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ESG Investment and Financial Performance: Evidence from Listed Companies in China

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Abstract: This study examined the relationship between ESG performance and financial performance among Chinese listed firms, focusing on nonlinear effects, the mediating role of financing constraints, heterogeneous impacts across industries and firm sizes, and the development of practical ESG guidelines. Using 841 firm-year observations from 137 A-share listed companies during the period 2000–2025, the study employed panel data methods, including fixed-effects regression, mediation analysis, and subgroup analysis, together with expert validation of the proposed guidelines. The results revealed an inverted U-shaped relationship between ESG performance and ROE, indicating an optimal ESG threshold beyond which excessive ESG engagement generated diminishing financial returns. Financing constraints significantly mediated this relationship, as stronger ESG performance improved firms' access to capital and reduced financing pressure. ESG effects were found to be context-dependent, with stronger positive impacts observed in high environmental impact industries. ESG performance also improved accounting performance among large firms and enhanced market valuation among SMEs. The study further developed evidence-based ESG guidelines for balanced and strategic ESG implementation. These findings contribute to a better understanding of ESG mechanisms in emerging markets and provide practical implications for balancing sustainability objectives and financial performance.

Keywords: ESG Investment; Financial Performance; Financing Constraints

1. Introduction

Against the backdrop of global sustainable development, data from the Global Sustainable Investment Alliance (GSIA, 2025) shows that global sustainable investment assets reached 120.24 trillion yuan, representing a 49% increase over two years. Guided by China's "dual carbon" goals, the scale of ESG public funds in China exceeded 82.4 billion yuan in 2025, and the ESG disclosure rate for A-share listed companies reached 49.4% in 2026. However, a mismatch between ESG input and output persists in practice: the average ESG index score in China is only 59.10. For example, Baosteel's substantial environmental investments failed to meet emission reduction targets and were accompanied by declining profitability[1].

Additionally, the correlation coefficient between MSCI and CSI ESG ratings stands at merely 0.45, indicating that many enterprises make blind and inefficient ESG investments. Clarifying the relationship between ESG investment and financial performance can fill research gaps regarding nonlinearity and heterogeneity, while providing empirical support for enterprises, investors, and regulators.

Existing studies mostly confirm a positive linear relationship between ESG and financial performance[2][3] identified heterogeneous effects across industries and firm sizes [4] [5] verified the

positive impact of ESG in the Chinese context. Nevertheless, research gaps remain: the nonlinear effects of excessive ESG investment are overlooked; the mediating role of financing constraints has not been tested in heterogeneous scenarios; research on the moderating mechanisms of industry and firm size is limited; inconsistent rating standards and a lack of practical guidelines persist[6].

In this context, clarifying the relationship between ESG investment and corporate financial performance holds both theoretical and practical value. Focusing on Chinese A-share listed companies, this study addresses the limitations of existing research, with four core objectives:

1. To examine the relationship between ESG investment and financial performance among listed companies in China, including potential non-linear effects.

2. To examine the mediating role of financing constraints in the relationship between ESG overinvestment and financial performance.

3. To compare the effects of ESG investment on financial performance across different industry groups and firm sizes through multiple group analysis, in order to explore potential moderating effects of industry characteristics and firm size.

4. To develop practical guidelines for making well-balanced ESG investment decisions among Chinese listed companies.

Theoretically, this study fills gaps in research on the nonlinear effects and heterogeneous boundaries of ESG investment, enriching the theory of ESG value creation. Practically, it provides precise references for enterprises to allocate ESG resources, supports investors' decision-making, and offers empirical evidence for regulators to improve ESG disclosure standards and formulate differentiated policies, thereby advancing the sustainable development of China's capital market.

2. Methodology

2.1 Research Design

This study adopts a multi-stage research design to explore the relationship between ESG investment, and the financial performance of Chinese A-share listed companies. Quantitative analysis is performed using panel data econometric methods, combined with expert validation, ensuring both theoretical rigor and practical research value.

