

Corporate ESG Performance and Cost of Debt Capital

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Abstract. The impact of corporate ESG performance on the cost of debt capital is examined using A-share listed companies in Shanghai and Shenzhen from 2007 to 2021 as the research sample. The empirical results show that ESG performance has a significant negative relationship with the cost of debt capital, i.e., firms can reduce their cost of debt capital by improving ESG performance. It is further found that ESG performance has a stronger effect on reducing the cost of debt capital for non-state-owned enterprises than for state-owned enterprises; ESG performance has a more significant effect on reducing the cost of debt capital for enterprises with high quality of internal control than for enterprises with low quality of internal control; and the effect on reducing the cost of debt capital is better for enterprises with high level of external supervision than for enterprises with low level of external supervision.

Keywords: ESG Performance; Cost of Debt Capital; Nature of Ownership; Quality of Internal Control; External Supervision.

1. Introduction

In recent years, the practice of "double carbon" target has pushed China's green and coordinated development to a new level, which will play a crucial role in the economic and social development in the coming decades. In the new stage of high-quality economic development, how to achieve sustainable development has become the focus of attention of both theoretical and practical circles in recent years. What governments and societies are pursuing nowadays is not just economic growth, but the overall health, wealth and sustainable development of society. The concept of sustainable development has given rise to the concept of responsible investment, which has been gradually extended to corporate ESG performance, i.e., the three dimensions of environment, social responsibility and corporate governance, and has become an important criterion for the international community to measure the level of green and sustainable development of enterprises. In 2020, the Shenzhen Stock Exchange issued the Guidelines on the Standardized Operation of Listed Companies on the Shenzhen Stock Exchange (revised in 2020) and other documents, stipulating that listed companies are required to disclose the causes of major environmental pollution problems, the impact of environmental pollution, etc. in regular reports and other situations. Disclosure. As corporate ESG performance is increasingly valued by the government, management, investors, etc., its role in corporate efficiency improvement and risk reduction is also increasing.

The economic consequences of corporate ESG implementation have now become a focus of attention for domestic and international scholars. It has been shown that corporate ESG performance can alleviate information asymmetry (Shuai, Zhenghua, 2022; Rober et al., 2022) , suppress the risk of financial irregularities in firms (Zhao et al., 2021) , reduce the operational risk of firms (Xiaofang and Lan, Fengyun, 2021) , alleviate the financing constraints of firms (Li, Zhibin et al., 2022) , enhance the operational efficiency of firms (Huang, Jun. 2022), improve innovation performance (Wang, Zhi and Peng, Baichuan, 2023), positively impact on firm performance and value (Saygili et al., 2022; Raimo et al., 2021) . The above literature provides useful insights into the economic consequences of ESG implementation by firms, but there are few studies on the mechanisms of ESG's impact on the cost of capital, and even the small amount of literature dealing with the cost of debt capital is based on a sample of developed countries (Hamrouni et al., 2019; Dahiya and Singh, 2020), and such studies based on developing countries are currently very limited.

In view of this, this paper comprehensively reveals the impact of corporate ESG performance on the cost of debt capital by using A-share listed companies in Shanghai and Shenzhen from 2007-2021 as the research sample. Starting from corporate reputation, information asymmetry theory and

principal-agent theory, we obtain through empirical research that corporate ESG performance has a significant negative impact on the cost of debt capital. After a series of robustness tests for endogeneity problems due to omitted variables and research bias due to sample self-selection, the study findings remain robust. Meanwhile, further research finds that ESG performance has a stronger effect on reducing the cost of debt capital for non-state enterprises compared to state-owned enterprises; ESG performance has a more significant effect on reducing the cost of debt capital for enterprises with high quality of internal control compared to enterprises with low quality of internal control; and a better effect on reducing the cost of debt capital for enterprises with high level of external supervision compared to enterprises with low level of external supervision.

The marginal contributions of this paper may be as follows: first, the existing literature mainly focuses on accounting information (Zhenghua Shuai, 2022; Rober et al., 2022), firm risk (Zhao et al., 2021; Xiaofang and Fengyun Lan, 2021), firm value (Saygili et al., 2022; Raimo et al., 2021), firm efficiency (Jun Huang, 2022; Zhi Wang and Baichuan Peng, 2023) and other perspectives to examine the economic consequences of ESG implementation, less attention has been paid to its important role on the cost of debt capital of enterprises. This paper examines the impact of corporate ESG practices from the perspective of the cost of debt capital, enriches the research related to the economic consequences of ESG practices, reveals the role of ESG practices in reducing the cost of debt capital, and promotes enterprises to actively disclose ESG information while fulfilling their social responsibility.

