

The Impact of ESG Internal Development Balance on Corporate Financing Constraints

Yi Zhong

School of Economics and Management, Nanjing University of Science and Technology, Nanjing, China

Abstract. Under the dual carbon goals and the context of high-quality development, ESG performance has become an important measure for assessing corporate risk and value. However, the unbalanced development model of some companies that 'focus on the environment but neglect governance' can easily trigger accusations of 'greenwashing' and conceal potential financial risks. Based on this, this paper uses Chinese A-share listed companies from 2010 to 2024 as a sample and innovatively constructs an 'ESG Internal Development Balance' indicator to deeply examine its impact on corporate financing constraints and the transmission mechanism. The study finds: First, the ESG internal development balance can significantly alleviate corporate financing constraints. Coordinated ESG practices can convey highly reliable sustainability signals to the market, effectively reducing the information screening costs for financial institutions. Second, external audit certification and enhanced debt acquisition capability serve as dual transmission paths. Balanced ESG development not only encourages companies to engage high-quality audits to reduce information asymmetry but also aligns with green credit preferences, thereby significantly improving borrowing capacity and substantively enhancing liquidity. Third, heterogeneity analysis shows that this alleviation effect is more pronounced in non-state-owned enterprises, non-heavy-pollution enterprises, and high-tech companies. This paper provides practical insights for companies to optimize sustainable development resource allocation and break financing barriers.

Keywords: Balance of internal ESG development, financing constraints, external audit certification, financial leverage, information asymmetry.

1. Introduction

With the deepening of China's "dual carbon" goals and the high-quality transformation of its economy, Environmental, Social, and Governance (ESG) performance has surpassed traditional financial indicators to become a key benchmark for capital markets in assessing a company's sustainable development capability and long-term investment value. In theory, good ESG performance can reduce information asymmetry and help enterprises expand financing channels. However, in reality, some companies, to cater to regulations or obtain green finance support, have demonstrated serious "greenwashing" or "imbalanced" phenomena—making significant investments in the environmental (E) dimension while having obvious shortcomings in corporate governance (G) or employee rights protection (S). Whether this extreme imbalance in internal ESG development will transmit distorted signals to the capital market, and how investors and creditors will price such "structural noise," remains a practical concern.

Scholars at home and abroad have conducted extensive research on the relationship between ESG performance and corporate financing constraints. The mainstream literature generally finds that good overall ESG scores can significantly reduce a company's debt and equity financing costs (Goss & Roberts, 2011; Cheng et al., 2014; Lins et al., 2017; Eliwa et al., 2019)^[1,2,3,4]. However, most existing studies treat ESG as a homogeneous composite indicator or investigate individual dimensions in isolation. A notable exception is recent work uncovering a paradox in China's heavily polluting industries: while overall ESG performance alleviates financing constraints, the environmental subcomponent alone significantly aggravates firms' financing difficulties (Wang, 2025)^[5]. This finding reveals the critical limitation of treating ESG as a monolithic score and points to the importance of examining the structural relationship among its pillars. Yet few studies have systematically examined the issue of "structural balance" within the three main pillars of E, S, and G.

In practice, companies face resource constraints and often show an imbalanced development pattern of "emphasizing environment but neglecting governance." This internal imbalance may obscure their true willingness to assume responsibilities and potential financial risks.

Accordingly, this paper focuses on three core questions: First, can the internal balance of ESG development substantially alleviate the financing constraints faced by firms? Second, what is the micro-level transmission mechanism—does it operate by enhancing external audit certification to reduce information asymmetry, or by improving debt acquisition capabilities to ease funding constraints? Third, does this alleviation effect differ significantly across firms of different ownership types, industry pollution levels, and technological attributes?

The marginal contributions of this study are mainly reflected as follows: In terms of perspective, it overcomes the limitation of "score-only analysis" and innovatively constructs an ESG internal development balance indicator from the perspective of "structural balance," enriching the application scenarios of signaling theory in the ESG field; in terms of mechanism, it introduces "external audit certification" and "financial leverage" as dual mediating pathways, opening the "black box" of how internal ESG structure affects financing constraints, and providing solid micro-level evidence for understanding its underlying logic; in terms of heterogeneity findings, it reveals that the impact of ESG balance is more significant for non-state-owned enterprises, non-high-pollution industries, and high-tech firms, offering practical insights for formulating differentiated sustainable development strategies for different types of companies.