Population and Sample

The research population covers all listed firms in China's A-share market. Financial performance data are retrieved from the China Stock Market and Accounting Research (CSMAR) database, while ESG indicators are obtained from the Huazheng ESG rating system. This study excludes financial industry firms, ST-listed firms, and samples with missing key data. The final research sample consists of 137 listed companies, yielding a total of 841 firm-year observations spanning from 2000 to 2025.

2.2 Measures

In this empirical research on the association between ESG performance and financial performance, the variables are grouped into four categories: the explained variable (dependent variable), the explanatory variable (independent variable), the mediating and moderating variables, and the control variables. The variables used to measure financial performance include ROA, ROE, and Tobin's Q. The main independent variable in this research is ESG performance. The financing constraints are used as mediating variables, while the moderating variables in this research include industry characteristics and firm size. In addition, there is several control variables including leverage ratio, revenue growth, board size, independent directors, and institutional ownership.

Table 1. Definition and Classification of Variables

Type of Variable	Variable Name	Variable Symbol
Explained Variable	Financial performance	ROA, ROE, Tobin's Q
Explanatory Variable	ESG investment	ESG
Moderating Variables	Industry Characteristics	Industry
	Firm Size	Size
Mediating Variable	Financing constraints	FC
Control Variables	Asset-liability ratio	Lev
	Operating income growth rate	Growth
	Board size	Board
	Proportion of independent directors	Indep
	Institutional ownership ratio	INST

2.3 Data Analysis

This study employs software for quantitative analysis of the panel data. By analyzing the practical characteristics of ESG investment among Chinese A-share listed firms and combining financial performance indicators including return on assets, return on equity, and Tobin's Q, as well as financing constraints and other influencing factors, this paper thoroughly explores the impact mechanism and heterogeneous characteristics of ESG investment on corporate performance. Correlation analysis and panel regression are adopted to systematically clarify the influencing paths of ESG investment on various financial indicators, verify the mediating effect of financing constraints, and analyze the heterogeneous differences caused by industrial environmental sensitivity and firm size.

Furthermore, this study formulates practical ESG investment guidelines for Chinese listed companies, whose content validity is assessed by three professional experts through the Item-Objective Congruence (IOC) method, providing reliable references for corporate decision-making and regulatory policy formulation[7]. In terms of qualitative analysis, thematic analysis is utilized to process and summarize expert responses to open-ended questions. Key themes and professional suggestions extracted from expert feedback are adopted to revise and optimize the formulated ESG investment guidelines.

3. Results

3.1 Sample Description and Variable Characteristics

Table 2 illustrates the overall sample profile.

Table **2**. Sample Overview

Item	Value
Firm-year observations	841
Unique firms	137
Sample period	2000-2025
Industry categories	41
Average observations per firm	6.140
High environmental impact observations	198
Low environmental impact observations	643
Large-firm observations	429
SME observations	412

Note: The final analytical sample is based on the common sample used in the baseline regressions.

This study presents descriptive statistics and sample characteristics based on the main regression sample. After eliminating missing values of key variables and control variables, the final sample includes 841 firm-year observations covering 137 listed companies across 41 industry categories, with a research time span from 2000 to 2025. On average, each firm has 6.14 observations, indicating that

the sample possesses favorable longitudinal tracking characteristics. In terms of sample grouping, high environmental-impact industries account for 198 observations, representing 23.5% of the total sample, while low environmental-impact industries comprise 643 observations, accounting for 76.5% of the sample. Firm size grouping is determined by the annual median of the natural logarithm of total assets. Large enterprises contribute 429 observations (51.0% of the total sample), and small and medium-sized enterprises (SME s) contribute 412 observations (49.0% of the total sample).

