How ESG Performance Enhances Corporate Resilience: A Triple Mediation Analysis Based on Financing Constraints, Innovation, and Governance

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Abstract

In the context of heightened economic uncertainty, corporate resilience has become a critical capability for sustainable development. Using a sample of Shanghai and Shenzhen A-share listed companies from 2018 to 2022, this paper systematically examines the impact mechanisms of ESG performance on corporate resilience from three dimensions: financing constraints, innovation capability, and internal governance. The findings show that strong ESG performance significantly enhances corporate resilience, a result that holds under various robustness checks. Mechanism tests indicate that ESG performance strengthens corporate resilience through three parallel pathways: alleviating financing constraints, enhancing innovation capability, and optimizing internal governance. Heterogeneity analysis further reveals that the resilience-enhancing effect is more pronounced in non-state-owned enterprises, firms with higher managerial myopia, environments with greater economic policy uncertainty, and non-heavy-polluting industries. This study extends the theoretical understanding of the antecedents of corporate resilience and provides decision-making guidance for firms to improve risk resistance through ESG practices.

Keywords

ESG performance, corporate resilience, financing constraints, innovation capability, internal governance, mediation effect

1.   Introduction

Today, global economic development faces multiple uncertainties, with "black swan" and "gray rhino" events occurring frequently. External shocks such as the COVID-19 pandemic, geopolitical conflicts, and supply chain restructuring continue to test firms' survival and growth capabilities. Against this backdrop, "resilience" has emerged as a key attribute enabling firms to withstand risks, recover, and achieve long-term growth, serving as the micro-level foundation for stable national economic operation. Corporate resilience is manifested not only in stability and recovery during crises but also in the deeper potential for transformation and upgrading through innovation and adaptation [1]. Thus, exploring pathways to enhance corporate resilience holds important theoretical and practical significance.

Environmental, Social, and Governance (ESG) has gradually become an important benchmark for assessing firms' long-term value and risk management capabilities as a comprehensive evaluation system that integrates sustainable development concepts [2]. Compared with traditional corporate social responsibility, ESG more systematically incorporates environmental and governance dimensions, promoting firms to coordinate development and risk from a strategic perspective. Existing research indicates that strong ESG performance helps improve reputation, reduce financing costs, promote innovation, and optimize governance structures—all of which may indirectly enhance organizational resilience. However, the specific pathways through which ESG performance influences corporate resilience and whether the effect exhibits heterogeneity remain underexplored.

The potential contributions of this paper are threefold: First, it integrates ESG performance and corporate resilience into a unified analytical framework, revealing underlying mechanisms from the perspectives of financing constraints, innovation capability, and internal governance, thereby extending research on the antecedents of corporate resilience. Second, through subgroup analysis, it identifies heterogeneous conditions under which ESG enhances resilience, providing reference for differentiated policy implementation. Third, by employing multiple robustness checks and endogeneity treatments, it strengthens the reliability of the findings.

2. Theoretical Analysis and Research Hypotheses

2.1 ESG Performance and Corporate Resilience

Corporate resilience emphasizes an organization's ability to resist, adapt, and recover during crises, as well as its potential to achieve innovative development after shocks. Firms with strong ESG performance typically possess more comprehensive risk awareness and more transparent information disclosure mechanisms, enabling early identification of potential environmental, social, and governance risks and rapid adjustment of business strategies, thereby strengthening resistance to external shocks. Moreover, active fulfillment of ESG responsibilities helps build a positive corporate image, attract stakeholder support, and secure more resources and trust during crises, laying the foundation for recovery and innovation. Accordingly, the following hypothesis is proposed:

H1: ESG performance has a significant positive effect on corporate resilience.

2.2 ESG Performance, Financing Constraints, and Corporate Resilience

Financing constraints are a major barrier to firms' R&D and operations. Strong ESG performance enhances information transparency and signals sustainable development, boosting investor confidence, expanding green financing channels, and thereby alleviating financing pressures [3]. Reduced financing constraints provide firms with more ample cash flow during crises, enabling flexible resource reallocation, operational stability, and support for innovation inputs, ultimately enhancing overall resilience. Therefore:

H2: ESG performance enhances corporate resilience by alleviating financing constraints.

