Corporate ESG Performance and Its Impact on Financial Constraints in China's A-Share Listed Companies

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Abstract. In light of significant changes in the global economic and social landscape, corporate environmental, social, and governance (ESG) performance has increasingly become a central focus for investors and stakeholders. This study examines a sample of non-financial listed companies in China's A-share market from 2015 to 2024, employing ESG rating data from *SynTao Green Finance* to investigate the influence and mechanisms of corporate ESG performance on financing constraints. Utilizing a panel regression methodology, the research incorporates leverage ratio and enterprise size as moderating variables to conduct a comprehensive analysis of the differential effects of financing constraints on enterprises. The findings reveal that ESG performance substantially mitigates corporate financing constraints, with the effect being more pronounced in enterprises with low leverage and smaller scale. Robustness checks further affirm the validity of these conclusions. The results provide empirical evidence for companies aiming to optimize their financing conditions and achieve sustainable development by enhancing their ESG performance.

Keywords: ESG Performance, Financial Constraints, Leverage, Firm Size, Heterogeneity Analysis.

1 Introduction

Amidst increasingly complex and uncertain external financing markets, corporate financing constraints have emerged as a crucial factor limiting the investment efficiency and long-term development of Chinese listed companies. Previous research has predominantly concentrated on the influence of financial indicators, governance structures, and macroeconomic conditions on financing constraints [1]. However, with the growing emphasis on sustainable development, Environmental, Social, and Governance (ESG) performance has progressively become a critical dimension for assessing corporate value and risk in capital markets [2]. Robust ESG performance is posited to reduce corporate reputational risks and enhance information transparency. The literature examining the nexus between ESG and financing constraints has yielded heterogeneous findings. Some studies suggest that investments in environmental and social responsibilities may impose additional costs, thereby intensifying financing difficulties [3].

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Conversely, other scholars argue that proactive ESG practices can bolster corporate reputational capital and external evaluations, thus ameliorating financing conditions [4]. Given China's distinctive institutional environment and capital market structure, investigating the impact of ESG performance on financing constraints holds significant theoretical and practical value.

This study utilizes a dataset encompassing non-financial firms listed on China's Shanghai, Shenzhen, and Beijing A-share markets from 2015 to 2024. It constructs indicators to measure financing constraints and incorporates ESG performance alongside a range of control variables to systematically examine the influence of ESG performance on financing constraints. Furthermore, the study examines the moderating effects of corporate leverage and firm size, analyzing whether the impact of ESG performance on financing constraints is modulated by corporate characteristics and managerial behavior. The findings reveal that robust ESG performance generally alleviates corporate financing constraints, with this effect being particularly pronounced in firms with low leverage and those of smaller scale. The empirical result indicating that a high leverage ratio does not enhance the mitigating effect of ESG performance on financing constraints, which challenges traditional Signaling Theory expectations. This suggests that companies should prudently manage their debt levels alongside improving ESG performance to prevent high debt from overshadowing the potential benefits of ESG. The moderating effect of firm size offers theoretical backing and practical insights for developing differentiated ESG investment strategies for firms of varying sizes. These findings not only expand the theoretical framework concerning the relationship between ESG and corporate financial behavior but also provide strategic recommendations for business managers and policymakers, aiding firms in achieving sustainable development in complex economic contexts.

2 Theoretical Basis and Research Hypotheses

2.1 The Relationship Between ESG Performance and Corporate Financial Constraints

Asymmetric information denotes the uneven distribution of information among market participants [5]. Within the financial market, asymmetries between enterprises and investors can lead to elevated financing costs and heightened difficulties in securing funds. Superior ESG performance can mitigate information asymmetry by enhancing a company's transparency and reputation. For instance, a company excelling in environmental, social responsibility, and governance domains is likely to be more forthcoming in information disclosure, thereby reducing investor uncertainty, bolstering investor confidence, and subsequently alleviating financing constraints. The study by Wang & Yao (2024) corroborates this perspective, asserting that companies producing high-quality ESG reports can indeed enhance their information transparency [6]. This enhanced transparency allows for more precise investor risk assessments, thereby easing capital acquisition challenges. Concurrently, Signaling Theory posits that firms convey information about their intrinsic quality to the market through specific actions or behaviors [7]. Exemplary ESG performance may be interpreted as a positive signal,

reflecting a company's robust commitment to sustainable development and corporate governance [8]. This signal can attract a broader array of investors and creditors, thereby diminishing the firm's financing constraints. Hence, the study posits the following hypothesis 1.

