

ESG Ratings, Corporate Productivity, and Debt Financing Costs

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Abstract: Based on panel data from Chinese listed companies between 2014 and 2020, this study examines the specific impact of ESG performance on debt financing. The findings reveal that: First, an improvement in ESG ratings significantly reduces corporate debt financing costs, a facilitating mechanism that has passed robustness and endogeneity tests. Second, mediation effect tests indicate that ESG can effectively lower financing costs by enhancing corporate productivity. Furthermore, heterogeneity analysis shows that strong ESG performance has a more pronounced cost-reducing effect for non-state-owned enterprise and high-tech companies. These results indicate that companies need to prioritize and transparently disclose ESG ratings, governments should establish stringent and standardized ESG policies, and investors should incorporate ESG metrics into their investment considerations.

Keywords: ESG; Debt Financing Costs; Corporate Productivity

1. Introduction and Literature Review

As a comprehensive tool for evaluating corporate sustainability, ESG (Environmental, Social, and Governance) encompasses three key dimensions. It was first formally introduced in the 2004 report *Who Cares Wins* and has since gained increasing prominence in today's environmentally conscious era. In 2023, China's Reference Indicator System for ESG Special Reports of Central State-Owned Enterprise-Controlled Listed Companies established a standardized framework for ESG disclosures, improving reporting quality and addressing issues such as inconsistent disclosure formats and uneven data quality. In May 2025, the Ministry of Finance issued the *Corporate Sustainability Disclosure Standards-Basic Standards (Draft for Comments)*, aiming to develop a unified national sustainability disclosure framework, providing fundamental

guidelines and general requirements for Chinese enterprises. This initiative is crucial for establishing a cohesive sustainability disclosure system in China and promoting sustainable economic, social, and environmental development. For corporations, strong ESG performance reflects their sustainability capabilities and potential, thereby enhancing corporate reputation and stakeholder recognition [1], while also mitigating overall and systemic risks [2]. Moreover, ESG may significantly reduce debt financing costs. While existing literature has explored this relationship—for instance, Eliwa et al. [3] found a negative correlation between ESG practices and debt financing costs using data from EU-listed firms, and Apergis et al. [4] corroborated this finding in the U.S. market—the mediating mechanisms remain underexamined. Prior studies have identified factors such as increased media attention [5] and reduced financing constraints [6] as potential channels. However, few studies have investigated the mediating role of corporate productivity. Against this backdrop, this study employs panel data from Chinese listed companies (2014–2020) to examine how robust ESG performance reduces debt financing costs, with a focus on the mechanism through which high ESG ratings enhance corporate productivity to lower financing expenses. The findings offer valuable insights for companies to comprehensively and proactively disclose ESG metrics and provide policy recommendations for governments to refine ESG rating systems.

2. Theoretical Analysis and Research Hypotheses

2.1 ESG Performance and Debt Financing Costs

From the environmental perspective, firms that prioritize environmental protection mitigate operational risks by increasing investments in eco-friendly technology R&D, adopting energy conservation and emission reduction measures, and developing green production models. These

practices reduce potential losses from environmental penalties or production suspensions. Moreover, a green corporate image facilitates access to government policy support and subsidies, enhancing both market competitiveness and sustainable development capabilities. Consequently, creditors perceive environmentally responsible firms as lower-risk borrowers and are more willing to provide low-cost debt financing to minimize their own credit risk. From the corporate governance perspective, when companies offer strong employee benefits, they boost workforce satisfaction and loyalty, leading to improved productivity and innovation capacity. Active participation in social welfare initiatives strengthens community ties and garners public recognition, while protecting consumer rights enhances trust in corporate products. These positive outcomes attract greater stakeholder engagement and strengthen the firm's resilience to market risks. Creditors view robust social responsibility performance as an indicator of sound creditworthiness and operational stability, resulting in preferential financing terms with lower interest rates. From the corporate social responsibility perspective, sound corporate governance, characterized by well-structured decision-making processes, oversight mechanisms, and incentive systems, effectively curbs managerial opportunism and reduces financial risks while promoting long-term growth to protect shareholder and creditor interests. Enhanced disclosure practices under proper governance also mitigate information asymmetry between firms and creditors. Therefore, creditors are more inclined to provide financing to well-governed companies and demand lower risk premiums.

