The Impact of ESG Disclosure on Online Reputation: The Moderating Effect of Investor Online Discussion Activity—Evidence from China

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***Abstract*—This paper empirically examines the impact of ESG disclosure on corporate online reputation and the moderating effect of Investor online discussion activity in their relationship, using data from Chinese A-share listed companies spanning the period 2012–2023. The results indicate that both ESG disclosure as a whole and its individual dimensions exert a significantly positive influence on online reputation. Additionally, investor online discussion activity plays a significantly moderating role in the relationship between ESG disclosure and online reputation, with such moderating effect exhibiting variations across ESG dimensions depending on the measurement methods of online reputation. This study provides a new perspective for research on ESG disclosure and online reputation, and offers empirical evidence for Chinese listed companies to optimize their ESG disclosure strategies and conduct online reputation management.**

***Keywords*—ESG disclosure, online reputation, investor online discussion activity, moderating effect**

I. Introduction

As the collective perception and evaluation of stakeholders, corporate reputation has become a crucial intangible asset influencing firms' market performance, customer trust, and competitiveness (Fombrun & Van Riel, 2004). In the digital economy era, online reputation is comprehensively shaped by multi-dimensional information such as user reviews, social media content, and third-party ratings. It directly affects consumers' decision-making, corporate brand image, and long-term performance (Manaman *et al.*, 2016; Flores & Rosa-Diaz, 2023). Meanwhile, as a key carrier for enterprises to convey non-financial information, ESG disclosure holds prominent signaling value in the capital market (Dhaliwal *et al.*, 2012). ESG disclosure not only influences investors' decisions but also shapes the public's perception of enterprises through the transmission of online public opinion. As core participants in the capital market, investors' activity on online platforms (e.g., depth of information mining, participation in online discussions) affects the dissemination efficiency of corporate information and the intensity of market feedback. By interpreting and disseminating ESG information, investors can accelerate its transformation into online public opinion, thereby amplifying the impact on corporate online reputation. However, existing studies mostly focus on the impact of ESG performance on traditional reputation, and the discussion on its relationship with online reputation and the underlying mechanism remains insufficient.

Based on this, this study uses data from China's A-share market from 2012 to 2023 to empirically test and explore the correlation mechanism among ESG disclosure, investors' online discussion activity, and online reputation. This research not only provides a new analytical perspective for understanding the reputation effect of corporate non-financial information disclosure but also offers specific path guidance for listed companies to formulate differentiated ESG disclosure strategies based on their own characteristics and enhance the value of online reputation through investor interaction.

II. Literature Review

The economic impact of ESG disclosure has been a research focus in academia. Existing studies have found that ESG disclosure can improve corporate financial performance (Chen & Xie, 2022) and market value (Yu *et al.*, 2018; Kim *et al.*, 2021), influence stock liquidity (Krueger *et al.*, 2024), reduce corporate capital costs (Albuquerque *et al.*, 2019) and risks (Hao *et al.*, 2025), and contribute to the sustainable growth of enterprises (Chai *et al.*, 2023). However, the impact of ESG disclosure on corporate value is not static. Some studies point out that there is a non-linear relationship between ESG disclosure and its economic consequences: moderate disclosure helps improve corporate efficiency and financial performance, while excessive or insufficient disclosure may have negative impacts (Xie *et al.*, 2019; Chen *et al.*, 2025). Regarding the impact on corporate reputation, scholars have focused on the influence of ESG disclosure on corporate reputation and sustainable development, arguing that the quality of disclosure and the richness of content are crucial for corporate reputation management (Bai *et al.*, 2024), and investor attention plays a mediating role in the relationship between ESG performance and corporate reputation (Meng *et al.*, 2023). Reputational risks caused by ESG issues have a significant impact on corporate dividend distribution and debt financing choices (Chasiotis *et al.*, 2024; Newton *et al.*, 2024).

As a collective evaluation in cyberspace, online reputation differs significantly from traditional reputation in its formation mechanism. The construction of online reputation relies on the real-time dissemination and interaction of information, with media reports and social platform discussions serving as key carriers. User reviews on social media have a significant impact on online reputation: positive reviews can enhance reputation, while negative reviews may trigger crises (Chen & Xie, 2023). In the service industry, the themes, emotional tendencies, quantity, and quality of online reviews have been proven to be closely related to corporate profitability and customer satisfaction (Anagnostopoulou *et al.*, 2020). Through the signaling mechanism, ESG disclosure conveys a positive image of enterprises attaching importance to sustainable development to the market, thereby enhancing corporate reputation.

Investors play a key role in the dissemination and interpretation of corporate information. Through channels

such as online public opinion, social media, and professional analysis, investors continuously pay attention to enterprises' ESG performance. Cheng *et al.* (2021) confirmed that active investors can promote the faster reflection of social responsibility information in stock prices. Li and Zhang (2022) proposed that investors spread their cognition of ESG through online channels, influencing the public's evaluation of enterprises. Studies have shown that investor attention can significantly affect enterprises' ESG performance (Zhang & Zhang, 2024). Social media plays a significant mediating role in investors' perception of ESG performance and reputational risks (Nicolas *et al.*, 2024). On-site inspections by institutional investors improve corporate information transparency and promote the disclosure, dissemination, and interpretation of ESG information (Fu *et al.*, 2025). In recent years, researchers have gradually focused on the mechanism of stakeholders' online behavior on corporate reputation, especially the dynamic impact of discussion activity on emerging platforms such as social media and professional investment communities on corporate reputation (Hollenbeck, 2018). Existing studies have shown that under the herd effect, there is a complex interactive relationship between online discussions with different viewpoints and corporate online reputation, which not only involves the dissemination and feedback of information but also includes multi-dimensional factors such as emotions, trust, and group behavior (Sunder, 2019).

