Greenwashing and ESG Rating Penalties Among Chinese Listed Firms

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Abstract. In the context of intensifying national "dual carbon" objectives and the rapid expansion of environmental, social, and governance (ESG) investment, the veracity of corporate environmental disclosures has attracted increasing scholarly and regulatory attention. Using A-share listed firms in Shanghai, Shenzhen, and Beijing over the period 2015-2024 as the sample, this study employs cross-matched *Huazheng* ESG ratings and *Bloomberg* environmental disclosure data to construct an index measuring the divergence between disclosed environmental information and substantive green activities, which serves as a proxy for greenwashing. The paper then systematically investigates the effect of greenwashing on ESG ratings and explores relevant boundary conditions. Empirical results indicate that greenwashing exerts a statistically significant negative effect on ESG ratings, and this relationship remains robust across firms with different ownership structures and across industries with varying environmental sensitivity. Further analyses reveal that research and development (R&D) investment mitigates the adverse impact of greenwashing on ratings, whereas the moderating role of ownership concentration is not statistically significant, suggesting that incentives for major shareholder monitoring may be offset by motivations for information manipulation. The findings offer policy implications for rating agencies to strengthen substantive verification procedures and for firms to prioritize technological innovation over superficial disclosures.

Keywords: Greenwashing, ESG Rating, R&D Investment, Ownership Concentration, Panel Regression.

1 Introduction

Against the backdrop of an accelerating global sustainable development agenda, environmental, social, and governance (ESG) considerations have become embedded in corporate strategic decision-making and capital market valuation processes. As the world's largest carbon emitter and the second largest equity market, China has witnessed rapid expansion of ESG investment driven by its "dual carbon" targets, accompanied by a broadening and deepening of ESG disclosures among listed firms [1]. However, this expansion has not uniformly translated into substantive green transformation. Greenwashing, defined as the construction of a misleadingly favorable environmental image through selective disclosure, exaggerated claims, or narrative packaging, has

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emerged as a salient threat to the integrity of ESG practices [2]. China's ESG evaluation infrastructure remains nascent and lacks a unified, context-appropriate standard. Divergent assessments by different rating agencies for the same firm weaken the credibility of ratings and create institutional gaps that firms can exploit through symbolic disclosures. Relative to jurisdictions such as the United States and the European Union, which have developed more rigorous regulatory frameworks to curb greenwashing, China's legal and regulatory response remains comparatively underdeveloped. In this institutional context, empirically examining the relationship between corporate greenwashing and ESG ratings is of urgent practical importance for refining localized ESG evaluation mechanisms and for mitigating adverse selection problems in capital markets.

The literature has begun to document the antecedents and consequences of corporate greenwashing. For example, Li & Chen (2024) show that executive pay disparities are associated with higher incidences of ESG greenwashing, which advances researchers' understanding of greenwashing antecedents but focuses on determinants rather than the consequences for ESG assessments [3]. Wang et al. (2024) examine how greenwashing affects corporate financing and report that, while greenwashing may relax financing constraints in the short term, it can impair a firm's long-term debt financing capacity [4]. This line of work treats greenwashing primarily as an explanatory variable to predict external market responses. By contrast, the specific mechanism through which greenwashing influences localized ESG ratings in China has not been fully elucidated. The effect is likely not to be homogeneous across firms, and there remains a paucity of integrated analyses that identify boundary conditions under which internal resources and governance structures moderate this relationship.

To address these gaps, this study uses A-share listed firms in Shanghai, Shenzhen, and Beijing from 2015 to 2024 and, by cross-matching *Huazheng* ESG ratings with *Bloomberg* environmental disclosure data, systematically investigates the effect of corporate greenwashing on ESG ratings. The study further examines the moderating roles of research and development (R&D) investment and ownership concentration. The contributions of this paper are threefold. First, in terms of topical scope, it directly links greenwashing behavior to localized ESG ratings and provides empirical evidence from a large Chinese sample to adjudicate competing theoretical predictions. Second, in terms of mechanism, it integrates the resource-based view and agency theory within a unified analytical framework to identify boundary conditions of the greenwashing-ESG rating relationship from the perspectives of internal resource endowment (R&D investment) and governance structure, thereby deepening theoretical understanding of the economic consequences of greenwashing. Third, in terms of practical implications, the findings offer actionable empirical guidance for rating agencies seeking to recalibrate rating criteria and for regulators designing differentiated incentives and oversight.