Second, the current literature on factors influencing firms' cost of debt capital focuses on financial environment (Yuan Fangjian et al., 2013; Wang Minghu and Zheng Xingdong, 2013), firm characteristics (Wang Ping and Lanjing, 2016; Li Guangzi and Liu Li, 2009; Baas and Schrooten, 2006; Mei Bo, 2017), corporate governance (Yuan Fangjian et al; Huang et al, 2020) and managerial characteristics (Dezhu Ye and Xiaolin Li, 2017) perspectives. In this paper, we explore non-financial information to enrich the research on the factors influencing the cost of debt capital, and combine the sustainable development framework in the context of the "double carbon" target with the perspective of corporate debt financing constraints to provide a theoretical basis and empirical support for reducing the cost of debt capital.

The subsequent parts of this paper are organized as follows: the second part is the literature review and research hypothesis, the third part is the research design, the fourth part is the empirical results and analysis, the fifth part is further analysis, and finally, the conclusions and implications of this paper are given.

2. Literature Review and Research Hypothesis

2.1 Economic Consequences of ESG Implementation

The economic consequences of corporate ESG performance have nowadays become the focus of domestic and international scholars. On the one hand, some scholars believe that ESG implementation can promote corporate development. Rajesh et al. (2020) suggests a positive relationship between corporate ESG scores and corporate sustainability performance; and Gunnar et al. (2015) combine previous academic inquiry to suggest that about 90% of studies obtained a non-negative relationship between ESG and CFP (corporate financial performance), where the vast majority of studies have positive results. Some domestic scholars have also pointed out that ESG ratings can reduce information risk and operational risk of companies and thus improve operational performance (Xiaofang and Lan Fengyun, 2021) and improve innovation performance and promote sustainable development (Wang, Zhi, and Peng, Baichuan, 2023).

On the other hand, some scholars argue that ESG implementation may be detrimental to firm growth due to cost effects and other reasons. Li Sihui (2022), using data from A-share listed companies as an experimental basis, suggests that the existing ESG implementation in China is not conducive to firm growth; and that firms that are forced to implement ESG suffer more negative effects on their growth ability. And over-investing funds in environmental and socially responsible

activities leaves fewer resources for investment and reduces investment efficiency (Broadstock et al., 2019).

Other scholars argue that ESG implementation does not have a single impact on firms; some scholars argue that ESG practice has a positive lag effect on long-term firm value although it reduces firm value initially (Yi lingue et al., 2022); some scholars also argue that there is a U-shaped relationship between ESG disclosure and green innovation performance of heavy polluters thus affecting the development of firms (Li Huiyun et al., 2022). Buchanan et al. (2018) proposed that CSR tends to have greater corporate value before a financial crisis and more losses during a financial crisis. In summary, the economic consequences of ESG implementation can vary across the life cycle of a firm, which may be one of the main reasons why the existing findings are controversial.

2.2 Factors Influencing the Cost of Debt Capital of Enterprises

The cost of capital is an important measurement factor for enterprises to conduct financing management, investment management and operation management, and also has a significant impact on the decision of enterprise capital structure. The cost of debt capital, as one of the important components of the comprehensive cost of capital of an enterprise, has received the attention of many scholars at home and abroad.

In terms of macro environment, when the economy is growing, it tends to favor lower cost of debt capital (Wang, M.H. and Zheng, J., 2016); also regions with faster economic development tend to have lower cost of debt financing (Wang, M.H. and Zheng, X.D., 2013). Chen (2010) suggests that the cyclical and uncertainty of macroeconomic changes affects firms' financial leverage, based on the assumption that trade-off theory holds. This, in turn, acts on their cost of debt capital. In contrast, when there is an economic recession, on the one hand, firms' solvency decreases and creditors demand higher interest rates, thus increasing the cost of debt capital (Bernanke and Gertler, 1989); on the other hand, firms' equity financing is restricted and more firms prefer debt financing (Korajczyk and Levy, 2003).

In terms of the mesoscopic environment, in terms of institutions, some scholars suggest that the cost of debt capital of firms has decreased after the implementation of mixed ownership reforms, as the shareholding of private shareholders has increased (Wang, P. and Lan, J., 2016); in terms of industry development, mature industries have higher interest rates and greater cost of debt capital (Mei Bo, 2017); in terms of scale, banks have higher supervision costs for SME borrowing, so interest rates are higher, i.e., the cost of debt capital is higher (Baas and Schrooten, 2006). In terms of financial environment, a good financial ecology helps to enhance the risk-revealing function of external audit, which allows firms to obtain a lower cost of debt capital (Yuan Fangjian and Wang Mei, 2013).