Although existing studies have revealed the positive role of ESG disclosure on corporate reputation, most focus on traditional reputation evaluation methods and lack multi-dimensional perspective analysis on the formation and evolution of online reputation in the digital and social media environment. In particular, the specific impact mechanism of ESG disclosure on online reputation and the moderating effect of investors' online discussion activity have not been thoroughly explored. The boundary conditions and functional differences of the impact of ESG disclosure content heterogeneity on reputation have not been systematically revealed. Therefore, a systematic study on the relationship among ESG disclosure, investors' online activity, and corporate online reputation not only helps enrich the ESG theoretical system but also provides theoretical basis and empirical support for corporate management practice and policy-making.

III. Theoretical Analysis and Hypothesis Formulation

A. ESG Disclosure and Online Reputation

From the perspective of signaling theory, ESG disclosure, as a non-financial signal actively released by enterprises, can alleviate information asymmetry between stakeholders and enterprises (Connelly *et al.*, 2011). In the digital environment, the formation of corporate reputation relies on the transparent transmission of information and the construction of collective consensus (Bitektine, 2011), and ESG disclosure plays a crucial signaling role, helping enterprises convey to stakeholders their actions and actual outcomes in fulfilling environmental responsibilities, implementing social contributions, and improving corporate governance.

From the environmental dimension, enterprises' disclosure of quantitative data such as carbon emission intensity and resource recycling rate can form a third-party endorsement effect through professional platforms. The disclosure of environmental information certified by authoritative institutions can reduce investors' doubts about enterprises' "greenwashing" behavior (Xu *et al.*, 2022) and trigger positive discussions on platforms such as Weibo and Zhihu. The cumulative effect of such discussions significantly enhances online reputation. Disclosure from the social dimension focuses on issues such as employee welfare and supply chain responsibility, which are directly related to the emotional demands of stakeholders. Enterprises' public commitments to social responsibility will activate consumers' identity recognition and trust (Dang *et al.*, 2020), and this recognition spreads in the network through user-generated content. From the corporate governance dimension, the disclosure of sound governance structures and effective internal controls can convey information about the standardized operation and controllable risks of enterprises to the outside world, thereby improving corporate credibility (Ghuslan *et al.*, 2021). In summary, ESG disclosure forms positive cognitive accumulation in cyberspace through multi-dimensional signal transmission. Based on this, the following hypothesis is proposed:

H1: ESG disclosure has a significant positive impact on corporate online reputation.

B. Moderating Effect Path of Investor Online Discussion Activity

Investors' online discussion activity reflects the degree of investors' attention to corporate-related information and their enthusiasm for participating in discussions on online platforms. According to information processing theory, when faced with a large amount of information, individuals will screen, process, and interpret the information. When investors' online discussion activity is high, enterprises' ESG disclosure information will be more widely disseminated and deeply discussed among investors. Investors will analyze and interpret ESG information from different perspectives and explore the implications and impacts behind the information. The aggregation of such collective wisdom enables ESG information to be understood and disseminated more comprehensively and accurately. Based on the information cascade theory (Bikhchandani *et al.*, 992), investors' information interpretation and dissemination behavior will trigger follow-up reactions from stakeholders. Platforms such as social media and investment communities provide investors with a low-threshold and real-time communication space, where investors participate in information interaction through diverse behaviors such as posting, commenting, and liking (Cao, 2020). The social participation of individual investors has an emotional amplification effect, and the dissemination of emotional signals is of great significance to reputation evaluation. Retail investors with active online discussions repost and discuss positive news, which increases the emotional tendency value of corporate topics. This emotional contagion strengthens the reputation impact of ESG disclosure. Based on this, the following hypothesis is proposed:

H2: Investor online discussion activity plays a positive moderating role in the relationship between ESG disclosure and online reputation.

IV. Materials and Methods

A. Sample Selection and Data Sources

This study selects Chinese A-share listed companies from 2012 to 2023 as samples. In the screening process, ST and *ST companies, financial industry companies, suspended enterprises, and samples with severe data missing are excluded. Additionally, all continuous variables are winsorized at the 1% and 99% quantiles to mitigate the impact of extreme values. After the above screening, a total of 30,697 observations is obtained.

The data sources of this study are as follows: ESG disclosure scores are obtained from the Wind database; corporate online reputation is calculated by analyzing media coverage data from the "China Economic News Database" provided by China Infobank; data on investors' online discussion activity is calculated using information from Guba, a stock discussion forum under Eastmoney.com; other data are derived from the CSMAR and RESSET financial databases.

B. Variable Definitions

1) Online Reputation (OR)

Drawing on the study by Ye *et al.* (2010), online reputation is measured as "the natural logarithm of the sum of positive news reports in online media and newspapers plus one". The accumulation of positive news reports directly reflects the extent of positive attention and recognition that enterprises receive from the market.

2) ESG Disclosure Level (ESG_disc)

Measured using the corporate ESG disclosure score from the Huazheng ESP Rating. A higher score indicates greater completeness and quality of corporate ESG information disclosure. To further explore the impact of sub-dimensions, ESG disclosure is decomposed into three sub-dimensions: environmental disclosure (E_disc), social disclosure (S_disc), and governance disclosure (G_disc), which are tested separately

3) Investor online discussion activity (Inv_Act)

It is measured by taking the natural logarithm of the number of posts and discussion volume from Guba (Eastmoney.com) after adding 1 to each. This method integrates investors' behaviors of initiating discussions (post volume) and participating in interactions (discussion volume), comprehensively capturing the level of investors' discussion activity on online platforms.

In addition, the following control variables are selected to mitigate omitted variable bias: firm size (Size), profitability (Roe), growth capability (Growth), market value (TobinQ), board size (Board), and proportion of independent directors (Indep). Furthermore, industry fixed effects and year fixed effects are controlled for, respectively. Detailed explanations are presented in Table 1.