H1: A significant negative correlation exists between ESG performance and financial constraints; specifically, as a company's ESG performance improves, the financial constraints it encounters tend to diminish.

2.2 The Moderating Role of Leverage Ratio in the ESG-Financial Constraint Nexus

The leverage ratio, a critical metric for assessing a company's financial leverage, potentially moderates the relationship between ESG performance and financial constraints. According to Signaling Theory, firms convey information regarding their intrinsic quality through observable actions. A high leverage ratio may indicate confidence in a company's profitability and growth potential [9]. In such cases, if a firm also exhibits strong ESG practices, it is likely to be perceived by external stakeholders as adept at managing both complex financial and non-financial risks concurrently. This positive signal may help alleviate concerns among investors and creditors. Consequently, this study posits that the signaling effect may be more substantial at higher debt levels, thereby alleviating the financial constraints typically associated with elevated debt. Based on this deduction, the paper proposes a second hypothesis.

H2: The leverage ratio positively moderates the relationship between ESG performance and financial constraints. Specifically, when a company's leverage ratio is high, robust ESG performance can more effectively mitigate the financial constraints.

2.3 The Moderating Role of Enterprise Scale in the ESG-Financial Constraint Nexus

In accordance with the theory of Information Asymmetry, larger enterprises are generally better equipped to mitigate issues of information asymmetry due to their enhanced credibility and comprehensive information disclosure. Information asymmetry is particularly pronounced in smaller enterprises, which often lack the resources to provide detailed disclosures, thus complicating external risk assessments and exacerbating financial constraints. Concurrently, the theory of Economies of Scale posits that as a company enlarges, it can decrease marginal costs and bolster market competitiveness through more efficient resource allocation and utilization [10]. Larger enterprises typically possess greater resources and market influence, affording them advantages in funding, talent, and technology. Consequently, they access a broader spectrum of financing channels, such as bank loans, bond issuances, and equity financing [11]. Conversely, smaller enterprises face disadvantages in the financing markets, resulting in higher costs of capital acquisition [11]. Hence, improvements in ESG performance may yield more significant marginal benefits for smaller firms, enhancing their standing in the financing market. Hence, the research proposes the third hypothesis as follows.

H3: Relative to large-scale enterprises, the mitigating impact of ESG performance on financial constraints is more pronounced in small-scale enterprises.

3 Empirical Testing

3.1 Sample Selection and Data Source

This study utilizes annual data from A-share listed companies on the Shanghai, Shenzhen, and Beijing stock exchanges for the period 2015 to 2024 as the initial sample set. Financial and corporate governance data were sourced from the *Choice Financial Data Terminal*, while ESG data were obtained from *SynTao Green Finance*. In alignment with the 2012 Industry Classification Standards established by the *China Securities Regulatory Commission*, the sample underwent the following rigorous screening to ensure the reliability of research outcomes: (1) exclusion of all samples with missing variable data; (2) exclusion of financial sector listed companies; (3) exclusion of companies categorized as ST and *ST during the sample period to avoid anomalies; (4) implementation of a 1% and 99% winsorization on variables to detect and handle outliers. Following this meticulous process, the dataset finally comprises 9,708 annual company observations for subsequent analysis.

3.2 Variable Definition and Measurement

3.2.1 Explained Variable – Financial Constraint (WW). The degree of financial constraints experienced by enterprises is quantified using the WW index model, as proposed by Whited and Wu (2006) [12]. This model integrates multiple dimensions of a company, such as cash flow, dividend payouts, growth prospects, and size, and is extensively applied in the domain of financial economics. The WW index is calculated using the following formula (1).

$$WW = -0.091 * CF - 0.062 * DivPos + 0.021 * LEV - 0.044 * SIZE + 0.102 * ISG - 0.035 * SG \quad (1)$$

