and regulatory level, the in-depth study of the relationship between ESG performance and debt financing costs is highly compatible with the country's strategic goal of promoting high-quality economic development. This research highlights the important role of financial markets in optimising resource allocation, promoting the improvement of corporate governance structures, facilitating compliance and green and low-carbon development. Based on these research results, the state is expected to introduce more guiding policies on ESG investment, and increase policy support and supervision, in order to guide the market to deepen the understanding and application of ESG investment concepts, further stimulate the vitality of ESG product and service innovation, and provide strong support for the realization of sustainable development.

1.3. Innovation point

This paper focuses on considering the impact of ESG performance of A-share listed companies on the cost of debt financing with the following innovations:

Firstly, in establishing the objectives of the study, the paper does not focus on a single dimension - environmental, social or governance - and explore in isolation their independent effects on the cost of corporate debt financing. Instead, the paper adopts a more comprehensive and integrated analytical approach, considering the three dimensions of environment (E), society (S) and governance (G) as an indivisible whole, and thus provides an in-depth assessment of the overall effect of a firm's ESG performance on its cost of debt financing.

Secondly, in terms of the choice of research methodology, this paper likewise reflects a unique perspective. Unlike much of the past literature, which has focused on the impact of ESG performance on corporate performance from the perspective of shareholders, this paper chooses to start from the perspective of creditors, meticulously analysing another key dimension of the economic impact of ESG performance on corporations. Through this new research perspective, this paper endeavors to reveal how ESG performance shapes creditors' trust and investment propensity towards firms, which in turn has a substantial impact on the cost of corporate debt financing.

Thirdly, in terms of the depth and breadth of the research content, this paper conducts a more detailed and comprehensive exploration. Compared with the path of previous studies that mainly focus on the direct relationship between ESG disclosure and firms' debt financing costs, this paper not only focuses on the nature of this relationship, but further delves into the significant differences of this relationship among firms with different ownership natures. By comparing the differences in

ESG disclosure among firms with different ownership natures and how these differences affect firms' debt financing costs, this paper aims to reveal the complex relationship between ESG practices and firms' debt financing costs in different ownership contexts, and to provide a more comprehensive reference for relevant policy making and market practice.

2. Literature review

2.1. Overview of relevant theoretical foundations

Firstly, according to the stakeholder theory, enterprises should take into account the demands of multiple stakeholders, such as the Government, consumers, creditors and employees, rather than focusing only on the accumulation of shareholder wealth. Enterprises also need to pay attention to their social benefits and actively fulfil their environmental and social responsibilities. Such a holistic approach helps to reduce moral hazard and adverse selection problems in order to gain the trust of stakeholders. This trust not only helps to enhance the enterprise's reputation, but also effectively reduces the enterprise's default risk, which in turn alleviates its financing constraints.

Secondly, according to the resource dependence theory, firms will seek to reduce their over-dependence on external resource providers and look for effective strategies to ensure a stable supply of key resources. Such a strategy not only focuses on the interaction between the firm and the external environment, but also emphasises on building a more robust access to resources by satisfying the needs of stakeholders such as creditors. Thus the relationship with stakeholders can be enhanced by deepening the investment in social and environmental responsibility, which in turn can lead to more favourable conditions in the debt financing process, such as lower financing costs or longer financing terms.

Thirdly, based on the information asymmetry theory, information asymmetry is prevalent in multiple segments of market transactions, which is mainly due to the uneven distribution of information between the two parties to the transaction due to their different levels of knowledge of transaction-related information. This imbalance brings two effects. On the one hand, in order to maximise their own interests, the party with the information advantage may resort to information manipulation and other means to make decisions unfavourable to other parties, thus triggering moral hazard. On the other hand, due to information asymmetry, the information disadvantaged party is difficult to accurately assess the real situation of the borrower, tends to take a more prudent decision-making strategy, that is, to set higher than the market equilibrium interest rate of the lending conditions. In this case, the phenomenon of "adverse selection" often occurs: low-risk, high-quality customers may give up lending due to high interest rates, while high-risk customers are more active in seeking loans because they can afford higher costs. Existing research reveals that when firms and financial institutions establish strong cooperative relationships, such relationships can significantly reduce information asymmetry. This improvement helps firms to access funds more smoothly, eases financing constraints, and enhances their ability to raise funds in the debt financing market [11]. Therefore, it can be argued that a firm's level of debt financing is closely related to the degree of information asymmetry it faces.