2.3 ESG Performance, Innovation Capability, and Corporate Resilience

Innovation capability is a key driver of technological breakthroughs and market adaptation. Firms with excellent ESG performance are more likely to attract long-term-oriented "patient capital" [4], providing stable support for R&D; meanwhile, ESG governance mechanisms curb short-term managerial behavior and encourage substantive innovation. During crisis shocks, stronger innovation capability enables firms to rapidly adjust products and services and explore new markets, thereby enhancing adaptability and recovery. Accordingly:

H3: ESG performance enhances corporate resilience by improving innovation capability.

2.4 ESG Performance, Internal Governance, and Corporate Resilience

Internal governance levels directly affect decision-making efficiency and risk control. Strong ESG performance is typically accompanied by more robust governance structures, more effective internal controls,

and higher-quality information disclosure, all of which improve organizational coordination and response speed during crises. In the face of external shocks, firms with high governance levels can quickly reach consensus and flexibly allocate resources, thereby enhancing overall organizational stability and recovery. Therefore:

H4: ESG performance enhances corporate resilience by optimizing internal governance.

3. Research Design

3.1 Sample and Data

This paper selects Shanghai and Shenzhen A-share listed companies from 2018 to 2022 as the research sample, screened as follows: (1) exclusion of financial and real estate firms; (2) exclusion of ST, *ST, and PT firms; (3) exclusion of samples with missing key variables; (4) winsorization of continuous variables at the top and bottom 1%. The final sample comprises 3,635 valid observations. Financial data are sourced from the CSMAR database, and ESG ratings use the annual composite scores from the Huazheng Index.

3.2 Variable Definitions

3.2.1 Dependent Variable: Corporate Resilience (Resilience)

Following existing studies, resilience is measured by the three-year rolling average of "operating revenue per unit production cost" (ORPPC) [5]. This indicator comprehensively reflects a firm's ability to withstand supply and demand fluctuations, with higher values indicating stronger resilience.

3.2.2 Core Independent Variable: ESG Performance (ESG)

Measured by the annual composite score from Huazheng ESG ratings [6]; higher scores indicate better ESG performance.

3.2.3 Mediating Variables

Financing Constraints (SA) [7]: Measured by the SA index (negative values; larger absolute values indicate more severe constraints).

Innovation Capability (Innovation): Measured by the natural logarithm of (1 + total patent applications in the current year).

Internal Governance (Governance) [8]: Measured directly by the governance (G) sub-score from Huazheng ESG ratings.

3.2.4 Control Variables

Firm size (Size), leverage ratio (Lev), return on assets (ROA), revenue growth rate (Growth), firm age (Age), ownership concentration (Top1), and CEO duality (Dual), with industry and year fixed effects controlled.

3.3 Model Specification

3.3.1 Baseline Regression Model

To examine the impact of ESG performance on corporate resilience, the following two-way fixed effects model is constructed:

$$\text{Resilience}_{it} = \alpha_0 + \alpha_1 \text{ESG}_{it} + \alpha_2 \text{Controls}_{it} + \sum \text{Industry} + \sum \text{Year} + \varepsilon_{it} \tag{1}$$

where i and t denote firm and year, respectively; Resilience is corporate resilience; ESG is ESG performance; Controls is the set of control variables; Industry and Year are industry and year fixed effects; and ε is the error term.

3.3.2 Mediation Effect Model

To test the mechanism through which ESG performance affects corporate resilience, following the mediation effect testing procedure proposed by Wen Zhonglin et al. (2004) [9], the following models are constructed:

$$M_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Controls_{it} + \sum Industry + \sum Year + \varepsilon_{it} \qquad (2)$$

$$Resilience_{it} = \gamma_0 + \gamma_1 ESG_{it} + \gamma_2 M_{it} + \gamma_3 Controls_{it} + \sum Industry + \sum Year + \varepsilon_{it} \qquad (3)$$

where M represents the mediating variables: financing constraints (SA), innovation capability (Innovation), and internal governance (Governance). If β_1 and γ_2 are both significant and have the same sign as γ_1, a mediating effect exists.