In terms of the micro environment, there are a great number of factors that affect the cost of debt capital of firms. In terms of firm nature, it has been suggested that privately listed firms bear higher debt financing costs compared to non-privately listed firms (Guangzi Li and Li Liu, 2009) The private firms tend to use more expensive commercial credit for financing and have a higher cost of debt capital (Brandt and Li, 2007). Private firms tend to use more expensive commercial credit for financing and have higher debt capital costs (Brandt and Li, 2007). In terms of the degree of information disclosed by firms to the outside world, it has been suggested that the disclosure of internal control deficiencies by firms significantly increases the cost of debt capital (Wang Yilin and Wang Aijun, 2014); and Wang Jianling et al. (2016) also propose that the improvement in the quality of social responsibility reports can significantly reduce the cost of debt capital. The managers of a firm also have an impact on the cost of debt capital of the firm, and Dezhu Ye and Xiaolin Li (2017) propose that CEO financial experience is significantly and positively related to the cost of debt capital.

In summary: On the one hand, the cost of debt capital, as an important part of the investment decision and capital structure of enterprises, is of great significance to the economic activities of enterprises. The current research on the factors influencing the cost of debt capital has been abundant, and scholars have mainly conducted in-depth studies from the perspectives of industry environment, corporate governance, corporate characteristics, and managerial characteristics, but neglected the

impact of active corporate social responsibility, which can improve corporate reputation, reduce the degree of information asymmetry, and lower agency costs. Studying the impact of enhanced corporate ESG performance on the cost of debt capital helps to deepen our understanding of the cost of debt capital. On the other hand, research related to corporate ESG performance is increasing day by day. Although existing studies have found the impact of ESG performance on corporate risk, efficiency and value, they lack further analysis of capital structure. Capital structure, as an important choice for companies to make financial decisions, depends on the business risk, business efficiency and corporate value of companies. Therefore, studying the relationship between corporate ESG performance and the cost of debt capital from the perspective of capital structure can provide theoretical support for enterprises to make relevant decisions.

2.3 Corporate ESG Performance and Cost of Debt Capital

The impact of corporate ESG performance on the cost of debt capital is mainly in the following three aspects: First, from the perspective of corporate reputation and value, corporate ESG performance is conducive to improving corporate reputation and image and reducing the cost of debt capital. Actions such as actively fulfilling social responsibility, disclosing social responsibility reports, and improving ESG performance can effectively enhance corporate image and reputation, strengthen the trust and goodwill of investors and more stakeholders, and increase corporate access to key resources (Yang Daoguang et al., 2017) ; bring human capital advantage and reduce the cost of human resource replacement for companies (Wang, Zhi and Peng, 2022); enhance customer loyalty and trust (Atif and Ali, 2021), improve the financial performance of the company (Saygili et al., 2022), while reducing the business risk of the company and maintaining the stability of performance (Ye Kangtao et al., 2010). Above all, the implementation of ESG can enhance the reputation of a firm, improve its profitability, bring potential opportunities for the firm, reduce the cost of the firm, reduce the business risk of the firm, and thus reduce the cost of debt capital of the firm.

Secondly, from the perspective of information asymmetry, the implementation of ESG can reduce the degree of information asymmetry, thus reducing the cost of debt capital of enterprises. The high cost of debt capital is largely due to the low information transparency that makes creditors unable to accurately judge the value of the enterprise and reluctant to provide funds or raise interest rates for the sake of capital security. As a kind of non-financial information, ESG performance of enterprises can make up for the shortage of traditional financial information, so that creditors have a better understanding of enterprises' operating conditions and the required cost of capital decreases (Feng and Wu, 2021), which sends positive signals to the capital market (Qiu, Muyuan and Yin, 2019) and influences the credit rating of enterprises by rating agencies and thus affects the cost of debt capital of enterprises. . In addition, companies with better ESG performance tend to have stronger willingness to disclose information and higher quality of information disclosure, which can more effectively alleviate the information asymmetry problem (Shuai and Zhenghua, 2022) ,which is more helpful for firms to reduce the cost of debt capital (Wang et al., 2016).

Again, from the perspective of corporate governance, corporate ESG performance helps mitigate agency conflicts and thus reduces the cost of debt capital. Disclosure of ESG information can reduce the principal-agent problem brought about by information asymmetry and increase two-way communication between shareholders and management (Qiu, Muyuan, and Yin, Hong, 2019; Cui et al., 2018); reducing the agency costs and monitoring costs between shareholders and management. Meanwhile, firms with better ESG performance tend to have better governance mechanisms that can effectively monitor and discipline management behavior (Shuai, Zhenghua, 2022) ; and excellent governance mechanisms can reduce the cost of debt capital of listed companies (Wang, Qinxiang et al., 2022). Therefore, ESG performance is likely to reduce the cost of debt capital by alleviating agency conflicts and reducing agency costs. Based on the above analysis, this paper proposes the following hypotheses:

H1: The higher the level of corporate ESG, the lower the cost of debt capital.