Table **3**. Descriptive Statistics of Main Variables

Variable	N	Mean	SD	Min	P25	Median	P75	Max
ESG score	841	4.227	2.322	1.000	2.000	4.000	6.000	9.000
ROA	841	0.028	0.073	-0.480	0.012	0.032	0.059	0.418
ROE	841	-0.023	1.674	-47.719	0.029	0.067	0.113	0.598
Tobin's Q	841	2.016	1.988	0.795	1.127	1.438	2.014	19.824
Firm size (ln assets)	841	22.512	1.866	19.084	21.213	22.157	23.325	29.384
Revenue growth	841	0.211	0.834	-0.985	-0.040	0.100	0.286	15.583
Institutional ownership (%)	841	51.348	21.858	0.008	36.520	52.668	68.494	98.074
Board size	841	9.392	2.468	1.000	8.000	9.000	10.000	21.000
Independent directors (%)	841	35.586	7.505	0.000	33.330	33.330	38.460	60.000
KZ index	808	2.026	2.405	-14.731	0.792	2.189	3.355	11.087
SA index	841	-3.801	0.428	-5.073	-4.088	-3.831	-3.551	-2.245

Note: KZ index has fewer observations due to missing values in the merged source file.

As can be seen from Table 3, there is noticeable diversity in terms of the performance of ESG and financial performance, firm size, governance, and funding of firms listed on the Chinese stock exchange. The mean value of ESG performance is 4.227, and the mean values of ROA and Tobin's Q suggest that the performance of the sample firms is moderately good. However, negative values of the mean ROE and high variance confirm that some firms experienced large losses.

Table 4 presents the Pearson correlation matrix of the key variables. From the findings, it can be noted that ESG is positively and significantly related to ROA, ROE, firm size, institutional shareholding, and board size. This implies that companies that exhibit high ESG practices have better financial performance and good governance structures. On the other hand, ESG has a negative relationship with Tobin's Q and the percentage of independent directors. Leverage has a negative correlation with all financial measures, whereas firm size has a high positive correlation with ESG. In general, the correlation coefficients fall below the cut-off point of multicollinearity, implying that multicollinearity will not be an issue in this analysis.

Table 4. Pearson Correlation Matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. ROA	1.000									
2. ROE	0.313***	1.000								
3. To bin's Q	-0.113***	-0.038	1.000							
4. ESG	0.244***	0.079**	-	1.000						
5. Growth	0.140***	0.068*	-0.032	0.073**	1.000					
6. Leverage	-0.248***	-	-	0.110***	-0.008	1.000				
7. Size	0.103***	0.052	-	0.450***	0.041	0.493***	1.000			
8. Institutional	0.226***	0.023	-	0.395***	0.091***	0.161***	0.406***	1.000		
9. Board Size	0.112***	0.053	-	0.201***	-0.033	0.283***	0.379***	0.166***	1.000	
10. In dep Ratio	-0.083**	-0.041	0.040	-0.088**	0.009	0.057*	0.108***	0.170***	-0.226***	1.000

Note: N = 841. ***, **, and * indicate significance at the 1%,5%, and 10% levels, respectively. Variable definitions are as follows: ROA = Return on Assets; ROE = Return on Equity; Tobin's Q = Tobin's Q-value; ESG = ESG score; Growth = Revenue Growth Rate; Leveraged = Debt-to-Asset Ratio; Size = Firm Size (natural logarithm of total assets); Institutional = Institutional Ownership; BoardSize = Board Size; IndepRatio = Proportion of Independent Directors.

Table 5. Multicollinearity Test Result

Variable	VIF	Tolerance
ESG	1.429	0.700
Growth	1.014	0.986
Leverage	1.372	0.729
Size	1.936	0.517
Institutional	1.343	0.744
BoardSize	1.305	0.766
IndepRatio	1.177	0.850
Maximum VIF	1.936	
Mean VIF	1.368	
Minimum Tolerance	0.517	

Note: The maximum VIF is 1.936 and the mean VIF is 1.368. All VIF values are below 5 and 10, and all tolerance values are above 0.10.

Table 5 reports on the Variance Inflation Factor (VIF) and tolerance values. All VIF values range from 1.014 to 1.936, well below the threshold of 10 (and even the stricter threshold of 5). All tolerance values are above 0.10. These results indicate that multicollinearity is not a significant concern in the baseline model.