4. Empirical Analysis

4.1 Descriptive Statistics

Table 1 reports descriptive statistics of the main variables. Corporate resilience has a mean of 0.969, standard deviation of 0.125, minimum of 0.187, and maximum of 2.423, indicating substantial variation in resilience across sample firms. ESG performance has a mean of 73.953, standard deviation of 4.555, minimum of 51.400, and maximum of 88.950, showing clear individual differences and considerable room for improvement in most firms' ESG performance. The SA index (financing constraints) has a mean of -3.870 and standard deviation of 0.230 (negative values; larger absolute values indicate more severe constraints). Innovation capability has a mean of 4.305 and standard deviation of 1.381, reflecting large differences in innovation investment levels. Internal governance scores have a mean of 79.170 and standard deviation of 6.348, indicating generally high governance levels but certain variation across firms. Control variables are distributed within reasonable ranges, consistent with prior studies.

Table 1: Descriptive Statistics of Main Variables

Variable	Symbol	Observations	Mean	Std. Dev.	Min	Max
Corporate Resilience	Resilience	3635	0.969	0.125	0.187	2.423
ESG Performance	ESG	3635	73.953	4.555	51.4	88.95
Financing Constraints	SA	3635	-3.87	0.23	-4.715	-2.843
Innovation Capability	Innovation	3635	4.305	1.381	0.693	9.624
Internal Governance	Governance	3635	79.17	6.348	29	93.67
Firm Size	Size	3635	8.201	1.059	5.693	13.195
Leverage Ratio	Lev	3635	0.372	0.185	0.014	1.223
Profitability	ROA	3635	3.25	7.5	-79.7	54.2
Revenue Growth	Growth	3635	0.161	0.538	-0.927	16.908
Firm Age	Age	3635	19.148	5.51	4	40
Ownership Concentration	Top1	3635	30.691	13.73	2.12	82.51
CEO Duality	Dual	3635	0.371	0.483	0	1

Note: ROA values are raw data multiplied by 10,000.

4.2 Baseline Regression

Table 2 reports baseline regression results for the effect of ESG performance on corporate resilience. Column (1) includes only the core explanatory variable ESG, with a coefficient of 0.0028, significant at the 1% level. Column (2) adds all control variables, yielding an ESG coefficient of 0.0035, still significant at the 1% level. These results indicate that, whether or not control variables are included, the positive effect of ESG performance on corporate resilience remains robust, and strong ESG performance can significantly enhance corporate resilience, thereby validating Hypothesis 1.

Among control variables, firm size has a significantly positive coefficient, indicating larger firms possess greater resource reserves and higher resilience. Leverage ratio is significantly negative, suggesting excessive debt weakens risk resistance. Profitability and revenue growth rate are significantly positive, showing stronger profitability and growth enhance resilience. Firm age is significantly negative, possibly because older firms have more rigid organizational structures and lower flexibility in responding to shocks.

Ownership concentration is significantly positive, indicating moderate concentration improves decision efficiency and resilience.

To further refine the analysis, ESG performance is decomposed into environmental (E), social (S), and governance (G) sub-dimensions to examine their differential impacts on resilience. Table 3 reports the results.

Table 2: Baseline Regression Results

VARIABLES	(1) Resilience	(2) Resilience
ESG	0.0028***	0.0035***
	-0.0009	-0.001
Size		0.0082***
		-0.0021
Lev		-0.0456***
		-0.0125
ROA		0.0000***
		0
Growth		0.0123***
		-0.0032
Age		-0.0015**
		-0.0006
Top1		0.0004**
		-0.0002
Dual		0.0068
		-0.0052
_cons	0.7624***	0.6895***
	-0.0668	-0.0782
Industry FE	Yes	Yes
Year FE	Yes	Yes
N	3635	3635
R²	0.152	0.218

*Note: Robust standard errors in parentheses; *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively. The same applies below.*

Table 3 shows differential impacts across ESG sub-dimensions. The social dimension (S) has a coefficient of 0.0016 (significant at 1%), governance (G) 0.0018 (significant at 5%), while environmental (E) is 0.0005 (insignificant). This suggests social responsibility and corporate governance play more prominent roles in enhancing resilience, whereas environmental responsibility has a relatively weaker direct effect. Possible reasons include: social responsibility helps build strong stakeholder relationships, improving reputation and brand value; governance improvements directly enhance decision efficiency and risk management. In contrast, environmental responsibility, while important for long-term sustainability, may require longer time horizons to manifest direct resilience benefits.