3. Study Design

3.1 Sample Selection and Data Sources

In this paper, the data of A-share listed companies in Shanghai and Shenzhen from 2007 to 2021 are selected as the research sample, based on which (1) companies in the real estate and financial industries, (2) ST and *ST companies, and (3) companies with significant missing data are excluded. In addition, in order to eliminate the influence of extreme values on the results of the empirical study, all the continuous variables involved were subjected to tailoring at the 1% and 99% quartiles. A total of 17,188 study samples were finally obtained. The ESG information used in this paper is obtained from the China Securities ESG Rating Index, and the relevant financial data are obtained from Wind database and CSMAR database.

3.2 Variable Definition

1.Explained variable: cost of corporate debt capital (DC)

The cost of debt capital is an important part of a firm's financing, investment, and capital structure decisions, and this paper uses two metrics to measure the cost of debt financing (Sun et al., 2020). The ratio of interest expense to debt (DC1) is equal to the ratio of interest expense to the firm's total debt $\times 100\%$; the ratio of net financial expense to debt (DC2) is equal to the ratio of net financial expense to the firm's debt $\times 100\%$. Net financial expense refers to the sum of interest expense, fees and other financial expenses. The data are obtained from the detailed items of financial expenses in the notes to the financial statements. This paper uses DC1 as the explanatory variable in the main regression, while replacing it with DC2 as a measure of the cost of debt capital in the robustness test.

2.explanatory variables: ESG disclosure (ESG)

With the rising concern for companies to carry out focal issues such as ecological and environmental protection, fulfillment of social responsibility and sustainable development, many ESG rating agencies have emerged both at home and abroad, with well-known foreign agencies such as MSCI, Refinitiv and FTSE Russell based on the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB) and other ESG. The ESG performance of thousands of companies around the world has been evaluated based on the ESG disclosure standards of the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB) and others. At present, the domestic ESG evaluation system has started late and the evaluation targets are mainly limited to domestic companies, and rating agencies such as Shang Dao Rong Green, Social Value Investment Alliance and China Securities have released ESG reports mainly for A-share listed companies. In this paper, we choose the ESG rating of CSI and the ESG rating of SynTao Green Finance to measure the ESG disclosure of enterprises. In the main regression, this paper uses the CSI ESG rating index to measure the ESG performance of enterprises, which combines the actual situation of the domestic market and evaluates from the perspective of ESG core connotation and development experience, and constructs 3 primary indicators, 14 secondary indicators and 26 tertiary indicators from top to bottom, and the evaluation objects cover all A-share listed companies, with good continuity and availability of data. To facilitate the empirical study, the nine ratings of "C-AAA" were assigned 1-9 in order (Li, Zhibin et al., 2022). The higher the value, the better the ESG performance.

3.Control variables

Based on the existing literature, this paper systematically sets control variables from the dimensions of corporate capital structure, financial status, and development capability[1]. Specifically, the following: capital structure (LEV), asset size (SIZE), net asset margin (ROA), corporate growth (GROWTH), board size (BOARD), company age (AGE), management shareholding ratio (MSHARE), and asset turnover ratio (TURNOVER), while controlling for factors such as industry and year. The specific control variables connotations and definitions are shown in Table 1.

Table 1. Variable definition table

Variable Type	Name	Symbols	Definition
Explained variables	Cost of debt capital	DCI	Total interest expense/liabilities
Explanatory variables	ESG Disclosure	ESG	ESG rating of China Securities, assigned
Control variables	Capital Structure	LEV	Total liabilities/total assets
	Enterprise size	SIZE	Natural logarithm of total assets at the end of the year
	Net Asset Margin	ROA	Net Income / Total Assets
	Business Growth	GROWTH	(Current year's operating income - Prior year's operating income) - 1
	Board Size	BOARD	Total number of board of directors
	Company Age	AGE	Company establishment time
	Management shareholding ratio	MSHARE	Total number of shares held by directors, supervisors and executives as a percentage of total share capital
	Asset turnover ratio	TURNOVER	Operating income / average total assets

3.3 Model Design

In this paper, the following model (1) is designed to test hypothesis H1:

$$DC = \alpha_0 + \alpha_1 ESG + \gamma CONTROL + IND + YEAR + \varepsilon \quad (1)$$

where DC denotes the cost of debt capital proxy variable, ESG measures firm ESG performance, and CONTROL is the relevant control variable, as defined in Table 1. If the coefficient α_1 is significantly less than 0, it indicates that firm ESG performance is negatively related to the cost of debt capital, and the better the firm ESG performance, the lower the cost of debt capital, which in turn supports H1.