Based on this comprehensive analysis, the relevant hypothesis is proposed:

H1: Firms' ESG performance is significantly negatively correlated with debt financing costs - superior ESG performance results in lower financing expenses.

2.2 Analysis of Influence Mechanisms

Firms with strong ESG performance can enhance productivity through multiple channels: in resource utilization, they adopt green production practices to optimize energy and raw material allocation, minimize waste, and reduce per-unit production costs, while increased use of environmentally friendly inputs boosts

efficiency by mitigating pollution; in human capital management, safeguarding employee rights and welfare along with providing career development opportunities stimulates workforce motivation and creativity, thereby improving labor productivity; concurrently, ESG principles drive greater investment in innovative and sustainable production technologies, enabling the development of more competitive products and services that expand market share and strengthen profitability. This comprehensive productivity improvement generates more stable cash flows and enhanced risk resilience, ultimately reducing corporate debt financing costs.

H2: superior ESG performance lowers debt financing costs through increased corporate productivity.

3. Research Design

3.1 Sample Selection

This study examines A-share listed companies in China from 2014 to 2020, applying the following screening criteria: (1) exclusion of ST, *ST, and PT companies; (2) removal of financial firms due to their unique regulatory environment and debt-financing structure; and (3) elimination of observations with missing data. ESG ratings were obtained from the China Securities ESG Rating Database, while other financial indicators were sourced from the Wind database and calculated using standard formulas. The final sample comprises 18,642 valid firm-year observations after data processing.

3.2 Variable Definitions

3.2.1 Explanatory Variable

This study employs ChinaBond ESG Ratings to evaluate corporate performance across environmental, social, and governance (ESG) dimensions. The industry average weight of the governance (G) dimension is 42.66%, that of the environmental (E) dimension is 25.62%, and that of the social (S) dimension is 31.72%. A four-tier indicator system was constructed, classifying firms into nine rating grades (AAA to C), which were then assigned numerical values (1–9) for regression analysis. A higher rating grade corresponds to a higher numerical value, signifying superior ESG performance.

3.2.2. Dependent Variable

According to the approach of Qian Xuesong et al. [7], corporate debt financing cost (Cost1) is

measured as the ratio of financial expenses to total liabilities at the end of the period.

3.2.3 Mediating Variable: Corporate Productivity

Drawing on Mei Yingdan [8], total factor productivity-estimated via the Generalized Method of Moments-serves as the proxy for corporate productivity. A higher value indicates better productivity.

3.2.4 Control Variables

To enhance model robustness, the following control variables were included: Firm size (Size): Natural logarithm of total assets; Leverage ratio

$$Cost1_{i,t} = \alpha + \alpha_1 Esg_{i,t} + \alpha_2 Control_{i,t} + year_t + industry_e + \varepsilon_{i,t} \quad (1)$$

$$TFP_GMM_{i,t} = \alpha + \alpha_1 Esg_{i,t} + \alpha_2 Control_{i,t} + year_t + industry_e + \varepsilon_{i,t} \quad (2)$$

$$Cost1_{i,t} = \alpha + \alpha_1 Esg_{i,t} + TFP_GMM_{i,t} + \alpha_2 Control_{i,t} + year_t + industry_e + \varepsilon_{i,t} \quad (3)$$

Here, the dependent variable is corporate debt cost (Cost1), the independent variable is ESG, the mediating variable is total factor productivity (TFP_GMM), Control represents the corresponding control variables, year and industry denote year and industry fixed effects, and ε stands for the random error term.

4. Empirical Analysis

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics of the main variables. The mean ESG score is 4.098, indicating that most listed firms in China fall within the BB to BBB rating range, reflecting a moderate ESG performance level.

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cost1	18642	0.009	0.04	-1.573	0.947
Esg	18642	4.098	1.147	1	8
TFP_GMM	18642	5.626	0.862	1.803	10.619
Size	18642	22.31	1.281	19.63	26.398
Alr	18642	0.423	0.199	0.051	0.908
Tbq	18642	2.123	1.453	0.802	15.607
Top10	18642	0.156	0.11	0.015	0.579
Growth	18642	0.16	0.428	-0.658	4.024
Intangible	18642	0.047	0.049	0	0.339

The standard deviation (1.147) suggests significant variation across firms; the average corporate productivity (TFP) is 5.626, also at a moderate level, with a standard deviation of 0.862, further confirming substantial heterogeneity among firms; additionally, the mean debt financing cost (0.9%) is relatively low, implying that most firms perform reasonably well in managing their debt financing expenses.