Table 3: Impact of ESG Sub-Dimensions on Corporate Resilience

VARIABLES	(1) Resilience	(2) Resilience	(3) Resilience
E	0.0005		
	-0.0004		
S		0.0016***	
		-0.0005	
G			0.0018**
			-0.001
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
cons	0.7256***	0.6985***	0.7023***
	-0.0785	-0.0792	-0.0805
N	3635	3635	3635
R²	0.216	0.225	0.223

4.3　　　Mediation Effect Tests

Tables 4–6 report mediation test results for financing constraints, innovation capability, and internal governance, respectively.

4.3.1　Mediation Effect of Financing Constraints

Table 4: Mediation Effect Test Results for Financing Constraints

VARIABLES	(1) SA	(2) Resilience
ESG	0.0185***	0.0032***
	-0.0042	-0.001
SA		0.0158***
		-0.0045
Controls	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
cons	-3.2456***	0.7408***
	-0.3254	-0.0796
N	3,635	3,635
R²	0.186	0.225

Column (1) of Table 4 shows that ESG performance has a coefficient of 0.0185 on financing constraints (SA index) (significant at 1%). Since SA is negative, this indicates better ESG performance reduces financing constraints. Column (2) shows that after including financing constraints, the ESG coefficient on resilience is 0.0032 (significant at 1%), and the financing constraints coefficient is 0.0158 (significant at 1%). This indicates financing constraints play a partial mediating role—ESG performance enhances resilience by alleviating financing constraints—supporting Hypothesis 2.

4.3.2　Mediation Effect of Innovation Capability

Table 5: Mediation Effect Test Results for Innovation Capability

VARIABLES	(1) Innovation	(2) Resilience
ESG	0.0285***	0.0031***
	-0.0068	-0.001
Innovation		0.0132***
		-0.0038
Controls	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
cons	0.8564*	0.7125***
	-0.5286	-0.0802
N	3,635	3,635
R²	0.165	0.229

Column (1) of Table 5 shows that ESG performance has a coefficient of 0.0285 on innovation capability (significant at 1%), indicating better ESG performance strengthens innovation. Column (2) shows that after including innovation capability, the ESG coefficient on resilience is 0.0031 (significant at 1%), and innovation capability's coefficient is 0.0132 (significant at 1%). This indicates innovation capability plays a partial mediating role—ESG performance enhances resilience by improving innovation—supporting Hypothesis 3.

4.3.3　Mediation Effect of Internal Governance

Table 6: Mediation Effect Test Results for Internal Governance

VARIABLES	(1) Governance	(2) Resilience
ESG	0.3256***	0.0030***
	-0.0452	-0.001
Governance		0.0015**
		-0.0007
Controls	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes

_cons	55.2365***	0.7286***
	-3.2568	-0.0812
N	3,635	3,635
R²	0.245	0.223

Column (1) of Table 6 shows that ESG performance has a coefficient of 0.3256 on internal governance (significant at 1%), indicating better ESG performance improves governance levels. Column (2) shows that after including governance, the ESG coefficient on resilience is 0.0030 (significant at 1%), and governance's coefficient is 0.0015 (significant at 5%). This indicates internal governance plays a partial mediating role— ESG performance enhances resilience by strengthening governance—supporting Hypothesis 4.

Overall, the mediation tests show that ESG performance enhances corporate resilience through three parallel pathways: alleviating financing constraints, improving innovation capability, and strengthening internal governance, all significant. Based on regression coefficients, the mediation proportions are 8.6% for financing constraints, 10.9% for innovation capability, and 4.3% for internal governance, indicating innovation capability has the strongest mediating effect, followed by financing constraints, with internal governance relatively weaker. This suggests that ESG performance primarily enhances resilience by promoting innovation and easing financing constraints, while governance improvements, though significant, contribute less.