2 Theoretical Basis and Research Hypotheses

2.1 The Relationship between Corporate Greenwashing and ESG Ratings

Institutional theory posits that organizations operate within an institutional field composed of formal rules, normative expectations, and cognitive frameworks, and that their strategic choices are shaped not only by efficiency considerations but also by external institutional pressures [5]. New institutionalism further suggests that, when exposed to coercive, normative, and mimetic pressures, firms frequently adopt symbolic compliance strategies, seeking legitimacy through formal adoption of institutional forms rather than through substantive operational change [6]. This logic is particularly salient in the ESG domain. When regulators, investors, and industry peers jointly generate strong institutional pressure, firms have clear incentives to manufacture a pro-environmental image through selective disclosure, exaggerated claims, or narrative packaging, thereby formally satisfying the indicators used by ESG rating agencies. Empirical studies support this mechanism; for example, Teti et al. (2024) provide evidence that environmental performance rating agencies may fail to detect greenwashing, enabling such behavior to inflate a firm's environmental performance ratings [7]. Accordingly, it is plausible that, under institutional pressures that reward formal conformity, greenwashing functions as a low-cost symbolic management strategy that can temporarily enhance a firm's ESG evaluation through selective disclosure and image engineering. Based on this reasoning, the study proposes the following Hypothesis 1-a.

H1-a: Corporate greenwashing behavior exerts a positive effect on measured ESG performance.

An alternative perspective derives from legitimacy theory, which emphasizes that organizational survival and development depend on alignment between organizational actions and societal norms and stakeholder expectations [8]. Legitimacy is not a static endowment but a dynamic social construct that must be continuously maintained through sustained trust and fulfillment of expectations. Greenwashing creates a systematic divergence between proclaimed commitments and actual practices. If this divergence is revealed, it can precipitate a legitimacy crisis, i.e., stakeholders perceive an inconsistency between corporate narratives and behaviors and withdraw moral support and cognitive acceptance. In the ESG context, the transmission mechanism of legitimacy loss is relatively direct. Greenwashing undermines the trust relationship among firms, investors, consumers, and regulators, eroding the credibility foundations of ESG assessments and ultimately harming the firm's ESG standing. Supporting evidence includes Liang & Gao (2025), who use panel data from listed firms in China's public health sector to demonstrate that greenwashing significantly erodes organizational legitimacy and thereby reduces financial performance via a mediating pathway [9]. Xu et al. (2025) document significant negative stock market reactions following greenwashing disclosures, with firms that previously exhibited strong ESG reputations experiencing larger penalties, consistent with an expectation-violation effect [10]. Taken together, these findings imply that while greenwashing may generate transient benefits,

exposure of its inconsistency can trigger a rapid loss of legitimacy and materially impair ESG performance. Thus, the paper advances the following competing Hypothesis 1-b.

H1-b: Corporate greenwashing behavior exerts a negative effect on measured ESG performance.

2.2 The Moderating Effect of R&D Investment

The resource-based view asserts that a firm's sustained competitive advantage derives from its unique, difficult-to-imitate bundle of resources and capabilities, among which innovation capability is a core strategic resource [11]. Firms with strong innovation capabilities possess greater technological reserves and R&D resources and are better equipped to convert environmental pressures into substantive green outcomes. From this perspective, high innovation capacity enables firms to satisfy ESG evaluation criteria through genuine technological improvement rather than through low-cost symbolic disclosures, thereby reducing the incentives for greenwashing. Moreover, innovation activities typically involve long time horizons and substantial investment, fostering a long-term, value-oriented strategic mindset that is fundamentally at odds with the short-term opportunism underpinning greenwashing. Empirical evidence supports this mechanism. Shi (2025) shows that greenwashing significantly attenuates the positive effect of environmental performance scores on green innovation, underscoring the pivotal role of innovation capability in the link between environmental commitment and actual performance [12]. Consequently, firms with stronger innovation capabilities have a firmer resource base to meet ESG requirements via technological pathways, and the marginal influence of greenwashing on ESG outcomes should be reduced. Accordingly, the study proposes the following Hypothesis 2.