2. Theoretical Analysis and Research Hypotheses

2.1. ESG Internal Development Balance and Corporate Financing Constraints

In the real capital market, due to the objective existence of information asymmetry and agency problems, external investors and creditors, in order to prevent moral hazard and adverse selection, often require higher risk premiums, causing firms to fall into the "financing constraint" dilemma where the cost of external financing is higher than that of internal financing (Whited & Wu, 2006)^[6].

According to signaling theory, firms can alleviate this dilemma by sending positive and reliable high-quality signals to the outside world. In recent years, ESG performance has been widely regarded as a "green signal" indicating that a firm practices sustainable development and has long-term investment value (Cheng et al., 2014; Yoon et al., 2018)^{[2][7]}. However, the credibility of this signal is not solely determined by overall ESG scores. Recent evidence from China demonstrates that ESG rating divergence significantly exacerbates corporate financing constraints by reducing analyst forecast accuracy, with the divergence effect primarily driven by the environmental dimension (Wang et al, 2025)^[8]. This suggests that the market penalizes not only weak ESG performance but also ESG structural inconsistency. However, existing research mostly assumes that this signal is homogeneous and perfect, ignoring the "structural noise" within the signal. When a firm's investment and performance in the three dimensions of Environment (E), Social (S), and Governance (G) are extremely unbalanced, external investors have sufficient reason to suspect that a high score in one dimension is a "greenwashing" effort or "disguised information disclosure" by management to comply with regulations or obtain green credit. This internal imbalance not only undermines the reliability of ESG as a high-quality signal overall, but also significantly increases the information screening and verification costs for external financial institutions. Conversely, firms with highly balanced internal ESG development convey a "strong signal" to the outside world that the concept of sustainable development is deeply integrated into the overall corporate strategy (Taliento et al., 2019)^[9]. This coordinated comprehensive performance is more credible, can effectively reduce creditors' and investors' risk perception, gain higher market reputation and trust, and in turn broaden financing channels and lower the cost of external financing. Based on this, this paper proposes the first core hypothesis:

H1: All else being equal, the more balanced a company's internal ESG development, the lower the financing constraints it faces.

2.2. The intermediary role of external audit certification

Modern corporate governance theory holds that in order to mitigate principal-agent conflicts and reduce information asymmetry, enterprises need to introduce external supervision mechanisms. Among these, high-quality external auditing is the most important 'gatekeeper' and information verification channel in the capital market. In the process of pursuing balanced development across the three pillars of E, S, and G, enterprises face exponentially increasing management complexity and information disclosure requirements. To maintain this multidimensional strategic balance, enterprises inevitably need to establish a rigorous and standardized internal control system as well as a non-financial data aggregation system.

More critically, balanced enterprises have a strong intrinsic motivation to 'prove their innocence.' In order to demonstrate to the capital market that their balanced ESG practices are a substantive strategic implementation rather than mere public relations embellishment, such enterprises often voluntarily choose external auditing firms with higher industry reputation and stronger professional capabilities for strict verification. This high demand for audit quality is intuitively reflected in the enterprises' willingness to pay higher audit fees. The information verification provided by these high-cost audits exerts a powerful third-party 'certification effect.' When creditors see that an enterprise not only claims balanced ESG development but that such balance is established under stringent external audit supervision, their concerns about hidden negative information are greatly reduced. Darnall et al. (2022)^[10] provide direct evidence that third-party verification of ESG disclosures significantly enhances corporate information transparency and credibility. The significant improvement in information transparency directly prompts banks and other capital providers to lower the risk discount requirements for the enterprise. Based on this, this paper proposes:

H2: The balanced internal development of ESG can encourage companies to increase investment in external audit certification, thereby alleviating financing constraints by reducing information asymmetry.

2.3. The mediating role of financial leverage

In addition to lowering financing thresholds by improving the information environment, the internal development balance of ESG can directly affect a company's resource allocation position in the financial market. According to resource dependence theory, the survival and development of a company highly depend on its ability to acquire key resources from the external environment. Under the current macro policy guidance that strongly promotes green finance and transitional finance, the credit allocation logic of commercial banks is undergoing profound changes—the provision of credit funds now considers not only the company's financial statements but also incorporates ESG performance into the core risk control model.