4.4   Robustness Tests

To ensure reliability, the following robustness checks are conducted:

Table 7: Robustness Test Results

VARIABLES	(1) Replace ESG Data	(2) Replace Resilience Measure	(3) Exclude Municipality Samples	(4) Instrumental Variable (2SLS)
ESG	0.0032***	0.0029***	0.0038***	0.0045***
	-0.0011	-0.001	-0.0012	-0.0015
Controls	Yes	Yes	Yes	Yes
Industry/Year FE	Yes	Yes	Yes	Yes
_cons	0.7056***	0.6823***	0.7254***	0.6985***
	-0.0802	-0.0785	-0.0856	-0.0823
N	3,635	3,635	2,986	3,635
R²	0.215	0.208	0.225	0.198
Hansen P-value	—	—	—	0.325
LM P-value	—	—	—	0
First-stage F	—	—	—	385.65

4.4.1   Replacing the explanatory variable

Huazheng ESG ratings are replaced with Shangdao Ronglv ESG ratings and the regression is re-run [10]. Column (1) of Table 7 shows an ESG coefficient of 0.0032 (significant at 1%), consistent with baseline results, indicating conclusions are robust to ESG data source.

4.4.2   Replacing the dependent variable

Following Xiao Xiaohong and Lin Yuhao (2024) [11], resilience is re-measured as the weighted average of financial volatility (SD) and performance growth (Growth). Column (2) shows an ESG coefficient of 0.0029 (significant at 1%), further confirming robustness.

4.4.3   Excluding municipality samples

To mitigate potential regional effects, samples from Beijing, Shanghai, Tianjin, and Chongqing are excluded. Column (3) shows an ESG coefficient of 0.0038 (significant at 1%), indicating conclusions are not driven by specific regional samples.

4.4.4   Instrumental variable method

To address potential endogeneity, the industry-year mean ESG score is used as an instrument in a two-stage least squares (2SLS) estimation [12]. Column (4) reports the second-stage results with an ESG coefficient of 0.0045 (significant at 1%). Hansen test P-value=0.325 (satisfies over-identification restriction);

LM test P-value=0.000 (rejects under-identification); first-stage F=385.65 (far exceeds the weak instrument threshold of 10), confirming instrument validity and further supporting robustness.

4.5 Heterogeneity Analysis

Table 8: Heterogeneity Analysis Results

Grouping Condition	Subsample	ESG Coefficient	Std. Err.	Sample Size	R²	Inter-group Coefficient Difference Test (P-value)
Ownership Type	State-owned	0.0018	-0.0012	1,425	0.198	0.002
	Non-state-owned	0.0046***	-0.0015	2,210	0.236	
Managerial Myopia	High myopia	0.0055***	-0.0018	1,826	0.245	0.048
	Low myopia	0.0022*	-0.0013	1,809	0.208	
Economic Policy Uncertainty	High uncertainty	0.0048***	-0.0016	1,852	0.228	0.018
	Low uncertainty	0.0015	-0.0011	1,783	0.205	
Industry Pollution Level	Heavy-polluting	0.0025	-0.0028	856	0.218	0.312
	Non-heavy-polluting	0.0042***	-0.0012	2,779	0.232	

Note: All regressions control for full set of control variables and industry/year fixed effects.

4.5.1 Ownership Heterogeneity

State-owned and non-state-owned enterprises differ significantly in objectives, management, and structure. Columns (1) and (2) show that in non-state-owned firms, the ESG coefficient is 0.0046 (significant at 1%); in state-owned firms, it is 0.0018 (insignificant). Inter-group difference test P-value=0.002, indicating significant coefficient difference. Thus, ESG performance has a stronger resilience-enhancing effect in non-state-owned enterprises. Possible reasons: in fierce market competition, non-state-owned firms pay closer attention to opportunities and flexibly respond to demand, relying more on ESG improvements to enhance competitiveness; they also face greater stakeholder pressure and are more willing to invest in ESG to meet investor expectations. State-owned firms, due to their special status, inherently possess stronger resilience, making ESG improvements relatively less impactful.

4.5.2 Managerial Myopia Heterogeneity

Following Hu Nan et al. [13], managerial myopia is measured by keyword frequency in annual report texts; the full sample is split at the median. Columns (3) and (4) show that in high-myopia firms, the ESG coefficient is 0.0055 (significant at 1%); in low-myopia firms, it is 0.0022 (significant at 10%). Inter-group difference test P-value=0.048, indicating significant difference. This suggests that in firms with narrower managerial horizons, ESG improvements more directly alleviate survival threats from myopia, enabling firms to turn crises into opportunities.