H2: R&D investment negatively moderates the relationship between greenwashing and ESG performance such that the effect of greenwashing on ESG performance is weaker for firms with greater innovation capability.

2.3 The Moderating Effect of Ownership Concentration

Agency theory emphasizes that the separation of ownership and control can give rise to principal-agent problems, where managers may exploit informational advantages to pursue opportunistic actions that diverge from shareholder interests [13]. Greenwashing can be conceptualized as such a moral hazard behavior, undertaken by management to achieve short-term reputational gains under conditions of information asymmetry. A concentrated ownership structure endows large shareholders with stronger incentives and greater capacity to monitor management. Large shareholders, by virtue of substantial residual claims, are aligned with the firm's long-term interests and are motivated to restrain managerial short-termism, including tendencies toward greenwashing. In addition, controlling shareholders often have superior information access and analytical capability to see through superficial ESG narratives, identify managerial motives, and implement both preventive and corrective governance measures. Rehman et al. (2021) find that ownership concentration attenuates the relationship between corporate social responsibility performance and information asymmetry, implying that concentrated

ownership can reduce external stakeholders' reliance on disclosed ESG information by strengthening internal governance [14]. Therefore, higher ownership concentration should mitigate the information asymmetry that facilitates greenwashing and weaken its marginal impact on ESG performance. Therefore, Hypothesis 3 is proposed.

H3: Ownership concentration negatively moderates the relationship between greenwashing and ESG performance such that the effect of greenwashing on ESG performance is weaker in firms with higher ownership concentration.

3 Data and Methodology

3.1 Sample Selection and Data Sources

This study uses annual data for A-share listed firms on the Shanghai, Shenzhen, and Beijing exchanges spanning 2015-2024 as the initial sample. The primary data sources are *Sino-Securities Index Information Service (Shanghai) Co., Ltd.*, *Bloomberg*, and the *Choice* financial data terminal. To ensure the reliability of the empirical results, the initial sample was subjected to the following screening procedures: (1) observations with missing variable values were removed; (2) financial firms were excluded; (3) firms designated as ST or *ST were excluded; and (4) variables were winsorized at the 1st and 99th percentiles to mitigate the influence of extreme outliers on model estimation. After these procedures, the final sample comprises 6,934 firm-year observations.

3.2 Variable Definition and Measurement

3.2.1 Explained Variable – ESG Rating (ESG). The variable reflects a firm's overall performance across the environmental, social, and governance dimensions in the focal year. The *Huazheng* system draws on publicly disclosed information, periodic reports and interim announcements of listed firms, corporate social responsibility and sustainability reports, government and regulator websites, and media coverage [15]. The index encompasses 14 primary topics, 26 key indicators, and over 130 sub-indicators across the three pillars of environment, society, and governance. The *Huazheng* system has been adapted from mainstream international ESG frameworks to suit characteristics of the Chinese market and provides comprehensive coverage and frequent updates. Consistent with Li & Yuan. (2024), ESG ratings are coded on a nine-point scale from 1 to 9, with higher values indicating superior ESG performance [16].

3.2.2 Explanatory Variable – Greenwashing Behavior (GWS). Greenwashing is measured following Li & Ma (2025) as the standardized gap between environmental information disclosure and substantive environmental actions [17]. Environmental information disclosure (EDI) and substantive action ($Action$) are first standardized by subtracting their sample means and dividing by their standard deviations to place them on comparable scales. Greenwashing is then computed as the difference between the standardized EDI and the standardized $Action$, as shown in the following equation

(1). It should be noted that the theoretical core of greenwashing is the systematic divergence between environmental information disclosure and substantive environmental actions. The *Bloomberg* environmental disclosure score emphasizes the breadth and quality of a firm's environmental information disclosure, whereas the *Huazheng*'s environmental rating score reflects the firm's substantive environmental management and performance; these two measures thus correspond to the two central construct dimensions of "words" and "deeds," respectively. Using independent assessments from different agencies helps mitigate methodological bias associated with relying on a single rating system, because if the same agency supplied both disclosure and performance scores, its evaluations might be systematically correlated.

$$GWS = \left(\frac{EDI-\overline{EDI}}{\sigma_{EDI}}\right) - \left(\frac{Action-\overline{Action}}{\sigma_{Action}}\right) \quad (1)$$

Here, $\overline{EDI}$ and σ_{EDI} denote the sample mean and standard deviation of EDI, and $\overline{Action}$ and σ_{Action} denote the sample mean and standard deviation of $Action$. In this study, EDI is proxied by *Bloomberg* environmental disclosure scores, while $Action$ is proxied by *Huazheng* environmental scores. A larger Greenwash value denotes a greater divergence between disclosed environmental information and actual environmental performance, indicating more pronounced greenwashing.