However, as regulatory measures mature, banks no longer blindly rely on outstanding performance in a single dimension when granting credit. Simple "flash-in-the-pan environmental protection" or "copycat poverty alleviation" efforts cannot pass the strict comprehensive credit risk assessment of banks. Asimakopoulou et al. (2023)^[11] show that firms obtaining ESG ratings experience reduced information asymmetry and shift their financing from public bonds to bank loans, as the ESG rating conveys valuable private information to lenders. This finding supports the argument that only companies demonstrating high synergy and robustness across environmental compliance, social responsibility, and internal governance structures can be recognized by credit institutions as truly "low-risk, high-quality" credit entities. Relatedly, Eliwa et al. (2019)^[12] find that ESG practices significantly lower the cost of corporate debt, providing further evidence for the credit market's sensitivity to ESG performance. Therefore, the more balanced a company's internal ESG development, the more its overall creditworthiness aligns with the green credit preferences of financial institutions.

Meeting these preferences directly translates into a ticket for acquiring credit resources, enabling the company to obtain higher credit limits and more relaxed borrowing conditions. At the micro financial level, this is directly reflected in the expansion of corporate debt financing scale and a significant increase in financial leverage. This cash inflow of "real money" immediately strengthens the company's available cash flow, fundamentally alleviating the financing constraints the company faces (Zhang et al., 2020). Based on this, this paper proposes:

H3: The internal development balance of ESG can highly meet the preferences for green credit, significantly enhancing the company's ability to obtain debt, and thereby substantially alleviating financing constraints.

3. Research Design

3.1. Sample Selection and Data Sources

This study takes A-share listed companies in China from 2010 to 2024 as the initial research sample. Data on corporate ESG ratings and environmental (E), social (S), and governance (G) sub-scores are sourced from the Huazheng ESG rating database, while corporate financial characteristics and corporate governance data are sourced from the CSMAR and RESSET databases.

To ensure the reliability of the empirical results, the initial sample was screened as follows: (1) financial and insurance listed companies were excluded due to essential differences in asset structure and regulatory requirements compared to non-financial enterprises; (2) companies that were subject to ST, *ST, or PT delisting risk warnings during the sample period were excluded; (3) sample observations with severely missing key variables were excluded. After these procedures, a total of 38,378 valid 'company-year' panel observations were obtained.

Furthermore, to eliminate the interference of extreme outliers on regression estimation, all continuous variables were winsorized at the 1% and 99% percentile levels.

3.2. Variable Definition

3.2.1. Dependent variable

The dependent variable in this paper is corporate financing constraints. Existing literature often uses the SA index as a proxy variable, but the SA index is constructed only from two non-financial characteristics of a firm: firm size and years since listing. It has a strong structural stickiness and is difficult to sensitively capture short-term fluctuations in the capital chain caused by improvements in non-financial information.

$$SA = -0.737 \times Size + 0.043 \times Size^2 - 0.040 \times Age$$

The ESG internal balance discussed in this paper is fundamentally aimed at substantially improving corporate cash flow by reducing information asymmetry and expanding credit channels. Therefore, this paper refers to the study by Whited & Wu (2006) and selects the WW index, which includes real financial indicators such as operating net cash flow, dividend distribution, and financial leverage, as the core dependent variable for the baseline regression. A higher WW index value indicates more severe substantive financing constraints faced by the enterprise. At the same time, to ensure the robustness of the conclusions, this paper uses the SA index and the KZ index as alternative variables for robustness testing.