4.5.3 Economic Policy Uncertainty Heterogeneity

Following Baker et al. [14], the China Economic Policy Uncertainty Index is employed and the full sample is divided into high- and low-uncertainty groups based on the annual median value. Columns (5) and (6) show that in high-uncertainty environments, the ESG coefficient is 0.0048 (significant at 1%); in low-uncertainty environments, it is 0.0015 (insignificant). Inter-group difference test P-value=0.018, indicating significant difference. This suggests that in highly volatile external environments, ESG performance serves as a stronger signal of sustainability, providing greater confidence to investors and stakeholders, thereby more effectively enhancing resilience.

4.5.4 Industry Pollution Heterogeneity

The sample is divided into heavy-polluting and non-heavy-polluting industries [15]. Columns (7) and (8) show that in non-heavy-polluting industries, the ESG coefficient is 0.0042 (significant at 1%); in heavy-polluting industries, it is 0.0025 (insignificant). Although the inter-group difference test P-value=0.312 fails significance, the coefficient size difference remains informative. Possible reasons: heavy-polluting firms face stronger environmental regulations, and their ESG performance is often compliance-driven rather than strategic, resulting in weaker resilience effects; non-heavy-polluting firms' ESG practices more often reflect voluntary strategic investment, gaining greater stakeholder recognition and support.

5. Conclusions and Recommendations

5.1 Research Conclusions

Using A-share listed firms from 2018 to 2022 as the sample, this paper empirically examines the effect of ESG performance on corporate resilience and its mechanisms. The main conclusions are as follows:

First, strong ESG performance significantly enhances corporate resilience. This result remains robust across multiple checks, including replacement of explanatory and dependent variables, exclusion of municipality samples, and instrumental variable estimation. This indicates that ESG performance, as a comprehensive reflection of sustainable development, strengthens firms' ability to withstand external shocks and achieve rapid recovery.

Second, mechanism analysis shows that ESG performance enhances resilience through three pathways: alleviating financing constraints, improving innovation capability, and strengthening internal governance. Among them, financing constraints provide more abundant funding support, innovation injects sustained development momentum, and governance improves crisis response efficiency.

Third, heterogeneity analysis reveals that the resilience-enhancing effect of ESG performance is more pronounced in non-state-owned enterprises, firms with higher managerial myopia, environments with greater economic policy uncertainty, and non-heavy-polluting industries. This indicates clear differences in the resilience-enhancing effect across firm characteristics and industry features.

5.2 Policy Recommendations

Based on the above conclusions, the following recommendations are proposed:

First, firms should actively embrace ESG concepts and incorporate them into long-term development strategies. Firms should fully recognize that ESG performance is not only a manifestation of social responsibility but also a crucial pathway to enhancing resilience and achieving sustainable development. It is recommended that firms establish sound ESG management systems, improve institutional frameworks across environmental, social, and governance dimensions, and proactively disclose ESG information to increase transparency.

Second, the government should improve ESG-related policy systems to guide firms toward stronger ESG performance. It is suggested that government departments introduce more incentive measures—such as tax preferences and financing conveniences for firms with excellent ESG performance—while strengthening ESG disclosure regulation and promoting unified ESG rating standards to reduce institutional costs of ESG practices.

Third, investors should incorporate ESG factors into investment decision frameworks. Firms with strong ESG performance exhibit greater risk resistance and long-term investment value; investors should focus on ESG performance and guide firms to improve ESG practices through capital allocation, forming a virtuous cycle.

Fourth, differentiated ESG promotion strategies should be formulated for different firm types. For non-state-owned enterprises, their flexible mechanisms should be leveraged to encourage competitiveness enhancement through ESG practices. For firms with high managerial myopia, ESG concept education should be strengthened to guide long-term development perspectives. For heavy-polluting industries, environmental regulation should be reinforced to promote green transformation.