(Alr): Total liabilities divided by total assets; Tobin's Q (Tbq): Market value divided by total assets; Growth opportunity (Growth): Revenue growth rate; Ownership concentration (Top10): the proportion of shares held by the top ten shareholders to the total share capital; Intangible assets ratio (Intangible): Intangible assets divided by total assets.

3.3 Model Specification

The following regression model was constructed to test hypotheses H1 and H2:

4.2. Regression Analysis

Table 2. Baseline Regression Results

	(1)	(2)
	Cost1	Cost1
Esg	-0.00190*** (-7.47)	-0.00121*** (-3.52)
Size	-0.000745*** (-2.62)	-0.00116*** (-5.04)
Alr	0.0720*** (42.92)	0.0780*** (29.26)
Tbq	-0.00194*** (-9.16)	-0.00177*** (-5.37)
Top10	-0.0235*** (-9.04)	-0.0210*** (-8.85)
Intangible	0.0639*** (11.25)	0.0480*** (7.44)
Growth	0.000629 (0.96)	0.000485 (0.77)
cons	0.00768 (1.29)	0.0117** (2.29)
Industry FE	No	Yes
Year FE	No	Yes
N	18170	18170
adj. R2	0.146	0.180

t statistics in parentheses

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

As shown in Column (1) of Table 2, without controlling for year and industry fixed effects, the coefficient of ESG is -0.00190, which is statistically significant at the 1% level. This indicates that a one-unit improvement in ESG performance reduces corporate debt financing costs by 0.00190 units, supporting a significant negative correlation between ESG performance and debt financing costs. These results confirm Hypothesis H1; In Column (2), after controlling

for industry and year fixed effects, the coefficient of ESG remains negative (-0.00121) and statistically significant at the 1% level, further validating the inverse relationship between ESG performance and debt financing costs.

4.3 Robustness Tests

4.3.1 Alternative Measure of Dependent Variable

To ensure the robustness of our findings, we adopt the approach of Lin Zhonggao et al. [9] by

employing an alternative measure of debt financing cost (Cost2), calculated as the ratio of interest expenses to the average of long-term and short-term debt. As presented in Columns (1) and (2) of Table 3, the results remain statistically significant at the 1% level, regardless of whether industry and year fixed effects are controlled. This further confirms the negative association between ESG performance and debt financing costs, reinforcing the validity of our baseline findings.

Table 3. Calculation of Debt Financing Cost Index (Cost 2)

	(1)	(2)	(3)	(4)
	Cost2	Cost2	Cost1	Cost1
new_rating			-0.00412***	-0.00274***
			(-6.57)	(-3.77)
Esg	-0.00189***	-0.00161***		
	(-16.72)	(-9.91)		
Size	0.000412***	0.000246**	-0.000941***	-0.00129***
	(3.26)	(2.13)	(-3.36)	(-5.77)
Alr	0.0241***	0.0247***	0.0726***	0.0783***
	(32.24)	(29.06)	(43.39)	(29.99)
Tbq	-0.000558***	-0.000513***	-0.00193***	-0.00178***
	(-5.93)	(-3.71)	(-9.13)	(-5.41)
Top10	-0.0150***	-0.0174***	-0.0237***	-0.0212***
	(-12.98)	(-16.62)	(-9.13)	(-8.87)
Intangible	0.0328***	0.0175***	0.0648***	0.0483***
	(12.97)	(4.86)	(11.41)	(7.50)
Growth	-0.00347***	-0.00293***	0.000652	0.000495
	(-11.90)	(-8.61)	(0.99)	(0.79)
_cons	0.00989***	0.0131***	0.0112*	0.0143***
	(3.73)	(5.24)	(1.88)	(2.72)
Industry FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes
N	18170	18170	18170	18170
adj. R2	0.126	0.205	0.145	0.180

t statistics in parentheses

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

4.3.2 Alternative Measure of Core Explanatory Variable

To further verify the robustness of our results, we reconstruct the ESG rating measurement by adopting a three-point scoring system. The original 1-9 rating scale is recategorized into three tiers (1, 2, 3), creating a new explanatory variable (new_rating). As shown in Columns (3) and (4) of Table 3, the estimated coefficients remain statistically significant at the 1% significance level, indicating robustness and thereby reaffirming Hypothesis H1.