3.2.2. Explanatory variable

Unlike previous literature that mainly uses overall ESG ratings or single-dimension scores, this paper aims to examine the degree of synergy and balance of companies across the three ESG pillars: Environment (E), Social (S), and Governance (G). Drawing on the concept of the 'coefficient of variation' used in statistics to measure data dispersion, this paper constructs an internal ESG development balance indicator (ESG_Bal). The specific calculation formula is as follows:

$$ESG_Bal_{i,t} = 1 - \frac{\sqrt{\frac{1}{3} \sum_{k \in \{E, S, G\}} (Score_{k,i,t} - \mu_{i,t})^2}}{\mu_{i,t}}$$

Among them, $Score_{E,i,t}$, $Score_{S,i,t}$, $Score_{G,i,t}$ represent the specific continuous scores of company i in year t for the environmental, social, and governance dimensions respectively; $\mu_{i,t}$ is the arithmetic mean of these three scores for the company in that year. The score portion on the right side of the formula essentially represents the coefficient of variation of these three scores. By subtracting the coefficient of variation from 1, a higher value of $ESG_Bal_{i,t}$ indicates a smaller degree of dispersion among a company's scores, meaning that the company's internal development across the three ESG dimensions is more balanced.

3.2.3. Mediator variable

(1) External Audit Certification (AuditFee_Million): Audit fees are a direct indicator of the intensity with which a company obtains external third-party information supervision and verification. Considering that the absolute amount of original audit fees is too large and may easily cause heteroscedasticity issues in the model and lead to coefficient minimization, this paper measures it by dividing the company's annual audit fees in absolute terms by one million. The higher this value, the higher the quality of external certification introduced by the company and the cost of information disclosure.

(2) Financial Leverage (FL): This paper uses a derivative financial leverage indicator based on the debt-to-asset ratio, aiming to depict the company's actual ability to obtain debt credit resources and the adequacy of leverage expansion.

3.2.4. Control variable

In order to control for other confounding factors that may affect corporate financing constraints as much as possible, this paper draws on relevant classical literature and selects the following control variables from two dimensions: financial characteristics and corporate governance: debt ratio (Lev), return on total assets (ROA), revenue growth rate (Growth), capital expenditure (Capex), board size (Board), proportion of independent directors (Indep), CEO duality (Dual), and the shareholding ratio of the largest shareholder (Top1).

Table 1. Variable Definitions

Variable Type	Variable Name	Variable Symbol	Definition
Explained Variable	Financing Constraints	SA	SA index, calculated based on firm size and firm age; a larger value indicates more severe financing constraints
	Financing Constraints (Robustness)	WW	WW index, calculated based on cash flow, leverage, dividend payout and other indicators; a larger value indicates more severe financing constraints
	Financing Constraints (Robustness)	KZ	KZ index, calculated based on net operating cash flow, dividend payout, cash holdings and other indicators; a larger value indicates more severe financing constraints
	ESG Internal Development Balance	ESG_Bal	1-Coefficient of Variation, i.e., 1-the ratio of the standard deviation to the mean of corporate annual E, S and G scores; the higher the value, the more balanced the development of the three dimensions
	ESG Comprehensive Score	esg_score	Comprehensive score from Huazheng ESG Rating
Mediating Variable	External Audit Certification	LnAuditFee_Million	Adopt the logarithm of audit fees as the proxy variable to measure the investment intensity of corporate external audit certification
	Financial Leverage	FL	Take asset-liability ratio as the proxy variable, reflecting the degree of corporate debt financing and long-term solvency
Control Variable	Asset-Liability Ratio	Lev	Total ending liabilities / Total ending assets
	Profitability	ROA	Return on Total Assets = Net Profit / Total Assets
	Growth	Growth	Operating Revenue Growth Rate = (Current Operating Revenue - Previous Operating Revenue) / Previous Operating Revenue
	Capital Expenditure	Capex	Capital Expenditure Ratio = Cash paid for constructing fixed assets, intangible assets and other long-term assets / Total Assets
	Board Size	Board	Natural logarithm of the total number of board directors
	Proportion of Independent Directors	Indep	Number of independent directors / Total number of board directors
	Duality of Chairman and General Manager	Dual	Dummy variable; assigned 1 if the chairman concurrently serves
	Ownership Concentration	Top1	Shareholdings of the largest shareholder / Total share capital
Heterogeneity Variable	Property Right Nature	SOE	Dummy variable; assigned 1 if the ultimate controller is SASAC at all levels, local government or central state organs (state-owned enterprise); assigned 0 for private, foreign-funded and other non-state-owned enterprises
	Pollution Attribute	Pollute	Dummy variable; referring to the <i>List of Industry Classification for Environmental Verification of Listed Companies</i> issued by the former Ministry of Environmental Protection and CSRC industry classification standard; assigned 1 for heavily polluting industries, assigned 0 for non-heavily polluting enterprises
	High-tech Attribute	HighTech	Dummy variable; in accordance with the <i>Classification of High-tech Industries (Manufacturing/Service Industries)</i> of the National Bureau of Statistics; assigned 1 for high-tech/hi-tech industry enterprises, assigned 0 for non-high-tech enterprises