4. Analysis of the Empirical Results

4.1 Descriptive Statistical Analysis

Table 2. Descriptive statistics results

Variables	Sample size	Average value	Standard deviation	Minimum value	25% quantile	Median	75% quantile	Maximum value
DC	17188	2.0398	1.4714	0.0013	0.8020	1.8828	3.0059	6.3699
ESG	17188	6.5495	1.0952	4.0000	6.0000	6.0000	7.0000	9.0000
LEV	17188	0.4611	0.2028	0.0735	0.3027	0.4568	0.6112	0.9346
SIZE	17188	22.3428	1.3282	19.7810	21.4010	22.1674	23.0980	26.4045
ROA	17188	0.0354	0.0607	-0.2762	0.0137	0.0351	0.0633	0.1905
GROWTH	17188	0.2055	0.4787	-0.5278	-0.0076	0.1205	0.2882	3.3029
BOARD	17188	8.6814	1.7257	5.0000	7.0000	9.0000	9.0000	15.0000
AGE	17188	17.9478	5.6064	5.0000	14.0000	18.0000	22.0000	32.0000
MSHARE	17188	0.1029	0.1808	0.0000	0.0000	0.0010	0.1255	0.6717
TURNOVER	17188	0.3451	0.2391	0.0368	0.1880	0.2913	0.4264	1.4086

As can be seen from Table 2, the cost of debt capital of Chinese listed companies varies widely, with a mean value of 2.0398, a minimum value of 0.0013 and a maximum value of 6.3699; indicating that the debt financing of listed companies varies widely, providing a rich sample for this study. The mean ESG rating is 6.5495, with a median value of 6, indicating that more than fifty percent of listed companies have ESG performance. The minimum value is 4, the maximum value is 9, and the standard deviation is 1.0952, which shows that the ESG performance of supervisors' companies varies greatly, with some listed companies performing well and some having more room for improvement.

4.2 Regression Results and Analysis

Table 3. Regression results of corporate ESG performance and cost of debt capital

Variables	DC1		
	(1)	(2)	(3)
ESG	-0.0985*** (-9.51)	-0.0900*** (-8.38)	-0.0752*** (-7.00)
LEV		1.6649*** (22.44)	1.9709*** (25.13)
SIZE		-0.0712*** (-6.81)	-0.0453*** (-4.21)
ROA		-3.4929*** (-14.72)	-3.5954*** (-15.25)
GROWTH		-0.1545*** (-6.13)	-0.0859*** (-3.42)
BOARD		0.0410*** (6.45)	0.0004 (0.06)
AGE		-0.0031 (-1.54)	0.0074*** (3.44)
MSHARE		-0.0062*** (-9.85)	-0.0045*** (-7.05)
TURNOVER		-0.3600*** (-7.33)	-0.5168*** (-9.28)
CONSTANT	2.6852*** (38.47)	3.4952*** (16.85)	3.9236*** (16.85)
INDUSTRY	No	No	Yes
YEAR	No	No	Yes
N	17,188	17,188	17,188
R ² _a	0.0053	0.1192	0.2050

Table 3 first empirically tests the relationship between corporate ESG performance and the cost of debt capital, where column (1) presents the regression results without controlling for the relevant control variables and the annual industry effect, column (2) presents the regression results without controlling for the annual industry effect but with the inclusion of control variables such as capital structure and asset size, and column (3) presents the regression results with the inclusion of control variables and controlling for the annual industry effect. . Table 3 shows that the coefficient of ESG is

significantly negative in all three columns, and the coefficient of ESG is -0.0752 ($t=-7.00$) in column (3) after controlling for the relevant control variables and industry-year effects, indicating that the level of ESG is significantly negatively related to the cost of debt capital, and the higher the level of ESG, the lower the cost of debt capital, which supports the previous hypothesis H1. the previous hypothesis H1.

4.3 Robustness Test

1.Replacement measurement method

Table 4. Robustness tests: change variables

Variables	DC1 (1)	DC2 (2)
ESG		-0.0741*** (-6.63)
SESG	-0.0580*** (-3.06)	
LEV	1.8928*** (8.63)	1.8641*** (22.88)
SIZE	-0.0921*** (-3.55)	-0.0575*** (-5.11)
ROA	-3.6414*** (-6.45)	-3.8045*** (-15.46)
GROWTH	-0.1601* (-1.80)	-0.0867*** (-3.31)
BOARD	-0.0069 (-0.53)	-0.0010 (-0.16)
AGE	0.0033 (0.67)	0.0066*** (2.98)
MSHARE	-0.0013 (-0.63)	-0.0041*** (-6.25)
TURNOVER	-0.7587*** (-5.88)	-0.3622*** (-6.35)
CONSTANT	5.0040*** (8.44)	4.3515*** (17.97)
INDUSTRY	Yes	Yes
YEAR	Yes	Yes
N	2,140	17,157
R2 a	0.2444	0.1934