In this model, CF represents the ratio of net cash flows from operating activities to total assets; $DivPos$ is a binary variable representing cash dividend disbursements, assigning a value of 1 if dividends are paid during the current period, and 0 otherwise; LEV denotes the ratio of total liabilities to total assets; $SIZE$ is the natural logarithm of total assets; ISG refers to the industry average sales growth rate, based on the 2012 Industry Classification Standard proposed by *China Securities Regulatory Commission*, where manufacturing is assigned a two-digit code, and other industries a one-digit code; SG is the sales revenue growth rate. A higher computed value of the WW index indicates more pronounced financial constraints, signifying greater challenges for the enterprise in securing external financing.

3.2.2 Explanatory Variable – ESG Rating Score (ESG). This study employs the ESG rating data provided by *SynTao Green Finance* to quantify corporate ESG performance.

As the pioneering ESG provider in China to be listed on Bloomberg's terminal, *SynTao Green Finance* possesses a real-time monitoring system that encompasses news, announcements, and social media across the entire network, enabling daily updates on adverse public sentiment [13]. It is also the first entity in the bond ESG sector to achieve comprehensive coverage of A-shares, Hong Kong Stock Connect, Chinese concept stocks, and major credit creditors, thereby advancing the application depth within the fixed income market [13]. Its rating outcomes are extensively applicable to investment decision-making, risk management, policymaking, and the innovation and development of sustainable financial products. The aggregate rating score is derived from summing the ESG proactive management score (evaluating a company's specific measures and effectiveness in environmental stewardship, social responsibility, governance, etc.) and the ESG risk exposure score (evaluating the ESG-related risks faced by the company).

Based on the performance of various enterprises, the rating outcomes are categorized into ten levels: D, C-, C, C+, B-, B, B+, A-, A, A+. The highest score is A+, while the lowest is D. For this study, the ESG variables are obtained using a 1-10 point scale, where a score closer to 10 indicates superior ESG performance.

3.2.3 Moderator Variables. ① Leverage Ratio (LEV): The leverage ratio serves as a pivotal metric in assessing a company's financial leverage and debt servicing capability, typically defined as the ratio of total liabilities to total assets [9]. A higher leverage ratio suggests a greater proportion of the company's assets is financed by creditors, indicating a heightened reliance on external debt financing and relatively elevated financial risk. Conversely, a lower leverage ratio implies that the company's assets are largely financed by shareholder equity, resulting in a more stable financial structure and enhanced debt servicing ability.

② Enterprise Size ($SIZE$): Enterprise size reflects the economic strength and operational scope of an entity, serving as an indicator of its market influence, resource acquisition capabilities, and competitive positioning. In alignment with previous studies, this research measures enterprise size using the natural logarithm of a company's annual total assets [14]. Generally, a larger enterprise size corresponds to stronger capital base, which typically signifies a larger market share and influence.

3.2.4 Control Variables. In accordance with established methodologies in enterprise management and investment behavior research, this study incorporates the ratio of fixed assets to total assets (FA), corporate growth ($GROWTH$, measured by the year-on-year growth rate of operating income), enterprise age (AGE), and executive shareholding ratio ($MANAGER$) as control variables in the regression models.

3.3 Empirical Models

Based on the research hypotheses established in the previous section, panel regression models can be constructed. Assuming Hypothesis 1, its formula is as follows (equation (2)). In this formula, $ControlVar$ includes two moderator variables in 3.2.3 and control variables in 3.2.4 (all six variables are used as control variables in the main hypothesis).

If the regression coefficient β_1 of ESG is significantly negative, then Hypothesis 1 is supported, that is, good ESG performance helps to suppress financial constraints.

$$WW_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 ControlVar_{i,t-1} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (2)$$

In addition, to investigate whether the leverage ratio and size of a company play a moderating role in the relationship between ESG performance and financial constraints, the following moderating effect models (3) and (4) are constructed. The significance of the coefficient of the interaction term between the independent variable and the moderator variable should be observed. If α_3 or μ_3 is significant, it proves that the related moderating effect exists.