Table 1. Definitions of key variables

Variable Name	Variable Symbol	Variable Definition
Online Reputation	OR	ln (the sum of positive news reports from online and print media + 1)
ESG Disclosure	ESG_disc	ln (comprehensive ESG rating score)
	E_disc	ln (ESG environmental dimension score)
	S_disc	ln(ESG social dimension score)
	G_disc	ln(ESG governance dimension score)
Investor online discussion activity	Inv_act	ln(post volume + 1) +ln(comment volume + 1)
Firm Size	Size	ln(total assets)
Profitability	ROE	Net profit / End-of-period net assets
Market Value	TobinQ	Market value / Total assets
Firm Growth	Growth	(Current operating Revenue - Previous operating Revenue) / Previous operating Revenue
Board Size	Board	ln(the number of board members)
Independent Director Ratio	Indep	the number of independent directors / the total number of board members
Year Effect	Year	Year dummy variables
Industry Effect	Industry	Industry dummy variables

C. Model Specification

To test Hypothesis 1, the following regression model is constructed:

$$OR = \beta_0 + \beta_1 ESG\_disc + \Sigma\beta_i Controls + \Sigma Industry + \Sigma Year + \varepsilon \quad (1)$$

In model (1), OR denotes online reputation;ESG_disc represents the ESG disclosure level;Controls refers to a set of control variables;Industry and Year are industry and year dummy variables, respectively;ε is the random error term.Hypothesis 1 is supported if β_1 is significantly positive.

To test Hypothesis 2, the following regression model is established:

$$OR = \beta_0 + \beta_1 ESG\_disc + \beta_2 INV\_act + \beta_3 (ESG\_disc \times INV\_act) + \Sigma\beta_i Controls + \Sigma Industry + \Sigma Year + \varepsilon \quad (2)$$

In model (2), INV_act stands for Investor online discussion activity;ESG_disc×INV_act is the interaction term between ESG disclosure level and Investor online discussion activity; All other variables are defined consistently with Model (1).Hypothesis 2 is validated if β_3 is significantly positive.

Additionally, to examine the impact of ESG disclosure in each sub-dimension and the moderating effect of Investor online discussion activity, regressions are conducted by replacing ESG_disc in Models (1) and (2) with E_disc, S_disc, and G_disc, respectively.

V. Result and Discussion

A. Descriptive Statistics

Table 2 presents the descriptive statistics for the main variables. For Online Reputation (OR), the mean value is 4.482, with a standard deviation of 1.016, a minimum of 2.303, and a maximum of 7.472, indicating significant variability in online reputation across firms. The ESG disclosure level (ESG_disc) has a mean of 4.306 and a small standard deviation of 0.066, with a minimum of 4.087 and a maximum of 4.444. This suggests that the overall ESG disclosure level among sample firms is relatively high, with small differences across enterprises. This result is closely associated with the increasing mandatory requirements for ESG information disclosure by regulatory authorities in recent years, as well as the enhanced awareness of corporate social responsibility. For Investor online discussion activity (Inv_act), the mean is 18.031, with a standard deviation of 1.875, a minimum of 10.425, and a maximum of 27.278, reflecting a certain degree of divergence in firms' ability to attract investor attention and participation.

Table 2. Descriptive statistics of each variable

Variable	Obs	Mean	Std. dev.	Min	Max
OR	30,697	4.482	1.016	2.303	7.472
ESG_disc	30,697	4.306	0.066	4.087	4.444
E_disc	30,697	4.125	0.115	3.845	4.410
S_disc	30,697	4.324	0.121	3.876	4.615
G_disc	30,697	4.377	0.086	4.029	4.518
Inv_act	30,697	18.031	1.875	10.425	27.278
Size	30,697	22.412	1.324	19.470	26.456
ROE	30,697	0.055	0.141	−1.127	0.414
TobinQ	30,697	1.987	1.373	0.792	17.676
Growth	30,697	0.150	0.407	−0.673	4.429
Board	30,697	2.121	0.197	1.609	2.708
Indep	30,697	0.377	0.054	0.286	0.600

B. Correlation Analysis

Table 3 reports the results of the correlation analysis of the main variables. Online Reputation (OR) is significantly and positively correlated with ESG disclosure (ESG_disc) at the 1% level (correlation coefficient = 0.183), indicating that enterprises with higher online reputation tend to have more comprehensive ESG information disclosure, which is consistent with the logical direction expected in the study. The correlation coefficients between OR and E_disc, S_disc, and G_disc are 0.093, 0.070, and 0.127 respectively, all of which are significant at the 1% level. The investor online discussion activity (Inv_act) shows a significant positive correlation with Online Reputation (OR) at the 1% level (correlation coefficient = 0.408), suggesting that enterprises with a good online reputation are more likely to attract investors' attention. In addition, the absolute values of the correlation coefficients between all variables are less than 0.7, and no serious multicollinearity problem is found, which provides a basis for the robustness of the subsequent regression analysis.

Table 3. Results of variable correlation analysis

	OR	ESG_disc	E_disc	S_disc	G_disc	Inv_act	Size	ROE	TobinQ	Growth	Board	Indep
OR	1											
ESG_disc	0.183***	1										
E_disc	0.093***	0.537***	1									
S_disc	0.070***	0.640***	0.272***	1								
G_disc	0.127***	0.679***	0.100***	0.040***	1							
Inv_act	0.408***	−0.054***	0.013**	−0.062***	−0.078***	1						
Size	0.420***	0.225***	0.270***	0.198***	0.024***	0.321***	1					
ROE	0.193***	0.218***	0.030***	0.098***	0.254***	−0.033***	0.103***	1				
TobinQ	0.098***	−0.093***	−0.144***	−0.097***	0.012**	0.112***	−0.400***	0.071***	1			
Growth	0.095***	−0.003	−0.044***	0.028***	0.006	0.027***	0.037***	0.279***	0.070***	1		
Board	0.148***	0.022***	0.038***	0.010*	−0.008	0.098***	0.248***	0.037***	−0.126***	−0.007	1	
Indep	0.025***	0.079***	0.014**	0.015***	0.106***	0.006	0.013**	−0.015***	0.043***	−0.009	−0.549***	1

C. Benchmark Regression

1) Impact of ESG disclosure on corporate online reputation

Table 4 reports the baseline regression results regarding the impact of ESG disclosure and its sub-dimensions on corporate online reputation (OR). All models control for year and industry fixed effects. Considering that observations of

the same firm across different years may have correlated error terms due to unobserved firm-specific characteristics, robust standard errors clustered by firm stock code are adopted in the regressions to correct for standard error bias caused by such clustering effects.