3.2 ESG Investment and Performance: Nonlinear Relationship Test

To test the nonlinear relationship between ESG performance and corporate investment, this study constructs regression models with ESG linear and quadratic terms. The results show that ESG has a significantly inverted U-shaped relationship with ROE, with a turning point at approximately 5.115. However, ESG shows a U-shaped relationship with ROA, and no significant nonlinear relationship with Tobin's Q (Figure 1-3).

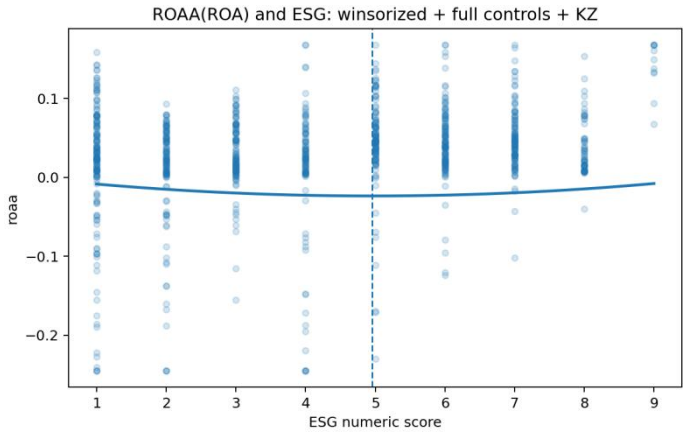

Figure 1. U-Shaped Relationship Between ESG Investment and Return on Assets

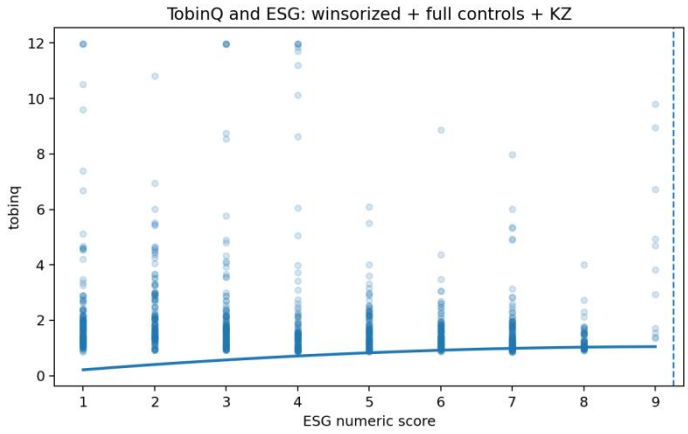

Figure 2. Relationship Between ESG Investment and Tobin's Q

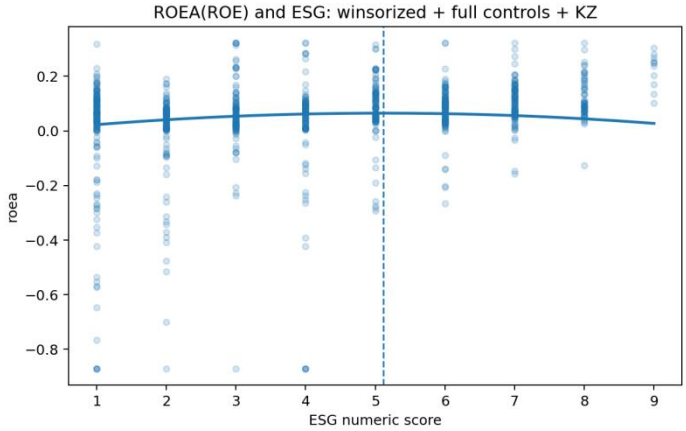

Figure 3. Inverted U-Shaped Relationship Between ESG Investment and Return on Equity

3.3 Mediation Effect Results

The mediation analysis shows that financing constraints (KZ index) significantly mediate the relationship between ESG and financial performance. For ROA, the mediation effect accounts for 25.71% of the total effect; for ROE, it accounts for 24.15%; and for Tobin's Q, it accounts for 22.37%.