3.3. Model Setup

3.3.1. Baseline regression

To examine the direct impact of internal ESG development balance on corporate financing constraints (i.e., to test hypothesis H1), this paper constructs the following two-way fixed effects panel regression model:

$$WW_{i,t} = \alpha_0 + \alpha_1 ESG_Bal_{i,t} + \sum \alpha_k Controls_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

In the model, the subscript i represents the firm, and t represents the year. $WW_{i,t}$ is the dependent variable of financing constraints; $ESG_Bal_{i,t}$ is the core explanatory variable representing the internal development balance of ESG. $Controls_{i,t}$ represents the set of control variables mentioned earlier. μ_i is the individual fixed effect, used to absorb unobservable firm characteristics that do not change over time; δ_t is the year fixed effect, used to control for the common influence of macroeconomic cycles and policy shocks. $\varepsilon_{i,t}$ is the random error term. If the coefficient α_1 is significantly negative, it indicates that balanced ESG development can effectively reduce the SA index and alleviate financing constraints, supporting hypothesis H1. All regressions in this paper use robust standard errors clustered at the firm level.

3.3.2. Mechanism testing

To examine the transmission mechanism of how external audit certification and financial leverage affect financing constraints in the process of ESG balance, this paper constructs the following mediation effect test model based on the benchmark regression model:

$$Med_{i,t} = \beta_0 + \beta_1 ESG_Bal_{i,t} + \sum \beta_k Control_{s,i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

$$WW_{i,t} = \gamma_0 + \gamma_1 ESG_Bal_{i,t} + \gamma_2 Med_{i,t} + \sum \gamma_k Controls_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (3)$$

Here, $Med_{i,t}$ represents the mediating variable (substituting separately for agency cost $AuditFee_Million$ and financial leverage FL). Equation (2) tests the effect of ESG balance on the mediating variable; equation (3) incorporates both the core explanatory variable and the mediating variable into the regression model. According to the logic of mediating effect testing, if β_1 in equation (2) is significant, and γ_2 in equation (3) is significant, it indicates the presence of a mediating effect; if at this time γ_1 is still significant and its absolute value is less than α_1 in the baseline model, it indicates a partial mediating effect.

4. Empirical Results and Analysis

4.1. Descriptive Statistics and Correlation Analysis

Table 2. Descriptive Statistics

	N	Mean	SD	Min	Median	Max
SA	38378	-1.021	0.072	-1.229	-1.017	-0.862
WW	38378	-3.871	0.272	-4.571	-3.870	-3.154
KZ	38378	1.678	2.132	-4.290	1.799	6.971
AuditFee_Million	38378	1.502	1.678	0.300	1	12.200
FL	38378	1.266	1.035	-1.317	1.043	7.765
esg_score	38378	73.086	5.306	57.025	73.220	86.270
e_score	38378	61.443	7.240	45.760	60.980	81.822
s_score	38378	75.434	8.640	48.410	76.170	100.000
g_score	38378	79.080	6.188	56.578	80.180	90.462
ESG_Bal	38378	0.875	0.050	0.727	0.878	0.978
Size	38378	0.443	0.204	0.059	0.440	0.916
Lev	38378	0.443	0.204	0.059	0.440	0.916
ROA	38378	0.030	0.063	-0.243	0.032	0.186
Growth	38378	0.142	0.368	-0.561	0.089	2.123
Capex	38378	0.048	0.047	-0.016	0.035	0.225
Board	38378	2.120	0.197	1.609	2.197	2.639
Indep	38378	0.377	0.053	0.333	0.364	0.571
Dual	38378	0.289	0.453	0	0	1
Top1	38378	0.335	0.149	0.080	0.311	0.740

Descriptive statistics of the main variables in this paper show that there are a total of 38,378 observations during the sample period. The dependent variable, WW index, has a mean of -3.871 and a standard deviation of 0.272; the means of SA index and KZ index are -1.021 and 1.678, respectively. The core explanatory variable, ESG internal development balance degree has a mean of 0.875 and a standard deviation of 0.050, indicating that there are some differences in the balance level of the E, S, and G dimensions among the sample firms. The mediating variable, audit fee has a mean of 1.502 million yuan, and financial leverage has a mean of 1.266. The distributions of all control variables are within a reasonable range.