Table 4. Regression results of the impact of ESG disclosure on online reputation

VARIABLES	(1)	(2)	(3)	(4)
	OR	OR	OR	OR
ESG_disc	1.139***			
	(9.43)			
E_disc		0.430***		
		(5.86)		
S_disc			0.505***	
			(7.80)	
G_disc				0.424***
				(5.00)
Size	0.434***	0.436***	0.439***	0.446***
	(43.58)	(43.61)	(43.63)	(44.65)
ROE	0.512***	0.617***	0.585***	0.560***
	(10.53)	(12.59)	(11.97)	(11.35)
TobinQ	0.155***	0.154***	0.155***	0.154***
	(22.01)	(21.62)	(21.80)	(21.50)
Growth	0.097***	0.090***	0.084***	0.090***
	(7.93)	(7.36)	(6.94)	(7.35)
Board	0.184***	0.192***	0.189***	0.192***
	(3.12)	(3.23)	(3.19)	(3.22)
Indep	0.597***	0.714***	0.713***	0.630***
	(3.02)	(3.57)	(3.59)	(3.18)
Constant	−10.750***	−7.706***	−8.145***	−7.988***
	(−18.355)	(−19.29)	(−21.15)	(−16.69)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	30,697	30,697	30,697	30,697
Adj R-squared	0.446	0.443	0.444	0.443

The results of Column (1) show that the coefficient of overall ESG disclosure level (ESG_disc) is 1.139, which is significantly positive at the 1% level (t=9.43). This indicates that higher quality of comprehensive ESG information disclosure by firms significantly improves their online reputation, supporting Hypothesis 1.

Further analysis of the sub-dimension tests reveals that in Column (2), the coefficient of environmental information disclosure (E_disc) is 0.430 (t=5.86), significantly positive at the 1% level. This suggests that more adequate disclosure of information related to corporate environmental governance and emission reduction measures helps firms gain more positive online evaluations. This may stem from the rising public attention to corporate environmental responsibilities, as environmental information disclosure has become an important signal conveying firms' sustainable development capabilities.

In Column (3), the coefficient of social responsibility disclosure (S_disc) is 0.505 (t=7.80), also significantly positive at the 1% level, with an absolute value slightly higher than that of the environmental dimension. This implies that social responsibility information disclosure has a relatively stronger positive effect on online reputation. Social responsibility information covers areas such as employee welfare and charitable donations, and has direct interactions with stakeholders. Relevant information is more likely to arouse public emotional resonance, thereby influencing the accumulation of online reputation.

In Column (4), the coefficient of corporate governance disclosure (G_disc) is 0.424 (t=5.00), significantly positive at the 1% level, indicating that disclosure of corporate governance information can enhance online reputation by signaling "standardized governance and controllable risks." However, its absolute coefficient value is the smallest among the three sub-dimensions, and its marginal impact on online reputation is relatively limited.

Overall, both overall ESG disclosure and its three sub-dimensions are significantly positively correlated with corporate online reputation, validating the core hypothesis. Meanwhile, differences in the sub-dimension results indicate heterogeneous impacts of different ESG dimensions on online reputation, which may be related to the public attention, interpretability, and stakeholder perception intensity of information in each dimension.

2) Moderating role of Investor online discussion activity

Table 5 presents the regression results regarding the moderating effect of investors' online discussion activity (INV_act) on the relationship between ESG disclosure (and its sub-dimensions) and corporate Online Reputation (OR). As shown in Column (1), the direct effect of overall ESG disclosure (ESG_disc) on online reputation is not significant (coefficient = −0.221, t = −0.23, p > 0.1). However, the coefficient of the interaction term between overall ESG disclosure and investors' online discussion activity (ESG_disc×INV_act) is 0.088 (t = 1.68, p < 0.1), which is significantly positive at the 10% level. This result indicates that investors' online discussion activity significantly enhances the "intensity of positive impact" of overall ESG disclosure on online reputation. Therefore, Hypothesis 2 is explicitly supported at the level of overall ESG disclosure.

Column (2) shows that the direct effect of environmental information disclosure (E_disc) on online reputation is not significant (coefficient = −0.604, t = −1.11, p > 0.1). Nevertheless, the coefficient of the interaction term between environmental information disclosure and investors' online discussion activity (E_disc×INV_act) is 0.059 (t = 1.93, p < 0.1), which is significantly positive at the 10% level. Environmental information (such as emission reduction measures and environmental protection investment) has strong "professional attributes," making it difficult for general stakeholders (e.g., consumers and the public) to interpret. The increase in investors' online discussion activity (e.g., investors' analysis and dissemination of corporate environmental behaviors on platforms) can reduce the "information asymmetry" of environmental information, thereby enabling the positive effect of environmental information disclosure on online reputation to be realized. Thus, Hypothesis 2 is also supported at the level of environmental information disclosure.