In addition to using the HSCI to measure corporate ESG performance, several domestic and international organizations regularly release their ESG ratings of companies each year, such as Bloomberg, the Social Value Investment Alliance and Business Unity Green. The core explanatory variable replaced in this paper is the Business Integration Green ESG rating (SESG). Compared with CSI ESG rating, it selects richer evaluation indicators and has a wider evaluation latitude. Also considering the influence of fees and charges and other financial expenses, we use the ratio of net financial expenses to debt (DC2) to measure the cost of debt capital of enterprises; net financial expenses refer to the sum of interest expenses, fees and charges and other financial expenses. As shown in Table 5, in column (1), controlling for industry and year effects with relevant control variables for the regression analysis of SynTao Green Finance ESG rating and corporate cost of debt capital, we can see that the coefficient is -0.0580 ($t=-3.06$) and is significant at the 1% level. In column (2), the regression analysis of the ESG rating of Huazheng and the cost of corporate debt capital (DC2), also controlling for industry and year effects and related control variables, at this point the regression coefficient is -0.0741 ($t=-6.63$) and is significant at the 1% level. It indicates that ESG

information disclosure by enterprises will reduce the cost of corporate debt capital; consistent with the findings of the above study, it indicates that the findings of this paper have good robustness.

2. Instrumental variable method

In the previous robustness test, the new measure chosen to measure the core variables in this paper proves the reliability of the experimental results to a certain extent, however, there may also be endogeneity problems due to measurement errors and omitted variables in the effect of firms' ESG performance on their cost of debt capital. To further deal with the endogeneity problem of ESG and firms' cost of debt capital, this paper adopts a two-stage least squares approach to enhance the reliability of the experimental results as follows: two variables, industry annual mean (Mean_ESG) and lagged one-period (L.ESG) of firms' ESG, are selected as instrumental variables in this paper to control for endogeneity caused by the influencing factors not included in the basic regression model problems. The industry average of a firm's ESG can restrict the impact on its ESG performance, but there is no clear evidence of a direct link with the firm's cost of debt capital, thus satisfying the relevance and exogeneity requirements of the instrumental variables. Mean_ESG and L.ESG are first put into the equation as independent variables, regressed on the original dependent variable ESG, and then the resulting fitted values are regressed on DC1 replacing the original dependent variable.

Table 5. Instrumental variable tests

Variables	ESG (1)	DC1 (2)
Mean_ESG	0.1034** (2.23)	
L.ESG	0.7720*** (130.66)	
LEV		-0.1302*** (-8.39)
SIZE	-0.0526*** (-3.72)	0.2497*** (8.71)
ROA	0.1025*** (19.81)	0.0272** (2.45)
GROWTH	0.2353*** (6.33)	-0.6847*** (-9.06)
BOARD	-0.0006* (-1.70)	-0.0011 (-1.61)
AGE	0.0050 (1.45)	0.0018 (0.27)
MSHARE	0.0012 (1.01)	0.0076*** (3.20)
TURNOVER	-0.0010** (-2.56)	-0.0071*** (-9.24)
CONSTANT	0.0095 (0.48)	-0.2791*** (-6.92)
INDUSTRY	Yes	Yes
YEAR	Yes	Yes
N	14,554	14,554
R2 a	0.6469	0.1141

The regression results of the instrumental variables method are shown in the figure, where (1) column presents the results of the first stage regression of 2SLS and (2) column presents the results of the second stage regression of 2SLS. (1) column presents the coefficient of Mean_ESG is 0.1304, which is significantly positive at the 5% level, and the coefficient of L.ESG is 0.7720, which is significantly positive at the 1% level. The coefficients are as expected, indicating that the instrumental variable is highly correlated with the endogenous explanatory variables and there is no weak instrumental variable problem; (2) the coefficient of ESG presented in the column is significantly

negative at the 1% level, which is consistent with the results of the benchmark regression, indicating that increasing the ESG level of firms is indeed beneficial to reducing the cost of debt capital of firms, further supporting the conclusions drawn in this paper.