3.2.3 Moderator Variables. Two moderator variables are included: R&D intensity (RD) and ownership concentration ($TSH1$). R&D intensity is measured as the ratio of annual R&D expenditure to total operating revenue; higher values indicate a greater relative commitment to research and development. Ownership concentration is measured as the shareholding ratio of the largest shareholder and reflects the degree of equity concentration and the controlling power of the largest shareholder.

3.2.4 Control Variables. Following prior study, the regressions include eight firm-level control variables, including firm size (A, measured as the natural logarithm of firm's total assets), leverage (LEV), return on total assets (ROA), cash ratio (CF), year-on-year growth rate of operating revenue ($GROWTH$), proportion of independent directors (IND), book-to-market ratio (BM), and firm age (AGE).

3.3 Empirical Models

The baseline regression model is specified as the following equation (2).

$$ESG_{i,t} = \alpha_0 + \alpha_1 GWS_{i,t-1} + \boldsymbol{\alpha_2 Controls'_{i,t-1}} + \gamma_t + \lambda_i + \varepsilon_{i,t} \quad (2)$$

Here, the one-period lagged treatment of greenwashing is adopted to mitigate potential reverse causality and contemporaneous bias between greenwashing and ESG ratings. In addition, ESG ratings are updated on an annual basis. Greenwashing, as a short-term information distortion arising from selective disclosure, typically leads to punitive score adjustments within one year after detection. Therefore, greenwashing information from t-2 to t is likely either to have been fully incorporated by the market or to have

been rendered ineffective by corporate remediation; extending the lag length further lacks a clear causal chain and institutional rationale. $\boldsymbol{Controls}$ includes the control variables specified in Section 3.2.4 and the two moderator variables RD and $TSH1$. γ_t represents time fixed effects that control for macroeconomic policy changes and annual shocks. λ_i denotes firm fixed effects that capture time-invariant firm characteristics and provide stronger control for endogeneity than industry fixed effects. $\varepsilon_{i,t}$ is the idiosyncratic error term. A statistically significant α_1 supports the main hypothesis H1.

To test the moderating effects of R&D investment and ownership concentration on the relationship between greenwashing and ESG performance, interaction terms are added to the baseline model, yielding the following equations (3) and (4).

$$ESG_{i,t} = \beta_0 + \beta_1 GWS_{i,t-1} + \beta_2 RD_{i,t-1} + \beta_3 (GWS_{i,t-1} \times RD_{i,t-1}) + \boldsymbol{\beta_4 Controls'_{i,t-1}} + \gamma_t + \lambda_i + \varepsilon_{i,t} \quad (3)$$

$$ESG_{i,t} = \theta_0 + \theta_1 GWS_{i,t-1} + \theta_2 TSH1_{i,t-1} + \theta_3 (GWS_{i,t-1} \times TSH1_{i,t-1}) + \boldsymbol{\theta_4 Controls'_{i,t-1}} + \gamma_t + \lambda_i + \varepsilon_{i,t} \quad (4)$$

When estimating the moderating effect of R&D investment, $\boldsymbol{Controls}$ includes both control variables and $TSH1$. When estimating the moderating effect of ownership concentration, $\boldsymbol{Controls}$ includes the control variables and RD. A statistically significant β_3 indicates that R&D intensity moderates the effect of greenwashing on ESG performance. A statistically significant θ_3 indicates that ownership concentration likewise moderates this relationship.