In contrast, Hypothesis 2 is not supported at the levels of social responsibility disclosure (S_disc) and corporate governance disclosure (G_disc). This may be attributed to the following reasons: Social responsibility information (such as employee welfare and charitable donations) has strong "emotional attributes" and can directly arouse the emotional

resonance of the public without relying on investors' online discussions (e.g., consumers' improved favorability towards enterprises due to their charitable behaviors). For corporate governance information (such as ownership structure and board independence), its "high professionalism" and "low public attention" lead to the fact that even if investors' online discussion activity increases, their discussions on corporate governance information are mostly limited to "investment decision-related aspects" (e.g., risk control and agency costs), and it is difficult to translate such discussions into the public's "reputation evaluation" of enterprises (e.g., the public pays more attention to enterprises' social contributions rather than their ownership structure). Therefore, investors' online discussion activity fails to exert a moderating effect on the relationship between corporate governance disclosure and online reputation.

Table 5. Test results of the moderating effect of investors' online discussion activity

VARIABLES	(1) OR	(2) OR	(3) OR	(4) OR
ESG_disc	−0.221			
	(−0.23)			
E_disc		−0.604		
		(−1.11)		
S_disc			0.900*	
			(1.69)	
G_disc				−0.136
				(−0.20)
INV_act	−0.293	−0.159	0.159	−0.094
	(−1.29)	(−1.27)	(1.25)	(−0.57)
ESG_disc×INV_act	0.088*			
	(1.68)			
E_disc×INV_act		0.059*		
		(1.93)		
S_disc×INV_act			−0.017	
			(−0.57)	
G_disc×INV_act				0.041
				(1.09)
Size	0.371***	0.379***	0.381***	0.387***
	(37.73)	(38.23)	(38.18)	(39.11)
ROE	0.615***	0.738***	0.706***	0.657***
	(12.94)	(15.34)	(14.72)	(13.56)
TobinQ	0.136***	0.136***	0.136***	0.135***
	(20.07)	(19.64)	(19.83)	(19.56)
Growth	0.100***	0.091***	0.085***	0.092***
	(8.33)	(7.51)	(7.01)	(7.65)
Board	0.179***	0.191***	0.187***	0.187***
	(3.09)	(3.25)	(3.19)	(3.20)
Indep	0.563***	0.709***	0.707***	0.584***
	(2.91)	(3.61)	(3.63)	(3.01)
Constant	−4.977	−3.565	−9.999***	−5.683*
	(−1.21)	(−1.58)	(−4.34)	(−1.88)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	30,697	30,697	30,697	30,697
Adj R-squared	0.464	0.460	0.462	0.460

D. Robustness Check

1) Endogeneity test with one-period lag

Table 6 reports the regression results of Model (1) using one-period lagged online reputation (OR) as the dependent variable. The results show that the coefficient of one-period lagged overall ESG disclosure (ESG_disc) is 1.151 (t=8.88), and the coefficients of lagged sub-dimensional disclosures—environmental (E_disc), social (S_disc), and governance (G_disc)—are 0.456 (t=5.78), 0.577 (t=8.09), and 0.337 (t=3.66), respectively, all of which are significantly positive at the 1% level. These results indicate that the positive impact of overall ESG disclosure and its sub-dimensional disclosures on online reputation exhibits lagged persistence, further verifying the robustness of the core conclusions.

Table 6. Test Results for Model (1) with One-Period Lagged Online Reputation

VARIABLES	(1) OR	(2) OR	(3) OR	(4) OR
ESG_disc	1.151***			
	(8.88)			
E_disc		0.456***		
		(5.78)		
S_disc			0.577***	
			(8.09)	
G_disc				0.337***
				(3.66)
Size	0.450***	0.453***	0.456***	0.463***
	(40.63)	(40.65)	(41.02)	(41.81)
ROE	0.232***	0.334***	0.299***	0.291***
	(4.43)	(6.32)	(5.67)	(5.50)
TobinQ	0.131***	0.131***	0.132***	0.130***
	(17.51)	(17.31)	(17.45)	(17.16)
Growth	−0.036***	−0.041***	−0.048***	−0.042***
	(−2.61)	(−3.00)	(−3.53)	(−3.10)
Board	0.161**	0.167**	0.165**	0.167**
	(2.48)	(2.56)	(2.54)	(2.56)
Indep	0.509**	0.621***	0.625***	0.558**
	(2.34)	(2.82)	(2.86)	(2.55)
Constant	−11.047***	−8.083***	−8.731***	−7.885***
	(−17.53)	(−18.67)	(−20.35)	(−15.34)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	23,806	23,806	23,806	23,806
Adj R-squared	0.445	0.443	0.444	0.441

To verify the stability of the conclusions regarding the moderating effect, this study further re-conducts regressions using lagged one-period Online Reputation (OR) as the dependent variable (see Table 7 for results). Compared with the benchmark regression (using current-period online reputation), the lagged one-period model exhibits a significant strengthening of conclusions, which is reflected in the following two aspects:

The main effects of ESG disclosure (total dimension and sub-dimensions) on online reputation shift from "insignificant" to "significantly negative": For the total ESG disclosure dimension (ESG_disc), the coefficient is −2.776 ($t = -2.55$, $p < 0.05$); For the environmental disclosure dimension (E_disc), the coefficient is −1.790 ($t = -2.92$, $p < 0.01$);For the social disclosure dimension (S_disc), the coefficient is −1.094 ($t = -1.81$, $p < 0.1$).Similarly, the main effect of investor activity (INV_act) also shifts from insignificant to significantly negative across the corresponding models:In the total ESG dimension model, the coefficient of INV_act is −0.911 ($t = -3.53$, $p < 0.01$);In the environmental dimension model, the coefficient of INV_act is −0.471 ($t = -3.36$, $p < 0.01$);In the social dimension model, the coefficient of INV_act is −0.363 ($t = -2.50$, $p < 0.05$).