5. Further Research

5.1 Nature of Property Rights

According to existing studies, the nature of the firm tends to influence the economic consequences of corporate ESG implementation. On the one hand, state-controlled enterprises have more financing advantages and are more favored by investors due to government policy support and implicit government guarantees, etc. (Chen, Ruohong et al., 2022; Chen, Qian et al., 2022); on the other hand, compared to non-private listed firms, private listed firms tend to bear higher debt financing costs due to credit discrimination and expensive business credit (Li, Guangzi and Liu, Li, 2019[14] ; Brandt and Li, 2007[18]). Zheng Sun et al. (2006) suggest that accounting information of publicly owned firms plays a lower role in debt covenants compared to privately owned firms; Zhang (2012) also suggests that political connections may have an impact on the bond covenant value of accounting information. Based on these and other studies, this paper takes the perspective of the nature of property rights and expects that the impact of ESG performance on the cost of debt capital is more pronounced for non-state-owned firms compared to state-owned firms. To verify this conjecture, this paper divides the sample data into the group of state-owned enterprises and the group of non-state-owned enterprises for regression analysis, and the regression results are shown in columns (1) and (2) of Table 7. The comparison of the regression results in columns (1) and (2) shows that the regression coefficient of corporate ESG performance is not significant in the group of state-owned enterprises, while in the group of non-state-owned enterprises its regression coefficient is -0.0838, which is significant at the 1% level. The regression coefficient is significantly negative. It indicates that compared to non-SOEs, the improved ESG performance of SOEs does not lead to a lower cost of debt capital and the accounting disclosure of SOEs has a limited role in debt covenants, which is consistent with the expectations of the previous analysis.

5.2 Internal Control

Internal control, as a control system that compensates for contractual incompleteness, can restrain management from engaging in information manipulation. On the one hand, its effectiveness directly determines the level of information transparency (Huang, Zheng et al., 2017), which in turn affects the choice of creditors; and high-quality internal control helps to curb agency costs between major and minority shareholders, managers and shareholders (Yang, 2009), which in turn affects the firm's cost of debt capital. On the other hand, internal control can significantly improve accounting soundness (Liu, Yi-Juan and Wei, An-Ying, 2020), improve firms' debt maturity structure (Luo, Hong et al., 2021), reduce firms' debt default risk, make firms less likely to fall into financial distress (Chen, Li et al., 2022), improve firms' reputation and image, and enhance the goodwill of stakeholders such as creditors. Therefore, based on the above studies, this paper incorporates internal control quality into the research framework and expects that ESG performance of firms with high internal control quality has a more significant effect on the reduction of the cost of debt capital. In this paper, the grouping is based on the industry-year median of the internal control index, which is defined as the high internal control quality group when the internal control index is greater than the median and, conversely, as the low internal control quality group when the internal control index is less than the median. The grouped regressions of model (1) yielded the results shown in columns (3) and (4) of Table 7: in column (3), the regression coefficient of firm ESG performance in the high internal control quality group is -0.0726, which is significant at the 1% level, while in column (4), its regression coefficient in the low internal control quality group is -0.0503, which is significant at the 1% level. This indicates that the ESG performance of firms with high internal control quality has a stronger effect on reducing the cost of debt capital compared to firms with low internal control

quality, and high internal control quality is more likely to enhance corporate reputation, reduce the degree of information asymmetry and agency costs and thus affect the cost of debt capital, which is consistent with the previous expectation.

5.3 External Supervision

Table 6. Results of heterogeneity test analysis

Variables	DC1					
	(1)State-owned enterprises	(2)Non-state enterprises	(3)Low quality of internal control	(4)Low quality of internal control	(5)Low audit quality	(6)High audit quality
ESG	-0.0248	-0.0838***	-0.0726***	-0.0503***	-0.0762***	-0.1027*
	(-1.48)	(-5.84)	(-4.63)	(-3.38)	(-3.79)	(-1.75)
LEV	1.8954***	2.0835***	2.1284***	1.8430***	1.9498***	1.7588***
	(14.73)	(20.34)	(18.46)	(16.31)	(13.92)	(3.05)
SIZE	-0.0932***	0.0434***	-0.0095	-0.0597***	-0.0256	-0.0882
	(-5.84)	(2.74)	(-0.52)	(-4.29)	(-1.03)	(-1.34)
ROA	-3.6340***	-3.7574***	-3.0907***	-4.8954***	-3.6482***	-2.9570
	(-8.16)	(-13.16)	(-9.18)	(-11.35)	(-11.82)	(-1.55)
GROWTH	-0.0137	-0.1481***	-0.1031**	-0.0343	-0.0956***	0.0390
	(-0.31)	(-4.77)	(-2.32)	(-1.08)	(-3.59)	(0.38)
BOARD	0.0331***	-0.0063	-0.0073	-0.0056	0.0055	-0.0510*
	(3.72)	(-0.72)	(-0.77)	(-0.69)	(0.42)	(-1.82)
AGE	0.0015	0.0148***	0.0043	0.0106***	0.0067	0.0169
	(0.41)	(5.42)	(1.27)	(3.82)	(1.42)	(0.89)
MSHARE	-0.0008	-0.0069***	-0.0042***	-0.0050***	-0.0046***	0.0001
	(-0.12)	(-9.83)	(-4.36)	(-5.89)	(-3.89)	(0.01)
TURNOVER	-0.6178***	-0.2891***	-0.4371***	-0.4803***	-0.4306***	-1.6745***
	(-8.23)	(-3.57)	(-4.45)	(-6.92)	(-3.39)	(-4.02)
CONSTANT	3.9977***	2.3215***	3.0750***	4.3628***	3.4760***	5.1759***
	(11.30)	(6.82)	(7.89)	(14.49)	(6.75)	(3.51)
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
N	6,369	10,515	8,139	8,245	15,969	1,219
R ² _a	0.2296	0.2136	0.1855	0.2146	0.2082	0.2690