As presented in Table 4, we observe a consistent negative relationship between ESG ratings (with one-, two-, and three-period lags) and debt financing costs. Specifically, the one-period lagged ESG rating shows a statistically significant coefficient of -0.00105 at the 1% level; the two- and three-period lagged ESG ratings remain significant at the 5% level, with coefficients of -0.000628 and -0.000746, respectively. These results indicate that improvements in ESG performance continue to reduce corporate debt financing costs over time, which aligns with our baseline regression findings and helps mitigate potential endogeneity concerns.

4.4 Endogeneity Tests

Table 4. ESG Rating Analysis

	(1)	(2)	(3)
	Cost1	Cost1	Cost1
L.Esg	-0.00105*** (-3.55)		
L2.Esg		-0.000628** (-2.46)	
L3.Esg			-0.000746** (-2.52)
Size	-0.00135*** (-5.83)	-0.00123*** (-4.81)	-0.00126*** (-4.31)
Alr	0.0700*** (29.96)	0.0641*** (27.11)	0.0676*** (24.01)
Tbq	-0.00192*** (-5.78)	-0.00130*** (-3.37)	-0.00153*** (-2.96)
Top10	-0.0214*** (-9.24)	-0.0230*** (-9.80)	-0.0258*** (-9.32)
Intangible	0.0458*** (6.82)	0.0414*** (6.53)	0.0447*** (6.03)
Growth	-0.000358 (-0.61)	-0.000845 (-1.26)	-0.00120 (-1.23)
_cons	0.0202***	0.0184***	0.0180***
Industry FE	(3.76) Yes	(3.17) Yes	(2.66) Yes
Year FE	Yes	Yes	Yes
N	14805	11761	8852
adj. R2	0.189	0.181	0.179

t statistics in parentheses

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

4.5 Mediation Effect Test

As shown in Table 5, the results demonstrate that ESG ratings have a statistically significant impact on both total factor productivity (TFP) and corporate debt financing costs at the 1% significance level. Specifically, the improvement of ESG ratings not only directly reduces financing costs (showing a significant negative correlation) but also indirectly lowers financing costs by enhancing total factor productivity (showing a significant positive correlation with a coefficient of 0.0189). These findings confirm the mediating role of TFP and support Hypothesis H2, thereby revealing the mechanism through which ESG performance affects debt financing costs. The underlying reasons for this mediation effect may include: First, firms with higher ESG ratings tend to prioritize optimization of environmental, social, and governance structures, which can improve operational and production efficiency, reduce resource waste, and ultimately enhance total factor productivity. For example, by optimizing

environmental management, operating costs can be reduced; by enhancing employee satisfaction, production efficiency can be improved; and by increasing corporate transparency, financing costs can be lower. Second, ESG-related investments often accompany the development and application of new technologies and processes. These innovation activities can boost productivity while simultaneously creating new market opportunities and revenue streams, thereby reducing operational risks and financing costs.

Table 5. The Impact of ESG Ratings on Total Factor Productivity (TFP) and Corporate Debt Financing Costs

	(1)	(2)
	TFP_GMM	Cost1
Esg	0.0189*** (2.87)	-0.00118*** (-3.00)
TFP_GMM		-0.00170** (-2.34)
Size	0.350*** (37.95)	-0.000570 (-1.32)
Alr	0.337*** (5.65)	0.0785*** (21.48)

Intangible	-1.418***	0.0456***
	(-6.69)	(5.73)
Growth	0.237***	0.000887
	(16.38)	(1.40)
Tbq	0.0147**	-0.00174***
	(2.17)	(-4.47)
Top10	0.246***	-0.0206***
	(2.94)	(-5.76)
_cons	-2.443***	0.00759
	(-12.47)	(1.03)
Industry FE	Yes	Yes
Year FE	Yes	Yes
N	18170	18170
adj. R2	0.561	0.181

t statistics in parentheses

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

4.6 Heterogeneity Analysis

4.6.1 Analysis by High-Tech Enterprise Status

As shown in columns 1 and 2 of Table 6, the

impact of ESG on corporate debt financing costs is statistically significant at the 5% level for both high-tech enterprises (coefficient = -0.00118) and non-high-tech enterprises (coefficient = -0.00108), while demonstrating a greater effect on high-tech enterprises compared to non-high-tech enterprises. The possible reasons are as follows: First, high-tech enterprises typically place greater emphasis on innovation and R&D, and ESG can promote corporate innovation. Good ESG performance helps enterprises attract and retain talent, enhance innovation capabilities, and increase benefits; Second, many countries and regions provide a range of policy supports to encourage the development of high-tech enterprises, including tax incentives and financial subsidies. These policy supports may be linked to the ESG performance of enterprises, thereby incentivizing high-tech enterprises to improve their ESG performance.