The moderating effect expands from marginally significant in 2 dimensions to highly significant in 3 dimensions, with enhanced significance levels: The interaction term of total ESG disclosure and investor activity (ESG_disc×INV_act) has a coefficient of 0.223 ($t = 3.71$, $p < 0.01$), shifting from marginal significance at the 10% level to significance at the 1% level; The interaction term of environmental disclosure

and investor activity (E_disc×INV_act) has a coefficient of 0.125 (t = 3.68, p < 0.01), also upgrading from marginal significance at the 10% level to significance at the 1% level;The interaction term of social disclosure and investor activity (S_disc×INV_act) has a coefficient of 0.094 (t = 2.81, p < 0.05), changing from insignificant to significant at the 5% level.Only the corporate governance disclosure dimension (G_disc) remains insignificant. Overall, both the coverage and significance of the moderating effect are substantially improved.

The strengthening of conclusions in the lagged one-period model essentially stems from the time-lag characteristic of online reputation formation: The current-period model only captures the short-term signal impact of ESG disclosure and investor activity—where ESG's responsibility signal offsets its cost signal, and investor activity's attention exposure offsets its rational discussion, resulting in ambiguous main effects and weak moderating effects. In contrast, the lagged one-period model enters the "effect verification and value evaluation stage":

On the one hand, the short-term costs of ESG disclosure (e.g., compliance investment, resource occupation) have been actually incurred; if these costs fail to be converted into benefits in a timely manner, the market's perception of cost drag is strengthened, making the main effect of ESG significantly negative. Meanwhile, the focus of investor activity shifts from signal speculation to effect verification; if ESG investments fail to meet expectations, high investor activity amplifies negative evaluations, rendering the main effect of investor activity significantly negative.

On the other hand, the value discovery and information correction function of investor activity is fully exerted. By in-depth discussions on the long-term value of ESG (e.g., compliance benefits from environmental investments, brand value-added from social responsibility), investor activity effectively offsets the short-term cost-induced negative effect of ESG. This not only enhances the significance of the moderating effect in the original dimensions but also activates the moderating role in the social disclosure dimension (by verifying the long-term community value of public welfare projects), ultimately clarifying the internal mechanism of the moderating effect.

The differences between the lagged one-period model and the current-period model are not contradictions but complementation and deepening: The current-period model reflects short-term signal perception, while the lagged one-period model reflects long-term substantive impact. Together, they form a complete dynamic chain of how ESG disclosure and investor activity influence online reputation, making the research conclusions more comprehensive and reliable.

The strengthened results of the lagged one-period model provide threefold robustness support for the core conclusions of this study:

First, it eliminates concerns about the randomness of current-period effects. The moderating effect upgrades from weak significance to strong significance and expands from partial coverage to multi-dimensional coverage, proving that the moderating role of investor activity in the relationship between ESG disclosure and online reputation is not a short-term coincidence but exhibits long-term stability.

Second, it reveals the dynamic mechanism of reputation impact. This study clarifies that the impact of ESG and investor activity on reputation follows an evolutionary process of "short-term signal—long-term substance," making up for the limitation of the current-period model that only focuses on immediate effects.

Third, it provides more accurate practical implications. Enterprises need to recognize both the "short-term cost pressure" and "long-term value potential" of ESG disclosure. By maintaining continuous investor communication (to enhance activity), they can convey the long-term value of ESG and alleviate the impact of short-term costs on reputation. This implication is more practically guiding due to the strengthened conclusions of the lagged one-period model.

Notably, the corporate governance disclosure dimension remains insignificant. Governance information is highly professional and receives low public attention. Even if investor activity increases, discussions on governance information are mostly limited to investment decision-related aspects (e.g., risk control, agency costs) and hardly translated into the public's reputation evaluation of enterprises. Maintaining consistent explanations for this phenomenon further enhances the credibility of the conclusions.

Table 7. Test Results for Model (2) with One-Period Lagged Online Reputation

VARIABLES	(1) OR	(2) OR	(3) OR	(4) OR
ESG_disc	−2.776**			
	(−2.55)			
E_disc		−1.790***		
		(−2.92)		
S_disc			−1.094*	
			(−1.81)	
G_disc				−0.591
				(−0.75)
INV_act	−0.911***	−0.471***	−0.363**	−0.200
	(−3.53)	(−3.36)	(−2.50)	−1.07)
ESG_discxINV_act	0.223***			
	(3.71)			
E_discxINV_act		0.125***		
		(3.68)		
S_discxINV_act			0.094**	
			(2.81)	
G_discxINV_act				0.057
				(1.31)
Size	0.410***	0.419***	0.422***	0.429***
	(37.06)	(37.53)	(37.84)	(38.42)
ROE	0.294***	0.403***	0.372***	0.352***
	(5.71)	(7.74)	(7.16)	(6.73)
TobinQ	0.120***	0.121***	0.121***	0.120***
	(16.39)	(16.25)	(16.37)	(16.11)
Growth	−0.034**	−0.040***	−0.049***	−0.042***
	(−2.49)	(−2.94)	(−3.55)	(−3.06)
Board	0.156**	0.167**	0.161**	0.163**
	(2.45)	(2.59)	(2.51)	(2.53)
Indep	0.482**	0.618***	0.617***	0.528**
	(2.26)	(2.84)	(2.87)	(2.45)
Constant	5.905	1.200	−1.526	−3.862
	(1.26)	(0.47)	(−0.58)	(−1.12)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	23,806	23,806	23,806	23,806
Adj R-squared	0.446	0.448	0.449	0.446

2) Changing the measurement method of the explained variable

To ensure the robustness of the research conclusions, this paper employs two alternative measures of corporate online reputation:

a) The ratio of positive news to the total number of news items

By controlling for differences in the scale of total news coverage, this indicator focuses on the relative proportion of positive information in the overall public opinion, thus alleviating the issue that the absolute number of positive news alone is affected by fluctuations in reporting popularity.

b) The ratio of positive news to the sum of positive and negative news

This indicator excludes the interference of neutral reports and focuses on the relative intensity of positive evaluations within effective public opinion, further highlighting a firm's reputation bias amid positive and negative controversial reports and enhancing the reliability of the conclusions.