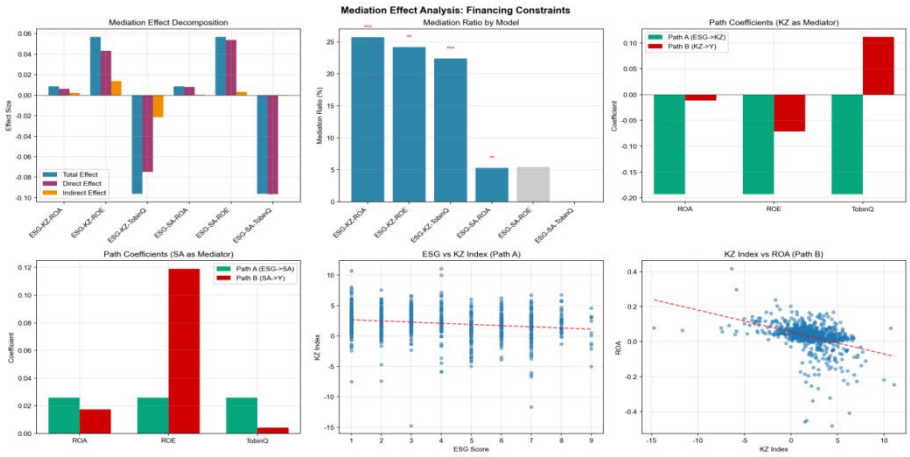

Figure 4. Mediation Effect Analysis: Financing Constraints

3.4 Industry Heterogeneity Analysis

The industry heterogeneity analysis reveals that the ESG-performance relationship varies significantly between high and low environmental impact industries. In high environmental impact industries, ESG has a significant positive effect on all three-performance metrics (ROA, ROE, and Tobin's Q). In contrast, in low environmental impact industries, ESG positively affects ROA and ROE but has a significant negative effect on Tobin's Q (Table 6).

Outcome	High EI	Low EI	Difference	N(High)	N(Low)
ROA	0.0122***	0.0076***	0.0046*	198	643
	(0.0023)	(0.0013)	(0.0027)		
ROE	0.0315***	0.0621*	-0.0306	198	643
	(0.0069)	(0.0343)	(0.0640)		
Tobin's Q	0.1134**	-0.1344***	0.2478***	198	643
	(0.0433)	(0.0380)	(0.0748)		

Table 6. Industry Heterogeneity in the ESG-Performance Relationship

3.5 Firm Size Heterogeneity Analysis

Table 7. Firm Size Heterogeneity in the ESG-Performance Relationship

Outcome	Large Firms	SMEs	Difference	p-value	N(Large)	N(SME)
ROA	0.0043***	0.0016	0.0027	0.172	429	412
	(0.0011)	(0.0016)	(0.0020)			
ROE	0.0133***	0.0383	-0.0251	0.612	429	412
	(0.0042)	(0.0491)	(0.0494)			
Tobin's Q	0.0515*	0.1047**	-0.0533	0.309	429	412
	(0.0297)	(0.0431)	(0.0524)			

Note: All models include control variables and year fixed effects. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The firm size heterogeneity analysis shows that ESG effects differ between large firms and SMEs. For large firms, ESG has significant positive effects on ROA and ROE. For SMEs, ESG has a significant positive effect only on Tobin's Q (Table 7).

3.6 Practical ESG investment guidelines for well-Balanced ESG investment decisions among Chinese listed companies

Based on the findings of this study, some practical guidelines are suggested for companies that aim at improving their financial performance using appropriate strategies of ESG investments (Table 8). The findings clearly show that the effect of ESG investments depends on the degree of investment, financing situations, industries in which they operate, and the size of the firms. The findings also show that there are nonlinear effects, mediation effects based on financing constraint, and heterogeneous effects among other firms. As such, ESG strategy needs to be evidence-based and strategically designed.