2.2. Current status of research

2.2.1 Environment and the cost of corporate debt financing

The research of many domestic scholars shows that the environment and the cost of corporate debt financing present a negative relationship. Liu Wei (2020) took the heavy pollution industry of Shanghai A-share market as the research object from 2014 to 2017, and empirically examined that in the heavy pollution industry, the environmental regulation policy implemented by the government of the region where the enterprise is located and its debt financing cost showed a significant negative correlation [12]. The study by Huang Rong (2020) takes listed companies in the heavy pollution industry in China's A-share market between 2013 and 2017 as the object, and the empirical analysis

reveals that environmental information disclosure and financial information present a complementary relationship in information transmission, and the quality of environmental information disclosure plays a significant role in alleviating financing constraints when the financial transparency of enterprises is relatively low [13].

Not only that, the findings of a large number of studies in the foreign literature further reinforce the idea that there is a clear negative relationship between corporate environmental protection initiatives and their debt financing costs. Specifically, Gracia (2021), in their exhaustive study of 1,443 samples over the period from 2004 to 2019, explicitly identified the positive impact of ASEAN firms' sustainability performance and related environmental disclosure on their cost of debt, an analysis that reveals that ASEAN firms are able to effectively reduce their cost of debt through sustainability practices [14]. Similarly, Caragnano (2020) study on EuroStoxx600 companies found a significant positive association between these companies' efforts to reduce carbon emissions and the reduction of debt financing costs, further validating the positive effect of implementing carbon reduction strategies on debt financing costs [15]. These studies not only enrich our understanding of the relationship between the environment and corporate debt financing costs, but also provide important practical guidance for companies.

2.2.2 Social responsibility and the cost of corporate debt financing

In an extensive reading of existing academic results, scholars at home and abroad generally agree on the idea that there is an inverse correlation between CSR and its debt financing costs, i.e., an increase in a company's emphasis on social responsibility may be followed by a decrease in its debt financing costs. However, these studies differ in their angles of entry, involving multiple dimensions such as disclosure of CSR information and direct social responsibility practices.

In exploring the relationship between CSR and corporate financing, Miao (2021) conducted an in-depth research and analysis using A-share listed companies on the two major stock exchanges in Shanghai and Shenzhen between 2009 and 2018. They found that there is a significant negative relationship between the quality of CSR disclosure and the cost of debt financing [16]. Similarly, Kuo (2021) study focused on stock exchanges and their listed companies and verified that CSR disclosure safeguards enforced by accounting firms can significantly enhance the transparency of disclosure, which in turn effectively reduces the cost of debt financing for enterprises [17].

In exploring the impact of enterprises' direct fulfilment of social responsibility, Zeng Ziyi (2021) selected pharmaceutical listed companies during the period from 2017 to 2019 as a study case. The study shows that pharmaceutical companies are able to significantly reduce their debt financing costs (DEBT) by actively fulfilling their social responsibility (CSRM). This is because when a company is actively socially responsible, its social reputation and credibility are enhanced, which in turn enhances the attractiveness of external financing, making it easier for the company to achieve a reduction in the cost of debt financing [18]. In addition, Kozak's (2021) study further reveals the positive effect of corporate reduction in CO2 emission intensity on reducing debt burden [19].

2.2.3 Corporate governance and the cost of debt financing

Corporate governance, as a widely covered topic, occupies an important place in the existing domestic and international research literature. Most studies have pointed out that there is a significant negative correlation between the quality of corporate governance and the cost of corporate debt financing.

Under the perspective of management research, Zheng (2021) takes the model worker culture as a new entry point to explore in depth how executives' status as model workers affects the cost of corporate debt and analyses the mechanism behind it. The results show that the identity of executives as labour models helps to reduce the cost of corporate debt [20].

Starting from the audit governance dimension, L Gandía (2020), using a sample of Spanish SMEs, found an asymmetric effect of audit fees on the cost of debt: for firms that are voluntarily audited, higher audit fees are associated with a lower cost of debt, whereas this association is not significant for mandatory audits [21].