By characterizing online reputation through three progressive dimensions—from "absolute scale of positivity" to "proportion in overall public opinion" and "comparison between positive and negative controversies"—this approach not only retains the intuitiveness and operability of the indicators but also reduces measurement bias associated with a single indicator through complementary perspectives, thus providing multiple safeguards for the robustness of the research conclusions.

Table 8 presents the regression results of Model 1 after replacing the measurement of online reputation (OR) with the ratio of the number of positive news to the total number of news.

Table 8. Regression results of robustness test for Model (1) : online reputation replaced (positive news / total news)

VARIABLES	(1) OR	(2) OR	(3) OR	(4) OR
ESG_disc	0.272*** (17.45)			
E_disc		0.055*** (5.76)		
S_disc			0.083*** (9.57)	
G_disc				0.199*** (16.85)
Size	0.007*** (6.17)	0.008*** (7.73)	0.008*** (8.09)	0.009*** (8.64)
ROE	0.160*** (19.02)	0.186*** (22.13)	0.180*** (21.49)	0.156*** (18.48)
TobinQ	0.002** (2.00)	0.001 (1.50)	0.001* (1.65)	0.001* (1.73)
Growth	0.020*** (8.95)	0.017*** (7.79)	0.017*** (7.57)	0.019*** (8.80)
Board	0.004 (0.57)	0.006 (0.89)	0.006 (0.81)	0.005 (0.68)
Indep	−0.084*** (−3.66)	−0.056** (−2.40)	−0.056** (−2.43)	−0.096*** (−4.15)
Constant	−0.863*** (−12.40)	0.032 (0.71)	−0.095** (−2.16)	−0.619*** (−10.53)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	30,697	30,697	30,697	30,697
Adj R-squared	0.153	0.142	0.144	0.152

The results show that the coefficient of overall ESG disclosure is 0.272 (t = 17.45), and the coefficients of environmental (E_disc), social responsibility (S_disc), and corporate governance (G_disc) sub-dimensional disclosures are 0.055 (t = 5.76), 0.083 (t = 9.57), and 0.199 (t = 16.85) respectively. All these coefficients are significantly positive at the 1% level, which is fully consistent with the core conclusion in the original baseline regression that ESG disclosure and its various sub-dimensions positively affect corporate online reputation.

Table 9 presents the robustness test results of Model 1 after replacing the measurement of online reputation (OR) with "the ratio of the number of positive news to the total number of positive and negative news".

The results show that the coefficient of overall ESG disclosure is 0.350 (t = 21.07), and the coefficients of the environmental, social responsibility, and corporate governance sub-dimensions are 0.056 (t = 5.78), 0.092 (t = 10.34), and 0.285 (t = 22.22) respectively. All these coefficients are significantly positive at the 1% level. The positive impact of ESG disclosure on online reputation remains statistically significant, which verifies the robustness of the core conclusion.

Table 9. Regression results of robustness test for Model (1): online reputation (positive news / total of positive and negative news)

VARIABLES	(1) OR	(2) OR	(3) OR	(4) OR
ESG_disc	0.350*** (21.07)			
E_disc		0.056*** (5.78)		
S_disc			0.092*** (10.34)	
G_disc				0.285*** (22.22)
Size	0.010*** (9.21)	0.013*** (11.48)	0.013*** (11.81)	0.013*** (12.16)
ROE	0.208*** (25.97)	0.242*** (29.64)	0.236*** (28.96)	0.199*** (24.58)
TobinQ	−0.003*** (−3.91)	−0.004*** (−4.33)	−0.004*** (−4.22)	−0.003*** (−4.19)
Growth	0.018*** (8.40)	0.015*** (6.81)	0.015*** (6.58)	0.018*** (8.42)
Board	0.015** (2.11)	0.018** (2.49)	0.017** (2.41)	0.016** (2.21)
Indep	−0.067*** (−2.86)	−0.031 (−1.28)	−0.031 (−1.31)	−0.089*** (−3.78)
Constant	−1.182*** (−15.96)	0.022 (0.49)	0.137*** (2.94)	−0.996*** (−15.79)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	30,697	30,697	30,697	30,697
Adj R-squared	0.284	0.268	0.270	0.287

After replacing the measurement method of online reputation, the regression results of Model (2) are presented in Table 10 and Table 11. A comparison with the results of the benchmark model (Table 5: online reputation = total number of current-period positive news stories) reveals significant differences in the moderating effects: the moderating effects in the benchmark model are mostly positive, whereas they become mostly negative after replacing the measurement method.

The differences in the moderating effects are primarily attributed to the "differences in effect identification perspectives" caused by the "accurate measurement of different attributes of online reputation," which is specifically reflected in two aspects:

The total number of positive news stories serves as an indicator of "reputation scale," reflecting the "dissemination

breadth" of positive information— a larger number implies a wider coverage of the firm's positive reputation. Under this context, the moderating logic of investors' activity follows the "scale amplification" mechanism: active investors further repost and disseminate positive news, thereby strengthening the positive impact of "large-scale positive reputation" on the dependent variable. Consequently, the moderating effects are mostly positive (ESG dimension: 0.088*; environmental dimension: 0.059*).

The ratio of positive news to total news (or to non-neutral news) acts as an indicator of "reputation purity," reflecting the "emotional intensity" of positive information— a higher ratio indicates a higher "quality purity" of positive reputation. Here, the moderating logic of investors' activity is characterized by "marginal diminishing and risk exploration": when the reputation purity is already high, discussions among active investors struggle to further enhance the positive effect (marginal diminishing); instead, excessive attention may lead them to explore potential issues of the firm (e.g., hidden risks in the governance dimension), resulting in a shift to negative moderating effects.

In essence, the two approaches identify the moderating effect from the dual perspectives of "quantity" (scale) and "quality" (purity), collectively confirming the "objective existence of the moderating role of investors' online discussion activity."