Table 6. The Impact of ESG on Debt Financing Costs of High-Tech and Non-High-Tech Enterprises

	(1)	(2)	(3)	(4)
	Cost1 High-Tech Enterprises	Cost1 Non-High-Tech Enterprises	Cost1 SOE =1	Cost1 SOE =0
Esg	-0.00118**	-0.00108**	-0.000886**	-0.00118**
	(-2.11)	(-2.03)	(-2.50)	(-2.13)
Size	-0.00151***	-0.000671	-0.000750	-0.000860*
	(-3.19)	(-1.38)	(-1.56)	(-1.71)
Alr	0.0889***	0.0607***	0.0556***	0.0908***
	(17.23)	(12.43)	(13.33)	(17.57)
Intangible	0.0789***	0.0296***	0.0353***	0.0623***
	(5.17)	(3.52)	(4.31)	(4.67)
Growth	0.00188*	-0.000934	-0.00118*	0.000715
	(1.82)	(-1.21)	(-1.74)	(0.76)
Tbq	-0.00159***	-0.00204***	-0.00242***	-0.00161***
	(-2.91)	(-4.91)	(-4.11)	(-3.14)
Top10	-0.0237***	-0.0178***	-0.0129***	-0.0258***
	(-4.59)	(-3.60)	(-2.91)	(-4.79)
_cons	0.0135	0.00931	0.0106	0.000852
	(1.28)	(0.92)	(1.02)	(0.08)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	10834	7336	6338	11462
adj. R ²	0.186	0.179	0.327	0.170

t statistics in parentheses

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

4.6.2 Analysis of Enterprise Ownership Nature

As shown in columns 3 and 4 of Table 7, compared to state-owned enterprises (coefficient = -0.000886), non-state-owned enterprises (coefficient = -0.00118) demonstrate a

significantly stronger effect of good ESG ratings in helping reduce debt costs. The possible reasons are as follows: First, good ESG performance can help enterprises attract more investor trust and support, thereby obtaining funds at lower costs; Second, non-state-owned enterprises lack implicit government guarantees,

have relatively weaker credit protection, and face higher risks such as default risk and bankruptcy risk. Therefore, good ESG performance in these enterprises may more easily attract social attention, to some extent reducing their risks and gaining more reputation and recognition.

5. Conclusions and Recommendations

This study utilizes panel data from China's A-share listed companies (2014-2020) to comprehensively analyze the influence of ESG performance on corporate debt financing costs and empirical results confirm a statistically significant negative correlation between ESG performance and debt financing costs. The findings demonstrate that improved ESG ratings not only directly reduce debt financing costs but also indirectly lower them through enhanced corporate productivity as a mediating variable. Heterogeneity analysis further reveals that the debt cost reduction effect of strong ESG performance is more pronounced for non-SOEs and high-tech companies.

According to these results, recommendations are proposed:

Corporate Level: Enterprises should prioritize and actively disclose ESG performance. By optimizing environmental, social, and governance structures to holistically improve ESG ratings, companies can effectively reduce debt financing costs. Non-state-owned and high-tech enterprises in particular should emphasize ESG practices to fully realize their potential for cost reduction.

Policy Level: Governments should establish and promote unified, rigorous ESG disclosure policies, providing clear reporting standards and guidance. Simultaneously, they should incentivize and support corporate ESG initiatives to foster sustainable economic, social and environmental development.

Investor Level: When making investment decisions, investors should incorporate corporate ESG performance as a key evaluation criterion. This practice will encourage greater corporate focus on sustainable development and social responsibility, ultimately maximizing long-term

investment value.

Through these measures, corporate ESG practices can be further advanced, debt financing costs can be reduced, and sustainable economic development can be promoted.

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