4 Research Results and Analysis

4.1 Descriptive Analysis

Table 1 presents descriptive statistics for the principal variables. The dependent variable, ESG rating, has a mean of 4.5698 and a standard deviation of 1.2152, indicating that sample firms display moderate ESG performance on average, approximately equivalent to a BB rating. The greenwashing index (GWS) has a mean of -0.0151 and a standard deviation of 1.1396, suggesting substantial cross-firm variation in greenwashing behavior. Some firms exhibit pronounced greenwashing, with environmental disclosures that diverge markedly from substantive environmental performance. The minimum GWS value is -2.5911, which reflects firms that perform well on substantive environmental actions but disclose conservatively. Regarding the moderator variables, RD has a mean of 0.0417 and a standard deviation of 0.0495, indicating considerable heterogeneity in R&D investment across firms and a right-skewed distribution. The largest shareholder share ($TSH1$) has a mean of 0.3646 and a median of 0.3474, implying a relatively concentrated distribution; the modal range for the largest shareholder is approximately 30 to 40 percent. The maximum $TSH1$ value is 0.7621, denoting the presence of firms with highly concentrated ownership dominated by a single shareholder, while the minimum value of 0.0812 indicates that some firms exhibit relatively

dispersed ownership. The distributions of the other control variables are broadly consistent with prior literature and fall within reasonable bounds.

Table 1. Descriptive statistical results.

Variable	Count	Mean	Standard deviation	Minimum	Median	Maximum
ESG	6934	4.5698	1.2154	1.0000	5.0000	8.0000
GWS	6934	-0.0156	1.1396	-2.5911	-0.0507	3.0919
RD	6934	0.0417	0.0495	0.0001	0.0313	0.2958
TSH1	6934	0.3646	0.1582	0.0812	0.3474	0.7621
A	6934	23.5331	1.2483	20.8996	23.4475	27.0836
LEV	6934	0.4720	0.1880	0.0821	0.4838	0.8694
ROA	6934	0.0664	0.0692	-0.1558	0.0560	0.2962
GROWTH	6934	0.1256	0.2681	-0.4636	0.0928	1.3406
CF	6934	0.8405	1.0439	0.0640	0.5002	6.7411
BM	6934	0.5020	0.3360	0.0513	0.4190	1.5806
IND	6934	0.3753	0.0564	0.3000	0.3571	0.5714
AGE	6934	21.3427	5.6152	8.0000	21.0000	36.0000

4.2 Multicollinearity Analysis

A preliminary correlation analysis is conducted to assess pairwise associations among the variables. The Spearman correlation coefficient between ESG and the greenwashing index is -0.0884, which provides initial qualitative evidence that corporate greenwashing behavior is negatively associated with ESG performance. Variance inflation factors computed for the control variables are all below 10, indicating that multicollinearity is not a material concern and that all variables can be retained in the regression analyses.

4.3 Panel Regression Analysis

4.3.1 Results of Hypothesis 1. Table 2 presents the baseline regression estimates. In the full sample reported in column (1), the coefficient on GWS is -0.0943 and is significant at the 1% level, indicating that higher greenwashing intensity is associated with lower ESG ratings. This result is consistent with the interpretation of greenwashing as a discrepancy between stated commitments and substantive actions. Firms may construct misleading green narratives through selective disclosure and exaggerated publicity while failing to support those narratives with substantive ESG actions such as green technology investment and pollution control expenditure. As ESG rating methodologies and verification practices become more comprehensive, rating providers place greater emphasis on the concordance between disclosures and observable implementation outcomes. When rating agencies detect material divergence between a firm's disclosures and its practices, they tend to assign punitive adjustments, resulting in lower ESG scores for firms that engage in greenwashing.

The ownership subsample results in columns (2) and (3) show that the GWS coefficient is -0.1206 for state-owned enterprises (SOEs) and -0.0810 for non-state-owned enterprises (non-SOEs), both significant at the 1% level. These findings indicate that the negative association between greenwashing and ESG ratings holds across ownership types, thereby supporting H1 for both SOEs and non-SOEs. Although these two types of firms differ in governance structures, objective functions and external constraints, they are subject to comparable ESG rating standards and verification procedures. In constructing scores, the rating provider applies a unified information collection framework and quantitative scoring rules. Consequently, deviations between disclosed information and actual conduct are identifiable irrespective of ownership background through techniques such as text analysis, public opinion monitoring, on site investigation and third-party data cross validation, and these deviations are reflected in downgraded ratings. Thus, the standardization and market-oriented operation of the ESG rating process reduce the likelihood that ownership status will shield firms from the consequences of greenwashing.