2.3. Review of research

After exhaustively reading and summarizing a large body of literature on the impact of environment, social responsibility and corporate governance on the cost of corporate debt financing, it is clear to observe that there is an inextricable relationship between these three and the cost of corporate debt financing. First, from an environmental perspective, the more transparent a firm's environmental information is, the lower its debt financing costs are likely to be. Not only that, but environmental measures taken by firms, such as reducing greenhouse gas emissions and lowering carbon emissions, have also been shown to be effective in reducing their debt financing costs. However, for specific industries, such as the manufacturing sector, some studies reveal a different phenomenon, i.e. there may be a positive correlation between the quality of environmental disclosure and the cost of debt financing.

Further exploring the social responsibility aspect, after careful research and analysis, it is not difficult to find that the active fulfilment of social responsibility by enterprises, either through information disclosure or actual actions, can significantly help enterprises to reduce the cost of debt financing. This finding reaffirms the positive contribution of the fulfilment of social responsibility to the economic performance of enterprises.

Finally, when exploring the relationship between examining corporate governance and the cost of corporate debt financing, it is found that scholars at home and abroad have conducted in-depth discussions from multiple dimensions, including management governance, accounting information quality, internal control, and surplus management. These studies generally indicate that optimising corporate governance structure and improving governance quality can effectively reduce the cost of corporate debt financing.

In summary, although there is a large body of literature that has separately explored the impact of each of environment, social responsibility and corporate governance on the cost of corporate debt financing, there are few studies that have combined these three to comprehensively analyse the impact of overall ESG performance on the cost of corporate debt financing. Therefore, this study aims to fill this academic gap by exploring in-depth the correlation between ESG performance and debt financing costs to provide new perspectives and strategies for firms to achieve more robust economic development.

3. Research design

3.1. Research hypothesis

Good ESG performance is conducive to lowering the cost of debt financing. Firstly, good ESG performance has a positive impact on business operations. Enterprises continue to optimize ESG practices and add more environmental features to their products, which not only conforms to socially responsible consumer values, but also creates a unique competitive advantage for the enterprise, which in turn enhances the added value of the products, effectively reduces the potential financial risks [22], consolidates the trust and loyalty between customers and suppliers, and guarantees the soundness and abundance of the enterprise's cash flow, which provides a strong support for the enterprise's debt repayment. strong support for debt repayment.

On the other hand, good ESG performance plays the role of an "umbrella" [23] and reduces the risk of financial distress. Companies with good ESG performance build a positive brand image and accumulate valuable reputational capital [24], which plays a crucial role in coping with internal and external unfavourable factors. When the external environment is challenged, it is easier for a firm to gain support from its stakeholders by virtue of its good reputation, and thus to weather the storm. This reputational capital not only enhances the firm's resilience, but also wins valuable trust resources for the firm.

In summary, this paper proposes the research hypothesis.

H1: The better the ESG performance, the lower the cost of corporate debt financing.

3.2. Variable Selection and Model Setting

3.2.1 Variable selection

(1) Explained variable: COD = interest expense/interest-bearing debt.

(2) Explanatory variables: the core explanatory variable is the ESG performance of the firms, and the quantitative indicators of this performance are constructed and assigned scores based on the CSI ESG indicator system. The CSI ESG rating system classifies corporate ESG performance into nine grades from C to AAA. For the purpose of the study, these nine grades are quantified by assigning values from 1 to 9 to grades C to AAA, respectively.

(3) Control variables: in constructing the model, reference was made to existing studies and a number of control variables that may have an impact on the cost of debt financing were included. On the financial side, factors such as gearing ratio (DTA), financial leverage (LEV), return on total assets (ROA), cash flow from operating activities (CF), and current ratio (QUICK) are considered. In addition, corporate governance factors are also taken into account, especially the proportion of the first largest shareholder's equity (FIRST/%) and the proportion of independent directors (INDEP/%). Also, ownership factors such as the nature of ownership (PRO) are used as control variables to ensure the comprehensiveness and accuracy of the model.

3.2.2 Modelling

In order to test the actual effect of firms' ESG performance on the cost of debt financing and thus verify hypothesis H1, this paper constructs regression model (1):

$$\mathrm{COD}_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_i \sum Controls_{i,t} + Ind + Year + \varepsilon$$

COD is used as a measure of the cost of debt financing, ESG is used to denote the ESG performance of the firms, and Controls covers all the control variables included in the model; i and t denote firms and years, respectively, and denotes ε random error term.