$$WW_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t-1} + \alpha_2 LEV_{i,t-1} + \alpha_3 (ESG_{i,t-1} * LEV_{i,t-1}) + \alpha_4 ControlVar_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (3)$$

$$WW_{i,t} = \mu_0 + \mu_1 ESG_{i,t-1} + \mu_2 AGE_{i,t-1} + \mu_3 (ESG_{i,t-1} * AGE_{i,t-1}) + \mu_4 ControlVar_{i,t-1} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (4)$$

4 Research Results and Analysis

4.1 Descriptive Analysis

Table 1 presents the descriptive statistics for all study variables. Analysis of the distribution characteristics of key variables yields the following insights: (1) The mean and standard deviation of the ESG performance indicator ESG are 5.7628 and 1.1330, respectively, indicating that most enterprises exhibit moderate ESG performance at a B level, with the highest rating at A-. (2) The mean and standard deviation for the enterprise financial constraint indicator, WW, are -1.0489 and 0.0761, respectively. This suggests that sample companies generally experience "low constraint" levels, with minimal variation among firms, reflecting highly concentrated financial constraints. Even the most constrained company exhibits a maximum value of -0.8869, remaining within the "light constraints" category. (3) The distribution of other variables falls within acceptable and reasonable limits.

Table 1. Descriptive statistical results.

Variable	Sample number	Average value	Standard deviation	Minimum	Median	Maximum
ESG	9708	5.7628	1.1330	4.0000	6.0000	8.0000
WW	9708	-1.0489	0.0761	-1.2450	-1.0460	-0.8869
LEV	9708	0.4483	0.1955	0.0691	0.4479	0.8998
SIZE	9708	22.9204	1.4756	20.1734	22.7510	26.8798
FA	9708	0.2015	0.1505	0.0024	0.1696	0.6432
GROWTH	9708	0.0650	0.2521	-0.5502	0.0482	1.0706
MANAGER	9708	0.1380	0.1801	0.0001	0.0364	0.6701
AGE	9708	23.1081	5.9073	10.0000	23.0000	40.0000

4.2 Multicollinearity Test

To assess the presence of collinearity among the variables, the study employs a multicollinearity test utilizing the Variance Inflation Factor (VIF). The VIF specifically measures the extent to which an independent variable is linearly predicted by other independent variables, as referenced in [15]. A VIF value exceeding 10 typically suggests collinearity issues, which can lead to instability in the regression coefficients, elevate the standard error of the coefficients, and potentially yield incorrect inferences, as discussed in [15].

Table 2 presents the findings of the multicollinearity analysis among the primary variables, indicating that all VIF values are below 10, thereby suggesting an absence of significant collinearity concerns. Consequently, the independent effects of each predictor variable on the dependent variable remain interpretable, allowing for the retention of all variables in the model.

Table 2. Variables' VIF calculation.

	Feature	VIF
1	*ESG*	1.0814
2	*LEV*	1.2879
3	*SIZE*	1.5393
4	*FA*	1.0163
5	*GROWTH*	1.0202
6	*MANAGER*	1.2791
7	*AGE*	1.0836

4.3 Panel Regression Analysis

4.3.1 Results of Hypothesis 1. The results presented in Table 3 reveal that the ESG coefficient is negative and statistically significant at the 1% level, indicating that superior ESG performance is associated with diminished financial constraints, thereby confirming Hypothesis 1. Economically, this suggests that a unit increase in ESG reduces financial constraints by 0.0024. The average value of the WW is -1.0489, signifying that a one-level enhancement in ESG corresponds to an approximate 0.229% reduction in financial constraints relative to the current average. Despite this percentage appearing modest, the concentration of financial constraints among the sampled firms implies a noteworthy impact on their financial decision-making processes, thereby engendering differentiated performance in the financial market. An elevated ESG score potentially bolsters investor confidence in a firm, as investors often perceive firms with high ESG performance as being well-managed, adhering to sustainable development principles, and likely to achieve superior financial performance and sustainable growth over the long term. Consequently, such firms may encounter fewer obstacles in securing external financing. Moreover, exemplary ESG performance typically reflects a firm's commendable practices in environmental stewardship, social responsibility, and governance, ultimately enhancing the firm's market reputation and brand image and mitigating

its overall risk profile. The reduction in risk may appeal to a broader array of investors and lending institutions, thus alleviating financial constraints.