Prior studies indicate that industry environmental sensitivity affects stakeholder expectations and thereby firms' environmental, social and governance outcomes [18]. To examine whether the impact of greenwashing varies by industry environmental sensitivity, the sample is divided into firms in high environmental sensitivity industries, defined as heavily polluting industries, and firms in low environmental sensitivity industries. Industry classification of heavily polluting sectors follows the China Securities Regulatory Commission's Guidelines for Industry Classification of Listed Companies (revised 2012) and the Ministry of Environmental Protection's Catalogue for Environmental Protection Verification of Listed Companies, encompassing 18 sectors such as coal mining and washing, oil and gas extraction, nonferrous metal mining and processing and selected manufacturing subsectors [19]. Columns (4) and (5) report results for the heavily polluting and non-heavily polluting subsamples. The GWS coefficient is -0.1033 in the heavily polluting subsample and -0.0894 in the non-heavily polluting subsample, with both estimates significant at the 1% level. These results suggest that greenwashing exerts a statistically significant negative effect on ESG ratings regardless of industry environmental sensitivity, supporting the generality of H1. A plausible interpretation is that rating agencies focus on the authenticity of environmental disclosures for firms in high-risk industries, but the evaluative criterion for greenwashing remains the consistency between rhetoric and action rather than the absolute level of environmental performance. Thus, even a firm in a heavily polluting sector that has relatively low emissions by industry standards may be penalized if its external communications are exaggerated or selectively disclosed. Conversely, firms in less environmentally sensitive industries face lower regulatory pressure but are nonetheless subject to consistent verification standards as ESG concepts diffuse among investors and stakeholders. Therefore, the adverse effect of greenwashing on ESG ratings stems from the uniform application of the fundamental principle that disclosed commitments must be substantiated by observable actions.

Table 2. Regression results for Hypothesis 1.

	Full sample	SOEs	Non-SOEs	Heavy polluters	Non-heavy polluters
GWS	-0.0943***	-0.1206***	-0.0810***	-0.1033***	-0.0894***
RD	0.9599	1.2257	0.8076	2.5287	0.5854
TSH1	-0.8795**	-1.6003**	-0.5419	-0.9959*	-0.7277
A	0.4641***	0.2733**	0.4702***	0.4524***	0.4670***
LEV	-1.1840***	-0.9211*	-1.1651***	-0.8191*	-1.3482***
ROA	1.7409***	1.8903**	2.0070***	1.7696***	1.6620***
GROWTH	-0.0217	-0.0147	-0.0297	0.1104	-0.0684
CF	-0.0435	-0.0123	-0.0494	-0.0160	-0.0665*
BM	-0.0870	0.0011	-0.0672	0.2176	-0.2588*
IND	0.6145	0.5673	0.8838	1.4453*	0.1223
AGE	-0.0781**	-0.0780	-0.0801*	-0.1179**	-0.0645
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.0459	0.0442	0.0472	0.0489	0.0462
N	6934	2046	4888	2653	4281

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 Hypotheses 2 & 3. Table 3 reports the moderating effects of RD and $TSH1$ on the greenwashing-ESG relationship. Column (1) presents the results for R&D investment. The coefficient on the interaction term $GWS \times RD$ is positive (0.6172) and statistically significant at the 10% level. This indicates a marginally significant negative moderating effect of R&D intensity. In terms of economic significance, when R&D intensity increases by one standard deviation above the mean, the negative effect of greenwashing on the ESG rating is reduced by approximately 47%. These results imply that, although statistical significance is marginal, the buffering role of R&D investment on the punitive effect of greenwashing is economically meaningful, providing support for H2. A plausible explanation is that firms with greater R&D intensity are more likely to substantiate their ESG claims with genuine technological capabilities and innovation outcomes. In the rating agencies' verification process, observable investments in R&D make it easier to align disclosure with actual green transformation capacity, which mitigates the punitive effect of greenwashing on ESG evaluations.