4. Empirical results and analyses

4.1. Descriptive statistics

Table 1. Results of descriptive statistics

Number	Scheme 1	Scheme 2	Scheme 3	Scheme 4	Scheme 5
VARIABLES	Sample Size	Average Value	Standard deviation	Minimum value	Maximum values
ESG	15,760	4.035	1.135	1	8
COD	15,760	0.0201	0.0144	0.000119	0.0636
LEV	15,760	0.323	0.217	0.0190	0.864
CF	15,760	0.0501	0.0680	-0.156	0.251
ROA	15,760	0.0328	0.0652	-0.227	0.228
QUICK	15,760	2.021	2.307	0.00592	80.66
DTA	15,760	0.482	1.472	0.00836	178.3
FIRST/%	15,760	33.82	14.91	1.840	89.99
INDEP/%	15,760	37.64	5.776	16.67	80
pro	15,760	0.480	0.500	0	1

Table 2 presents the results of descriptive statistics for the variables in question. With respect to the cost of debt financing (COD) of firms, it has the highest value of 0.0636, the lowest value of 0, and the mean value of 0.0201 with a standard deviation of 0.0144, which reveals the existence of some of the firms in the sample that are facing significantly high cost of debt financing. In addition, the mean value of firms' ESG performance (ESG) reaches 4.035, with a minimum value of 1 and a maximum value of 8, and a standard deviation of 1.135, which reveals significant differences in ESG performance across firms. The sample situation regarding the control variables will not be listed in detail.

4.2. Correlation analysis

Next, an exhaustive correlation test was conducted for all variables based on the data from 2015 to 2022, aiming to provide insights into the strength of the linear association between the variables. After carefully analysing the values in Table 3, it was found that the correlation coefficient between the cost of debt financing and firms' ESG performance is -0.167 and significant at the set 1% significance level, which initially indicates an inverse linear association between firms' ESG performance and the cost of debt financing. In addition, it is also observed that there is a positive trend between the cost of debt financing and financial leverage and gearing ratio, with correlation coefficients of 0.25 and 0.068, respectively, and which are significant at the 1% significance level, while there is a negative correlation with cash flow from operations, return on total assets, current ratio, and percentage of ownership by the largest shareholder, with correlation coefficients of -0.034 , -0.261, -0.211 and -0.096, and also significant at 1% significance level.

Table 2. Results of correlation analysis

	ESG	COD	LEV	CF	ROA	QUICK	DTA	FIRST	INDEP	pro
ESG	1									
COD	-0.167***	1								
LEV	0.080***	0.250***	1							
CF	0.110***	-0.034***	-0.122***	1						
ROA	0.206***	-0.261***	-0.279***	0.430***	1					
QUICK	0.022***	-0.211***	-0.396***	-0.019**	0.145***	1				
DTA	-0.038***	0.068***	0.133***	-0.00900	-0.095***	0.082***	1			
FIRST	0.123***	-0.096***	0.117***	0.114***	0.138***	0.025***	0.0110	1		
INDEP	0.070***	0.00200	0.020**	-0.00300	-0.019**	0.019**	0.0030	0.050***	1	
pro	0.090***	0.00500	0.283***	-0.035***	-0.070***	0.112***	0.019**	0.265***	0.0090	1

Note: *** p<0.01, ** p<0.05, * p<0.1 indicate significance at 1%, 5%, 10% level respectively.

4.3. Analysis of regression results

Table 3. Analysis of main regression results

	Scheme 1	Scheme 2
VARIABLES	COD	COD
ESG	-0.002***	-0.001***
	(-20.58)	(-15.32)
LEV		0.017***
		(27.00)
CF		0.013***
		(7.90)
ROA		-0.041***
		(-22.30)
QUICK		-0.001***
		(-11.26)
DTA		0.000
		(1.51)
FIRST		-0.000***
		(-14.33)
INDEP		0.000***
		(3.02)
pro		-0.002***
		(-8.48)
Constant	0.036***	0.035***
	(35.63)	(30.37)
Observations	15,760	15,748
R-squared	0.093	0.227
Industry FE	YES	YES
year FE	YES	YES

Note: *** p<0.01, ** p<0.05, * p<0.1 indicate significance at 1%, 5%, 10% level respectively.