The comparative analysis of the regression results for the subsamples of state-owned and non-state-owned enterprises demonstrates that the ESG scores in both categories possess negative coefficients and are statistically significant. This suggests that enhanced ESG performance effectively reduces financial constraints while augmenting market reputation and trust across both types of enterprises. With the rising tide of globalization and the active participation of international investors, ESG standards have emerged as universally applicable evaluation criteria [16]. This necessitates that both state-owned and non-state-owned enterprises compete on ESG performance to attract international capital. Furthermore, certain industries, such as consumer goods and technology, may experience homogenization pressures, rendering ESG performance a fundamental criterion of competition irrespective of enterprise nature [17]. Consequently, all enterprises may confront similar pressures to elevate their ESG scores in order to maintain a competitive edge in the market.

Table 3. Regression results for Hypothesis 1.

	Full sample	**State-owned enterprises**	**Non-state-owned enterprises**
ESG	-0.0024***	-0.0017**	-0.0027***
LEV	0.0547***	0.0702***	0.0511***
SIZE	-0.0513***	-0.0515***	-0.0513***
FA	0.0005	0.0060	-0.0002
GROWTH	0.0060***	0.0082***	0.0059***
MANAGER	-0.0218***	-0.0290**	-0.0211***
AGE	0.0002**	-0.0002	0.0003***
year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
F	1543.7000	391.6600	1108.8000
R-squared	0.8404	0.8614	0.8264
N	9708	1985	7723

Note: The data in the table are regression coefficients of each variable, and ***, **, and * are significant at the significance level of 1%, 5% and 10% respectively.

4.3.2 Results of Hypothesis 2 & 3. The study further explores the moderating effects of the leverage ratio and firm size on the relationship between ESG performance and the financial constraints. Initially, an interaction term, $ESG * LEV$, is introduced to assess the interplay between the leverage ratio (LEV) and ESG performance. The findings in Table 4 indicate that the coefficient for this interaction term is positive and statistically significant at the 10% level. This suggests that the leverage ratio negatively moderates the relationship in question. Specifically, in companies with high leverage ratios, the positive impact of ESG performance on alleviating financial constraints appears to be diminished. A plausible explanation for this phenomenon is that a higher debt-to-asset ratio is often perceived as an indicator of increased financial risk. This is because

it implies a greater dependency on debt financing, which could lead to heightened debt pressure and an elevated risk of bankruptcy [9]. Consequently, even when a firm excels in sustainable development practices, its substantial debt obligations may provoke investor skepticism regarding its long-term profitability and cash flow stability. Such skepticism might result in more conservative investor decision-making, thereby constraining the firm's ability to access external financing. Furthermore, when assessing a firm's credit risk, lending institutions may prioritize its financial leverage over its ESG performance. Hence, under conditions of elevated debt-to-asset ratios, the ability of ESG performance to mitigate financing constraints is attenuated, rendering Hypothesis 2 invalid.

In the subsequent analysis of the moderating role of firm size, the interaction term $ESG * SIZE$ is introduced. The coefficient of this term is found to be positive and significant at the 1% level, indicating that the mitigating effect of ESG performance on financial constraints diminishes with increasing firm size. This suggests that ESG performance has a more pronounced alleviating effect on financing constraints for smaller enterprises. Smaller firms often encounter greater information asymmetry and heightened financial constraints due to their limited market reputation and influence. High ESG performance can serve as a favorable signal for these firms, highlighting their exemplary environmental, social responsibility, and governance practices to investors and financial institutions, thereby enhancing trust. For smaller enterprises, strong ESG performance is particularly critical as it helps offset their disadvantages in terms of financial transparency and risk management. Investors and creditors may exhibit a greater propensity to support smaller businesses that demonstrate a commitment to responsible management and sustainable development. In essence, robust ESG performance can partially substitute or complement the deficiencies of smaller firms. Additionally, smaller enterprises possess higher agility, enabling them to swiftly adapt their business strategies to align with sustainability trends [18]. High ESG scores may further incentivize these enterprises to optimize internal management and resource utilization. This holistic effect not only alleviates financial constraints but also supports the long-term financial performance and market competitiveness of these firms. Therefore, in the context of small enterprises, ESG performance exerts a more significant influence on financial constraints, thus validating Hypothesis 3.