Effective external supervision is one of the important ways to restrain managers' opportunistic behavior. On the one hand, external audits can detect financial problems in the firm even if they are detected, disclose financial and non-financial information to interest stakeholders, and thus reduce information asymmetry (Luo, Mengni, 2018), and at the same time discipline and supervise management to improve the truthfulness and reliability of corporate accounting information (Feltkam and Hugkes, 1991). On the other hand, high-quality external audits can on the other hand, high quality external audit can effectively resolve the internal agency conflict, achieve the reduction of internal agency cost (Li, 2007), and reduce the external financing constraint of the firm (Xu et al., 2020). Therefore, based on the above studies, this paper selects external audit quality as a proxy variable from the perspective of external monitoring to investigate the effect of external monitoring on the relationship between ESG performance and cost of debt capital. Drawing on existing studies (Becker

et al., 1998; Yang et al., 2009; Dennis and Jeff, 2011), the high audit quality group is defined when the firm hires a "Big Four" audit firm, and the high audit quality group is defined when the audit firm is from a non-Big Four audit firm. "The results are shown in columns (5) and (6) of Table 7: in column (5), the regression coefficient of ESG is -0.0762, which is significant at the 1% level; in column (6), the regression coefficient of ESG is -0.1027, which is significant at the 10% level. significant. This indicates that ESG has a stronger role in reducing the cost of debt capital in firms with higher quality of external audit. Compared to firms with low level of external supervision, firms with high level of external supervision have more truthful and reliable accounting information and are better able to reduce agency costs, which in turn reduces the cost of corporate debt capital.

6. Research Conclusion and Implications

This paper combines the sustainable development framework in the context of the "double carbon" objective with the perspective of corporate debt financing constraints, and analyzes the relationship between corporate ESG performance and the cost of debt capital based on corporate reputation, information asymmetry theory, and agency cost theory. The relationship between ESG performance and cost of debt capital is analyzed based on corporate reputation, information symmetry theory and agency cost theory. With reference to the ESG rating of China Securities, the following conclusions are drawn for the study sample of Chinese A-share listed companies from 2007-2021: first, the ESG performance of enterprises can significantly reduce the cost of debt capital; second, compared with state-owned enterprises, the ESG performance of non-state-owned enterprises has a stronger effect on the reduction of the cost of debt capital; third, compared with enterprises with low quality of internal control, the ESG performance of enterprises with high quality of internal control has a stronger effect on the reduction of the cost of debt capital. Third, the reduction effect of ESG performance on the cost of debt capital is more pronounced for firms with high quality of internal control compared to those with low quality of internal control; fourth, the correlation coefficient of the cost of debt capital is more significant for firms with high level of external supervision compared to those with low level of external supervision.

This study enriches the literature in the fields related to corporate ESG performance and cost of debt capital, which has more important theoretical implications. First, the existing studies on the factors influencing the cost of debt capital mostly focus on the effects of firm nature, institutional environment, and CEO background on the cost of debt capital, but not on the ESG performance of firms. Corporate ESG performance affects corporate reputation, information asymmetry and agency costs, which in turn affects the cost of debt capital. This paper combines information asymmetry theory and agency conflict theory to explore the relationship between corporate ESG performance and the cost of debt capital by taking the heterogeneity of corporate ESG performance as an entry point, which enriches the existing literature on the factors affecting corporate debt capital. Second, this paper investigates the moderating effect of internal control quality and external audit quality on the relationship between ESG performance and cost of debt capital, and explores the differences in this relationship in different corporate contexts, enriching the literature on internal control quality and external audit quality.

This paper is also of great practical significance, and the findings of this paper have certain guiding significance for both creditors and management. As far as enterprises are concerned, they should recognize the important role of ESG implementation on enterprise development, strengthen ESG information disclosure, actively fulfill social responsibility, reduce the degree of information asymmetry with stakeholders, and strive for more resources; and reduce the cost of debt capital of enterprises. At the same time, compared with state-owned enterprises, non-state-owned enterprises should pay more attention to the role of corporate ESG performance in reducing the cost of debt capital. As for the government, it should make clearer laws and regulations, improve ESG information disclosure system, regulate ESG information disclosure behavior of listed companies, disclose more

true and complete information to the public and stakeholders, and form a good market order, so as to promote high-quality and sustainable development of the economy and society.

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