Table 3 details the results of the regression analyses of the impact of firms' ESG performance on the cost of debt financing. Specifically, column (1) presents the regression results controlling for industry and year fixed effects, while column (2) builds on this by further incorporating control variables and controlling for both year and industry fixed effects. The results of the regression analyses consistently show that the regression coefficients for ESG are all negative at the set 1% significance level, which significantly reveals a negative relationship between firms' ESG performance and their debt financing costs. Based on the above analyses, hypothesis H1 is fully and effectively tested.

4.4. Robustness Tests

Table 4. Robustness check

	Scheme 1	Scheme 2
VARIABLES	Cost1	Cost2
ESG	-0.002***	-0.003***
	(-12.70)	(-6.33)
LEV	0.026***	-0.019***
	(24.51)	(-6.40)
CF	0.005*	0.029***
	(1.90)	(3.64)
ROA	-0.050***	-0.062***
	(-16.08)	(-7.05)
QUICK	-0.004***	0.000
	(-53.86)	(0.15)
DTA	-0.000*	0.001***
	(-1.73)	(3.76)
FIRST	-0.000***	-0.000
	(-11.71)	(-0.15)
INDEP	0.000***	0.000
	(3.00)	(0.65)
pro	-0.003***	-0.004***
	(-8.42)	(-3.63)
Constant	0.035***	0.074***
	(17.81)	(14.10)
Observations	15,748	12,534
R-squared	0.341	0.037
Industry FE	YES	YES
year FE	YES	YES

Note: *** p<0.01, ** p<0.05, * p<0.1 indicate significance at 1%, 5%, 10% level respectively.

In order to verify the robustness of the model, this paper adopts the method of changing the explanatory variables and selects two different alternative indicators for regression analysis. Firstly, the original "ratio of interest expense to interest-bearing debt" is replaced by "ratio of corporate finance costs to total liabilities at the end of the period" (Cost1) as the explanatory variable, and the corresponding regression results are presented in the first column of Table 4. The analysis shows that the regression coefficient of ESG performance and cost of debt financing is -0.002, which is significant at 1% level of significance, thus confirming the significant negative relationship between the two.

Subsequently, "the share of firms' interest expense to the average of the year's long and short-term liabilities" (Cost2) was further adopted as an alternative measure of the cost of debt financing, where short-term liabilities include short-term borrowings in the balance sheet, while long-term liabilities cover maturing long-term borrowings, bonds payable, long-term payables, and other long-term liabilities. The results of this regression are presented in the second column of Table 4, which shows

that the regression coefficient between firms' ESG performance and the cost of debt financing is -0.003, a negative value that is also significant at the 1% level of significance, which further validates the negative relationship between the two.

By replacing the robustness test of the explanatory variables, it is observed that the regression results of the model remain consistent with the original model, which fully proves the robustness of the model.

4.5. Heterogeneity test

In delving into the impact of ESG performance on the cost of debt financing, the potential impact of the nature of firms' property rights cannot be ignored. First, the nature of property rights may have a significant impact on firms' motivation to improve their ESG performance. Specifically, state-owned enterprises (SOEs) are more likely to be orientated by government policies due to their special position in the dual role of politics and economy. Therefore, compared to non-SOEs, SOEs may respond more actively to national policies and calls to invest more in ESG and demonstrate their positive stance on social responsibility. However, when improving their ESG performance, non-SOEs tend to consider it more based on economic interests, viewing it as a strategic investment aimed at improving environmental performance, social responsibility and corporate governance quality, and thus achieving higher economic returns, lower operational risks and alleviation of financing constraints. In this context, the dampening effect of ESG performance on the cost of debt financing may be more pronounced in non-state-owned firms.

Table 5. Heterogeneity analysis results

	Scheme 1	Scheme 2
VARIABLES	Governmental	Non-governmental
ESG	-0.001*	-0.004***
	(-1.95)	(-6.05)
LEV	-0.013***	-0.029***
	(-2.90)	(-5.35)
CF	0.039***	0.030**
	(4.01)	(2.35)
ROA	-0.029**	-0.075***
	(-2.32)	(-5.78)
QUICK	0.001	-0.000
	(1.08)	(-0.50)
DTA	0.007	0.001***
	(1.26)	(3.18)
FIRST	0.000	-0.000
	(1.34)	(-1.10)
INDEP	-0.000	0.000
	(-0.25)	(0.61)
Constant	0.058***	0.087***
	(8.80)	(9.42)
Observations	6,463	6,029
R-squared	0.071	0.039
Industry FE	YES	YES
year FE	YES	YES

Note: *** p<0.01, ** p<0.05, * p<0.1 indicate significance at 1%, 5%, 10% level respectively.