Table 4. Regression results for Hypothesis 2 & 3.

	Full Sample	
	LEV moderation	*SIZE* moderation
ESG	-0.0037***	-0.0298***
LEV	0.0389***	0.0549***
*ESG * LEV*	0.0028*	/
SIZE	-0.0513***	-0.0585***
*ESG * SIZE*	/	0.0012***
FA	0.0006	0.0009
GROWTH	0.0060***	0.0061***

	Full Sample	
	LEV moderation	*SIZE* moderation
MANAGER	-0.0220***	-0.0222***
AGE	0.0002**	0.0002**
year	Yes	Yes
Industry	Yes	Yes
F	1498.8000	684.8400
R-squared	0.8405	0.6963
N	9708	9708

Note: The data in the table are regression coefficients of each variable, and ***, **, and * are significant at the significance level of 1%, 5% and 10% respectively.

4.4 Robustness Test

The study employs two methods, namely the variable replacement method and the error calculation replacement method, to conduct robustness testing on the primary model. Firstly, the calculation approach for the core variable, ESG, is substituted. ESG rating data provided by *Sino-Securities Index Information Service (Shanghai) Co., Ltd.* — recognized as a mainstream rating entity that integrates information disclosure within the Chinese capital market — is utilized [19]. This method categorizes corporate ESG performance into nine levels, ranging from C to AAA. These levels are subsequently assigned values from 1 to 9, where 9 corresponds to AAA. Regression analysis against WW reveals an ESG_grade coefficient of -0.0040, with a p-value of 0.0000, indicating significance at the 1% level.

Secondly, the study replaces the cluster-robust standard error, initially employed in testing the main hypothesis, with a heteroskedasticity-robust standard error. This approach accounts for individual differences rather than industry-level error correlation [20]. Under this method, the ESG coefficient is determined to be -0.0024, with a p-value remaining at 0.0000. The findings from both robustness tests are consistent with the primary hypothesis, thereby affirming the model's robustness.

5 Conclusion

This study utilizes data from A-share listed companies in China's Shanghai, Shenzhen, and Beijing exchanges, spanning the years 2015 to 2024, to examine the impact of corporate ESG performance on financial constraints. Further analysis is conducted to explore the moderating effects of the leverage ratio and firm size. The research yields the following principal conclusions and insights.

Firstly, there exists a significant negative correlation between a firm's ESG performance and its financial constraints, a relationship that remains consistent regardless of the company's nature. This finding suggests that robust ESG practices can universally enhance a company's market reputation and bolster investor confidence. Therefore, it

is recommended that the government incentivize more firms to adopt and enhance ESG standards, potentially through measures such as tax incentives or subsidies to support investments in environmental sustainability, social responsibility, and governance.

Secondly, an elevated leverage ratio attenuates the mitigating influence of ESG performance on financial constraints. This implies that substantial debt levels may induce apprehension among investors and lending institutions, even in the presence of strong ESG performance. Consequently, enterprises should adopt rigorous debt management strategies, optimize their capital structure, lower their leverage ratios, and enhance financial stability. Lending institutions could improve monitoring of corporate debt levels and offer consultancy services to help firms optimize their debt structures. Policymakers should consider devising strategies to encourage firms to decrease leverage, potentially by reducing the interest costs of new debt financing, thereby promoting financial health.

Thirdly, as firm size increases, the mitigating effect of ESG performance on financing constraints diminishes. This phenomenon may occur because larger firms possess more resources and market influence, which can alleviate financial constraints through alternative mechanisms. Nonetheless, large enterprises should persist in enhancing their ESG practices, particularly given the complexities of their organizational structures, to ensure effective implementation and transmission of ESG policies. Concurrently, the government should extend targeted support to small and medium-sized enterprises to improve their ESG performance, potentially through consultancy, training, or technical assistance, thereby enhancing their market competitiveness. Finally, the study advises investors to focus on the strategic execution and actual efficacy of ESG initiatives when assessing large enterprises, rather than relying solely on firm size and market position.

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