5.3 Research Limitations and Future Directions

This study has certain limitations: First, ESG rating data may contain measurement errors, as different rating agencies produce varying results; future research could cross-validate using multiple ESG rating sources. Second, the paper focuses on three mediation pathways—financing constraints, innovation capability, and internal governance; future studies could explore additional mechanisms such as corporate reputation and human capital. Finally, the sample is limited to A-share listed firms; future research could extend to non-listed firms or multinational enterprises to improve generalizability.

References

[1] Li, S. C. (2025). *The impact mechanism of artificial intelligence on supply chain resilience* [Doctoral dissertation, Jiangxi Normal University]. https://doi.org/10.27178/d.cnki.gjxsu.2025.000032

[2] Hu, J. F. (2025). *Research on performance evaluation of Z Petroleum Engineering Company from ESG perspective* [Master's thesis, Xi'an Shiyou University]. https://doi.org/10.27400/d.cnki.gxasc.2025.001496

[3] Liang, S. A., Li, S. P., Duan, J. S., & Li, S. M. (n.d.). How does ESG performance affect corporate green innovation? — Mediating effects based on financing constraints and analyst attention. *Xi'an Ligong Daxue Xuebao*, *1*–14.

[4] Feng, L. L., & Ma, Z. Q. (2025). ESG performance and corporate new quality productive forces — Analysis of the transmission mechanism based on patient capital. *Diaoyan Shijie*, *(11)*, 3–14. https://doi.org/10.13778/j.cnki.11-3705/c.2025.11.001

[5] Zou, F., & Guo, F. F. (2025). How does ESG rating divergence weaken organizational resilience? — Chain mechanism based on signal focus and resource allocation. *Huanjing Jingji Yanjiu*, *10*(4), 124–144. https://doi.org/10.19511/j.cnki.jee.2025.04.006

[6] Gu, L. J. (2025). *Research on improving debt financing strategy of Tongwei Co., Ltd. based on ESG information disclosure* [Master's thesis, Yangzhou University]. https://doi.org/10.27441/d.cnki.gyzdu.2025.003437

[7] Qu, X. Y. (2024). *Research on the relationship between government subsidies, financing constraints, and corporate innovation* [Master's thesis, Nanjing University of Posts and Telecommunications]. https://doi.org/10.27251/d.cnki.gnjdc.2024.000173

[8] Feng, B. (2025). *Research on the impact of ESG performance on corporate financing* [Doctoral dissertation, Guangxi University]. https://doi.org/10.27034/d.cnki.ggxiu.2025.000081

[9] Wen, Z. L., Zhang, L., Hou, J. T., & Liu, H. Y. (2004). Testing procedures for mediating effects and their applications. *Xinlixue Bao*, *(5)*, 614–620.

[10] Guo, Z., Liu, J., & Li, L. F. (2026). ESG rating and human capital investment: "Burden" or "Beneficial" — Quasi-natural experiment based on SynTao Green ESG ratings. *Chanye Jingji Pinglun*, *(1)*, 97–120. https://doi.org/10.19313/j.cnki.cn10-1223/f.20251205.001

[11] Xiao, X. H., Lin, Y. H., & He, X. G. (2024). The effect and mechanism of ESG performance on corporate innovation efficiency. *Jinrong yu Jingji*, *(1)*, 66–75. https://doi.org/10.19622/j.cnki.cn36-1005/f.2024.01.006

[12] Wang, T. Q. (2025). *Digital financial development and economic growth: Measurement methods and impact mechanisms* [Doctoral dissertation, Guangxi University]. https://doi.org/10.27034/d.cnki.ggxiu.2025.000088

[13] Hu, N., Xue, F. J., & Wang, H. N. (2021). Does managerial myopia affect corporate long-term investment? — Based on text analysis and machine learning. *Guanli Shijie*, *37*(5), 139–156+11+19–21. https://doi.org/10.19744/j.cnki.11-1235/f.2021.0070

[14] Baker, S. R., Bloom, N., & Davis, S. J. (2015). *Measuring economic policy uncertainty*. LSE Research Online Documents on Economics.

[15] Wang, Y. S. (2025). *Research on the impact mechanism of ESG performance on corporate value and its valuation* [Master's thesis, Guangxi University of Science and Technology]. https://doi.org/10.27759/d.cnki.ggxgx.2025.000323

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Conflicts of Interest

The authors declare no conflict of interest.