Table 3. Correlation Matrix of Major Variables

	WW	SA	KZ	AuditFee_Million	FL	esg_score	e_score	s_score	g_score	ESG_Bal
WW	1	⁻ 0.027	0.154	-0.552	-0.05	-0.305	-0.276	-0.211	-0.136	-0.151
SA	⁻ 0.027	1	⁻ 0.078	0.147	0.011	0.102	-0.06	-0.098	0.182	-0.152
KZ	0.154	⁻ 0.078	1	0.073	0.173	-0.205	0.002	-0.012	-0.319	0.097
AuditFee_Million	⁻ 0.552	0.147	0.073	1	0.033	0.175	0.231	0.128	0.038	0.143
FL	-0.05	0.011	0.173	0.033	1	-0.061	0.005	-0.052	-0.085	0.015
esg_score	⁻ 0.305	0.102	⁻ 0.205	0.175	⁻ 0.061	1	0.538	0.573	0.645	0.246
e_score	⁻ 0.276	-0.06	0.002	0.231	0.005	0.538	1	0.307	0.11	0.781
s_score	⁻ 0.211	⁻ 0.098	⁻ 0.012	0.128	⁻ 0.052	0.573	0.307	1	0.03	0.192
g_score	⁻ 0.136	0.182	⁻ 0.319	0.038	⁻ 0.085	0.645	0.11	0.03	1	-0.178
ESG_Bal	⁻ 0.151	⁻ 0.152	0.097	0.143	0.015	0.246	0.781	0.192	-0.178	1

Correlation analysis shows that the correlation coefficient between ESG_Bal and the WW index is -0.151, which is significant at the 1% level, preliminarily supporting the expectation that higher ESG balance corresponds to lower financing constraints. At the same time, the correlation coefficients between all variables do not exceed 0.6, indicating that the model does not have serious multicollinearity issues.

4.2. Analysis of Baseline Regression Results

Table 4 reports the benchmark regression results measuring corporate financing constraints using the WW index. In all models of this study, firm fixed effects and year fixed effects are strictly controlled, and the standard errors are clustered at the firm level.

Table 4. Benchmark Regression

	Model1 (Overall)	Model2 (Itemized)	Model 3 (Balance)
esg_score	-0.0009*** (-14.3188)		
e_score		-0.0004*** (-8.3098)	
s_score		-0.0002*** (-4.0315)	
g_score		-0.0006*** (-10.5882)	
ESG_Bal			-0.0250*** (-3.5731)
Control variable	Yes	Yes	Yes
EntityFE	Yes	Yes	Yes
YearFE	Yes	Yes	Yes

Columns (1) and (2) show that the overall ESG score and the individual E, S, and G scores all have a significant negative impact on the WW index, confirming that good ESG performance helps to alleviate financing constraints. In column (3), the regression coefficient of the core explanatory variable ESG_Bal in this study is -0.0250, which is highly significant at the 1% level. This result indicates that, after controlling for other factors and two-way fixed effects, for each one standard deviation (0.050) increase in the internal development balance of ESG, the WW index decreases by approximately 0.00125 units, meaning that financing constraints are significantly reduced. This provides strong support for hypothesis H1.

4.3. Robustness Test

To test the reliability of the conclusions, this paper replaces the explained variable and re-runs the regression using the SA index and the KZ index, respectively. The results show that when the KZ index is the explained variable, the coefficient of ESG_Bal is negative but not significant; when the SA index is the explained variable, the coefficient of ESG_Bal is significantly positive. This difference confirms the rationality of using the WW index as the benchmark variable: the SA index is mainly composed of firm size and listing age, exhibiting strong structural stickiness, making it difficult to capture short-term liquidity changes resulting from improvements in non-financial information; although the KZ index includes cash flow information, its construction differs from the focus of the transmission in this study. In contrast, the WW index embeds actual credit costs and cash flow fluctuations, making it more sensitive to the substantive financial improvements brought by ESG balance. Furthermore, this paper also conducts tests by changing the construction method of the core explanatory variable and adjusting the sample period, and the conclusions remain substantially unchanged, indicating that the baseline results are robust and reliable.