In addition, the nature of property rights may also affect the ability and efficiency of firms in ESG investment. As there are differences in resource access and policy support among enterprises with different property rights, these differences may directly affect the actual effectiveness and cost-efficiency of ESG investment. In the case of state-owned enterprises (SOEs), for example, although the selection of their management focuses on party awareness, moral character and political quality,

the prevalent absence of owners may lead to a lack of effectiveness in their governance structure and regulatory mechanisms, which in turn may face challenges in terms of capacity and efficiency in pursuing responsible investment. This situation may lead to a waste of corporate resources and undermine the role of ESG performance in reducing the cost of debt financing. On the other hand, however, SOEs, as an important part of the country's strategic industries, usually enjoy financial allocations or other favourable policies from the government, which helps to alleviate their financing constraints to a certain extent.

In columns (1) and (2) of Table 5, the regression results of firms' ESG performance and debt financing cost under different ownership properties are demonstrated. The observations show that the regression coefficients of ESG for both state-owned and non-state-owned firms are negative at the 1% significance level. However, further comparison reveals that the absolute value of the regression coefficients for non-state-owned enterprises is larger than that of state-owned enterprises, a phenomenon that suggests that the negative correlation between ESG performance and the cost of debt financing manifests itself more significantly in non-state-owned enterprises.

5. Conclusions and recommendations of the study

Taking China's A-share listed companies in 2015-2022 as a sample, this paper finds that corporate ESG performance is negatively correlated with the cost of debt financing, and the relationship still holds after the robustness test. The results of heterogeneity test show that the inhibitory effect of ESG performance on debt financing cost is more significant in non-state-owned enterprises.

Based on the above findings, this paper proposes the following recommendations:

5.1. Enterprise level

As far as companies are concerned, firstly, companies should further strengthen their focus on ESG practices and fully integrate ESG concepts into their strategic planning. To achieve this, companies need to increase their investment in ESG practices, including financial and other non-financial resources, to ensure the effective implementation and monitoring of ESG programmes. In addition, to meet the growing demand for ESG performance in the market, companies should actively develop and launch products and services that meet ESG standards. Second, companies should actively enhance the transparency of ESG disclosure. Specifically, enterprises should prepare and publish detailed and reliable ESG reports on a regular basis to fully disclose to stakeholders their efforts and progress in environmental, social and governance aspects. In this way, information asymmetry can be reduced, investor trust and recognition of the enterprise can be enhanced, and a more favourable financing environment can be created for the enterprise, thereby effectively alleviating financing pressure. Third, in order to ensure that the concept of ESG policy is thoroughly implemented within the enterprise, the enterprise should build a specialised ESG team and carry out systematic ESG training. Through this initiative, employees can have a more comprehensive understanding of ESG policies and actively implement the relevant concepts in their daily work. At the same time, the ESG team can also effectively promote and supervise ESG practices within the company to ensure that the company achieves sustainable operations.

5.2. Government level

The government has a crucial role to play in promoting ESG practices. First, the government should endeavour to build a set of detailed, flexible ESG standards that are tailored to the characteristics of different industries. This means tailoring ESG standards to the uniqueness of each industry and clarifying the specific content and format requirements for corporate ESG information reporting. This will greatly promote the standardisation and transparency of corporate ESG disclosure, thereby promoting the overall improvement of ESG performance of the whole society. Second, the government should further strengthen and improve the construction of ESG regulations. On the one hand, it can ensure the strict implementation of ESG practices by introducing mandatory ESG

regulations that explicitly impose severe penalties for ESG violations. On the other hand, the government can formulate a series of incentive policies, such as tax incentives and financial subsidies, in order to encourage enterprises to be more proactive in ESG practices, and jointly promote the development of the economy in a greener and more sustainable direction. Third, the government should increase its efforts to publicise ESG concepts and convey the importance and value of ESG practices to enterprises, investors and the public through various channels. By raising the level of awareness of ESG in the whole society, it will promote wider ESG practices and contribute to building a sustainable society.

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