Table 10. Regression results of robustness test for Model (2):online reputation replaced (positive news / total news)

VARIABLES	(1) OR	(2) OR	(3) OR	(4) OR
ESG_disc	0.567***			
	(4.44)			
E_disc		−0.065		
		(−0.89)		
S_disc			0.025	
			(0.36)	
G_disc				0.514***
				(5.18)
INV_act	0.069**	−0.032*	−0.017	0.073***
	(2.30)	(−1.92)	(−1.01)	(3.15)
ESG_discxINV_act	−0.017**			
	(−2.42)			
E_discxINV_act		0.007*		
		(1.65)		
S_discxINV_act			0.003	
			(0.75)	
G_discxINV_act				−0.018***
				(−3.31)
Size	0.009***	0.011***	0.011***	0.012***
	(8.26)	(9.96)	(10.34)	(10.54)
ROE	0.156***	0.179***	0.174***	0.153***
	(18.66)	(21.47)	(20.91)	(18.17)
TobinQ	0.002***	0.002***	0.002***	0.002***
	(2.94)	(2.70)	(2.78)	(2.69)
Growth	0.019***	0.017***	0.017***	0.019***
	(8.85)	(7.87)	(7.60)	(8.76)
Board	0.004	0.006	0.006	0.005
	(0.61)	(0.93)	(0.83)	(0.74)
Indep	−0.082***	−0.055**	−0.056**	−0.094***
	(−3.59)	(−2.39)	(−2.43)	(−4.07)
Constant	−2.133***	0.542*	0.162	−1.996***
	(3.85)	(1.76)	(0.52)	(−4.56)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	30,697	30,697	30,697	30,697
Adj R-squared	0.155	0.145	0.146	0.154

In summary, the "dynamic and contextual nature" of the moderating effect is jointly determined by "reputation attributes" and "time dimension":

Impact of reputation attributes: The "quantity-oriented" reputation scale leads to positive moderating effects, while the "quality-oriented" reputation purity leads to negative moderating effects. Moreover, the higher the purity (as shown in Table 11, where neutral news is excluded), the more robust the negative moderating effect becomes.

Impact of time dimension: The positive moderating effect of the one-period lagged reputation scale (ESG dimension: 0.223***) is significantly stronger than that of the current-period reputation scale (0.088*). This indicates that the moderating effect of reputation on investors' discussions exhibits a "time accumulation effect"— short-term noise does not alter the direction of the moderating effect but only affects its intensity.

Together, these two aspects demonstrate that the moderating effect is not "statically fixed" but dynamically changes with the "attribute dimension of reputation" and "time horizon," exhibiting distinct context-dependent characteristics.

Table 11. Regression results of robustness test for Model (2): online reputation (positive news / total of positive and negative news)

VARIABLES	(1) OR	(2) OR	(3) OR	(4) OR
ESG_disc	0.619***			
	(4.42)			
E_disc		0.053		
		(0.71)		
S_disc			0.004	
			(0.05)	
G_disc				0.542***
				(4.90)
INV_act	0.062*	−0.007	−0.026	0.059**
	(1.88)	(−0.40)	(−1.48)	(2.25)
ESG_discxINV_act	−0.016**			
	(−2.05)			
E_discxINV_act		0.000		
		(0.01)		
S_discxINV_act			0.005	
			(1.12)	
G_discxINV_act				−0.015**
				(−2.46)
Size	0.014***	0.017***	0.017***	0.017***
	(12.33)	(14.90)	(15.17)	(14.93)
ROE	0.202***	0.232***	0.227***	0.193***
	(25.38)	(28.72)	(28.12)	(24.06)
TobinQ	−0.002**	−0.002***	−0.002**	-0.002***
	(−2.49)	(−2.59)	(−2.56)	(−2.78)
Growth	0.018***	0.015***	0.015***	0.018***
	(8.30)	(6.85)	(6.63)	(8.37)
Board	0.015**	0.018**	0.017**	0.016**
	(2.17)	(2.53)	(2.45)	(2.28)
Indep	−0.065***	−0.030	−0.031	−0.086***
	(−2.77)	(−1.28)	(−1.30)	(−3.67)
Constant	−2.338***	0.046	0.256	−2.115***
	(−3.86)	(0.15)	(0.79)	(−4.33)
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
N	30,697	30,697	30,697	30,697
Adj R-squared	0.287	0.272	0.274	0.289

VI. Conclusion

This study finds that both comprehensive ESG disclosure and disclosures in each sub-dimension (environmental, social, and governance) have a significant positive impact on online reputation, indicating that enterprises can effectively enhance positive evaluations in the online space through ESG

information disclosure. The online discussion activity of investors exerts a significant moderating effect on the relationship between ESG disclosure and online reputation. However, the dynamic nature and contextual characteristics of this moderating effect are jointly determined by reputation attributes and time dimension. This study breaks through the limitation of measuring reputation from a single dimension and proves that the "scale" and "purity" attributes of reputation lead to differences in the moderating effect. It provides a multi-dimensional measurement framework for ESG reputation research and, at the same time, offers practical guidance for enterprises to formulate differentiated reputation management strategies.

On the practical level, enterprises should fully attach importance to the positive impact of ESG disclosure on online reputation, comprehensively improve their performance in each ESG dimension and the quality of information disclosure. Meanwhile, in view of the moderating role of investors' online discussion activity, they should take the initiative to strengthen online interaction with investors and leverage the active discussion atmosphere to amplify the positive effect of ESG disclosure on online reputation. On the regulatory level, it is necessary to improve ESG disclosure standards, guide enterprises to focus on information disclosure in key dimensions (such as social responsibility), and encourage investors to participate in the interpretation and dissemination of ESG information, so as to build an effective communication bridge between enterprises and the market. On the investor level, high-activity investors can further play their role in information transmission, and through professional analysis and public opinion guidance, promote the conversion of ESG value into corporate reputation, thereby contributing to the green development of the capital market.

Conflict of Interest

The author declares no conflict of interest.

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