Table 5. Robustness Test

	SA Index (Overall)	SA Index (Sub-item)	SA Index (Balance)	KZ Index (Overall)	KZ Index (Sub-item)	KZ Index (Balance)
esg_score	0.0012*** (7.4649)			-0.0126*** (-6.8695)		
e_score		0.0011*** (8.4422)			-0.0034** (-2.3661)	
s_score		-0.0003*** (-3.1638)			-0.0030** (-2.5557)	
g_score		0.0009*** (7.2424)			-0.0097*** (-6.0886)	
ESG_Bal			0.0414** (2.5597)			-0.0074 (-0.0386)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
EntityFE	Yes	Yes	Yes	Yes	Yes	Yes
YearFE	Yes	Yes	Yes	Yes	Yes	Yes

4.4. Mediation mechanism test

The previous text confirmed that ESG balance can significantly reduce financing constraints. This section further examines the two transmission paths of 'external audit certification' and 'financial leverage expansion.' Table 3 reports the results of the mediation effect test using the stepwise regression method.

Table 6. Mediation Mechanism Test

	LnAuditFee-Step2	LnAuditFee-Step3	FL-Step2	FL-Step3
ESG_Bal	0.4366** (2.4948)	-0.0199*** (-2.9921)	0.6503*** (3.5324)	-0.0246*** (-3.5174)
AuditFee_Million		-0.0116*** (-13.9652)		
FL				-0.0006** (-2.2872)
Control variable	Yes	Yes	Yes	Yes
EntityFE	Yes	Yes	Yes	Yes
YearFE	Yes	Yes	Yes	Yes

External Audit Certification Path: In Step 2, where audit fees (AuditFee_Million) are the dependent variable, the coefficient of ESG_Bal is 0.4366, significantly positive at the 5% level, indicating that balanced ESG development prompts firms to increase audit investment to introduce stricter external verification. In Step 3, after including both ESG_Bal and AuditFee_Million, the coefficient of AuditFee_Million on the WW index is -0.0116, significant at the 1% level, and the absolute value of the ESG_Bal coefficient drops from the baseline 0.0250 to 0.0199. This indicates that external audit certification plays a significant partial mediating role in alleviating financing constraints through ESG balance. Balanced enterprises, by hiring high-quality auditors for information verification, effectively reduce creditors' information asymmetry and risk concerns, thereby alleviating financing constraints. Hypothesis H2 is verified.

Financial Leverage Path: In Step 2, with financial leverage (FL) as the dependent variable, the coefficient of ESG_Bal is 0.6503, significantly positive at the 1% level, indicating that ESG balance highly aligns with green credit orientation, significantly increasing firms' debt financing scale. In Step 3, the coefficient of FL on the WW index is -0.0006, significant at the 5% level, and the ESG_Bal coefficient also declines. This shows that financial leverage is another important transmission path: balanced ESG development enhances firms' ability to access credit resources, and the real inflow of debt funds improves the firm's liquidity, ultimately alleviating financing constraints. Hypothesis H3 is verified.

4.5. Heterogeneity analysis

Table 4-6 reports the results of heterogeneity tests based on ownership nature, industry pollution attributes, and high-tech attributes. To avoid redundancy, only the coefficients and significance of the core explanatory variable ESG_Bal are shown.

Table 7. Heterogeneity Test

	State-owned enterprise	Non-state-owned enterprise	Heavily polluting enterprises	Non-heavy-polluting enterprise	High-tech enterprise	Non-high-tech enterprise
ESG_Bal	-0.0113 (-1.0862)	-0.0327*** (-3.4351)	-0.0065 (-0.5318)	-0.0290*** (-3.5663)	-0.0409*** (-4.4784)	-0.0080 (-0.7620)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
EntityFE	Yes	Yes	Yes	Yes	Yes	Yes
YearFE	Yes	Yes	Yes	Yes	Yes	Yes

Heterogeneity of property rights: In non-state-owned enterprises, the coefficient of ESG_Bal is -0.0327 and significant at the 1% level; while in state-owned enterprises, the coefficient is not

significant. This indicates that private enterprises, which lack implicit government guarantees, rely more on the balanced development of ESG as a high-quality 'soft credit signal' to break through financing barriers and alleviate credit discrimination based on ownership.