Column (2) shows the results for ownership concentration. The coefficient on the interaction term is negative (-0.0796) but not statistically significant, indicating that ownership concentration does not exert a robust moderating effect on the relationship between greenwashing and ESG ratings. This lack of significance is consistent with the notion that major shareholders' influence on greenwashing is ambiguous and context dependent. On the one hand, a high shareholding ratio may align major shareholders' incentives with long-term firm value and reputation, reducing information manipulation and thus suppressing greenwashing. On the other hand, controlling shareholders

may exploit their positional advantages to influence disclosures and conceal environmental or social deficiencies, thereby facilitating greenwashing to protect private interests or avoid regulatory scrutiny. The coexistence of these opposing mechanisms can yield offsetting effects, producing an overall null moderating impact at the sample level.

Moreover, from the perspective of rating agencies' assessment procedures, the detection of greenwashing primarily depends on objective inconsistencies between disclosed information and observed corporate behavior rather than on internal ownership characteristics. Consequently, even where concentrated ownership provides stronger internal oversight, this governance feature does not necessarily translate into differentiated standards in external ESG evaluations. Together, these considerations help explain the absence of a statistically significant moderating effect for equity concentration and the failure to validate H3.

Table 3. Regression results for Hypotheses 2 & 3.

	H2	**H3**
GWS	-0.1178***	-0.0644
GWS × RD	0.6147*	/
GWS × TSH1	/	-0.0796
RD	0.7492	0.9608
TSH1	-0.8746**	-0.8706**
A	0.4641***	0.4655***
LEV	-1.1897***	-1.1890***
ROA	1.7281***	1.7309***
GROWTH	-0.0226	-0.0224
CF	-0.0457	-0.0438
BM	-0.0882	-0.0875
IND	0.6056	0.6118
AGE	-0.0779**	-0.0781**
Year FE	Yes	Yes
Firm FE	Yes	Yes
R-squared	0.0466	0.0460
N	6934	6934

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.

5 Conclusion and Policy Implications

This study employs a sample of A-share listed firms in Shanghai, Shenzhen, and Beijing over the period 2015-2024 to examine empirically the effect of corporate greenwashing on ESG ratings and the moderating roles of R&D investment and ownership concentration. The empirical results indicate that corporate greenwashing exerts a significant negative effect on ESG ratings. This adverse effect persists across ownership types and industry classifications, holding for both SOEs and non-SOEs in heavily polluting and less environmentally sensitive industries. Moreover, higher R&D intensity

mitigates the negative impact of greenwashing on ESG ratings, whereas the moderating effect of ownership concentration is not statistically significant.

On the basis of these findings, the paper proposes the following policy recommendations. First, strengthen substantive review and disciplinary mechanisms for ESG disclosure. Regulators should prioritize verification of firms' actual performance within existing ESG disclosure frameworks. For firms found to engage in material greenwashing, authorities could implement a graduated sanction system combining public warnings and rating penalties to raise the institutional cost of deceptive disclosure and reduce the scope for selective or exaggerated reporting.

Second, establish incentives that align R&D investment with ESG outcomes. Rating agencies should incorporate observable indicators of technological innovation, such as patent grants and R&D intensity, into their assessment frameworks so as to reward substantive technological progress that supports environmental objectives. Doing so would encourage firms to substitute superficial green rhetoric with genuine innovation that improves resource efficiency and reduces environmental risk. At the same time, rating methodologies should flag firms whose R&D efforts are demonstrably inconsistent with their ESG claims for closer scrutiny to prevent the misuse of innovation narratives as a cover for greenwashing.

Third, strengthen mechanisms for shareholder balance and encourage long-term institutional investors to participate in corporate governance. Although the moderating effect of ownership concentration is not statistically significant, this may not reflect inaction by controlling shareholders; rather, it could result from offsetting forces between controlling shareholders' incentive-based monitoring and their opportunistic use of informational advantages to conceal poor operations. Accordingly, the paper recommends encouraging long-horizon institutional investors, such as pension funds and social security funds, to become among a firm's top shareholders. Introducing external large shareholders with a long-term, value-oriented perspective enhances constraints on controlling shareholders and helps ensure that incentive-based monitoring predominates. At the same time, improve the nomination and performance-protection mechanisms for independent directors and strengthen their independent oversight of controlling shareholders and management to prevent information opacity arising from excessive concentration of control. These measures will help realize the positive governance effects of equity concentration.

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