Heterogeneity of industry pollution characteristics: In the sample of non-heavily polluting enterprises, the coefficient of ESG_Bal is -0.0290, significant at the 1% level; for heavily polluting enterprises, it is not significant. The possible reason is that the financing constraints of heavily polluting enterprises mainly depend on hard constraints such as environmental compliance, and the performance of the single E dimension already dominates their credit evaluation, leaving limited marginal effect for balance; non-heavily polluting enterprises can gain more credit premium from the comprehensive synergy of E, S, and G.

Heterogeneity of high-tech attributes: In the sample of high-tech enterprises, the coefficient of ESG_Bal is as high as -0.0409, significant at the 1% level, while it is not significant for non-high-tech enterprises. High-tech enterprises generally lack traditional collateral, making external financing highly dependent on the soft power of non-financial information transmission. Therefore, the credit market is most sensitive to the ESG balanced signals released by these enterprises, and the 'soft guarantee' function of internal ESG balance is fully realized.

5. Conclusion and Policy Recommendations

5.1. Research Conclusion

This paper takes China's A-share listed companies from 2010 to 2024 as the sample, moving beyond the traditional framework of 'total scores only,' and innovatively constructs an 'ESG Internal Development Balance' indicator to systematically examine its impact on financing constraints and the transmission mechanism. The main conclusions are as follows:

First, the balance of internal ESG development can significantly alleviate corporate financing constraints. The more coordinated a company's practices are across the E, S, and G dimensions, the more reliable and consistent the sustainable development signals it sends to the capital market, effectively reducing financial institutions' costs of information screening and concerns about 'greenwashing' behavior. This conclusion remains robust after multiple checks, including replacing the financing constraint measurement indicators and altering variable construction methods.

Second, external audit certification and financial leverage expansion are two effective channels through which balanced ESG development alleviates financing constraints. Mechanism tests show that balanced ESG practices, on the one hand, encourage enterprises to increase high-quality audit investment, using third-party credibility to reduce information asymmetry; on the other hand, they highly align with commercial banks' green credit preferences, significantly enhancing debt financing capacity and fundamentally improving the company's funding situation.

Third, the aforementioned alleviation effect is more significant in non-state-owned enterprises, non-heavily polluting enterprises, and high-tech enterprises. Private enterprises lacking implicit government guarantees rely more on the soft power of balanced ESG to overcome credit ownership discrimination; non-heavily polluting enterprises can obtain more credit premium from comprehensive coordination of E, S, and G; asset-light high-tech enterprises, due to the lack of traditional collateral, depend heavily on non-financial soft information for external financing, making the alleviating effect of balanced ESG signals on their financing constraints the most prominent.

5.2. Policy recommendations

First, physical enterprises should abandon the utilitarian ESG development model of 'speculative compliance.' Management must plan the synergy of environmental investment, social responsibility fulfillment, and internal governance structure, while being cautious of the 'imbalanced focus' risk caused by excessive investment in a single dimension, and avoid being identified by external creditors as a 'pseudo-ESG top performer' due to internal imbalance.

Second, financial institutions should incorporate 'ESG structural balance' into credit risk control models. When issuing green loans or sustainable development-linked loans, in addition to evaluating the overall ESG rating, institutions must also conduct a detailed assessment of the balance across each dimension to accurately identify financing entities with serious imbalances, thereby improving the efficiency and security of credit fund allocation.

Third, regulatory authorities should accelerate the introduction of more detailed and mandatory ESG disclosure guidelines. When enterprises disclose ESG reports, they must provide detailed explanations of the resource allocation and coordination mechanisms across E, S, and G sub-items, and appropriately introduce a mandatory third-party verification system for ESG reports to fundamentally curb 'greenwashing' and selective disclosure, enhancing the transparency and credibility of non-financial information in the capital market.

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