Table 8. Practical ESG investment guidelines for well-Balanced ESG investment

Dimension	Practical Guideline	Key Actions	Empirical Evidence
ESG Investment Level Optimization	Firms should maintain ESG investment at an optimal level and avoid overinvestment.	- Identify optimal ESG threshold - Monitor marginal returns of ESG investment - Avoid excessive ESG expenditure	Inverted U-shaped relationship between ESG and ROE with turning point ≈ 5.115
Financing Strategy Integration	ESG should be used as a strategic tool to alleviate financing constraints.	- Enhance ESG disclosure - Improve transparency and governance - Use ESG to attract investors and lenders	ESG negatively affects KZ index; financing constraints significantly reduce ROA and ROE; mediation effect confirmed

Industry-Specific ESG Strategy	ESG investment should be prioritized in high environmental impact industries.	- Focus on environmental compliance - Strengthen sustainability practices - Align with regulatory pressure	ESG has stronger positive effects on ROA, ROE, and Tobin's Q in high environmental impact industries
Firm Size-Based ESG Adaptation	ESG strategies should be tailored based on firm size.	- Large firms: focus on operational efficiency and ESG integration - SMEs: use ESG as a signaling mechanism to investors	ESG improves ROA and ROE in large firms; improves Tobin's Q in SMEs
Short-term vs Long-term Value Balance	Firms should balance ESG costs and long-term value creation.	- Communicate ESG strategy to investors - Emphasize long-term sustainability benefits - Align ESG with growth strategy	ESG negatively related to Tobin's Q in some contexts, suggesting short-term market concerns
Governance and Institutional Support	Strong governance structures should support ESG implementation.	- Improve board structure - Increase independent directors - Engage institutional investors	ESG positively correlated with institutional ownership and governance variables
Data-Driven ESG Decision-Making	ESG investment decisions should be evidence-based and context-specific.	- Use internal and external benchmarking - Monitor ESG-performance linkage - Avoid one-size-fits-all approach	Significant heterogeneity across industries and firm sizes

From the analysis above, it becomes evident that companies need to ensure that their ESG investments are appropriately moderated to avoid the phenomenon of decreasing marginal returns from excessive expenditure. In terms of ROE, an inverted U-shaped relationship exists between the level of ESG and profitability. Also, ESG may be used as an appropriate tool for resolving the problem of financing constraints as it increases transparency and improves corporate governance practices as well as investor confidence.

Furthermore, the outcomes of this study point out several important factors that may influence the impact of ESG investment on firm performance. First, such factors as industry and size appear to be particularly important. For example, higher gains from ESG investment are found in those industries that are characterized by high environmental sensitivity while ESG investment is expected to have different effects on large companies compared to SMEs. Specifically, large firms are expected to benefit more in terms of operational advantages while SMEs will achieve higher profits due to market valuation improvement.

Finally, another significant factor to consider is the role played by the quality of corporate governance and the presence of institutional support in improving ESG performance. Effective board of directors as well as the presence of independent directors and institutional shareholders are important for improving ESG performance.

4. Discussion

Findings from this research show that ESG investments have complex and conditional impacts on financial performance. In the case of the correlation between ESG engagement and ROE, a reverse U-shaped relationship exists, where intermediate levels of engagement in ESG contribute to improved business performance due to better stakeholder confidence, reputation, and availability of funding. However, when companies invest excessively in ESG, they will be faced with increasing costs of compliance, managerial difficulties, and problems with allocating resources[8] .

In the context of China, most companies fall under the category of being at an intermediary stage of developing their ESG capacity and may thus lack sustainability management practices[9]. As indicated by the findings, there is a clear inverted U-shaped pattern between ESG investments and return on equity (ROE) investments, whereby high ROE values occur as a result of moderate ESG investments, but high costs of ESG can adversely impact ROE values due to marginal decreasing benefits . On the other hand, there is a clear U-shaped curve between ESG and ROA.

In view of this strong mediation of financing constraint issues, it can be assumed that the effectiveness of ESG performance is used as an important signaling tool in the capital market. Companies that adopt effective ESG policies are often regarded by their investors and other

stakeholders as firms that practice transparency, responsibility, and risk management, which enables them to enjoy greater sources of external finance and relieve themselves of capital constraints. In China, where financial markets are quite sensitive to information problems and corporate governance issues, such signaling processes gain extra importance [10]. From the findings of the mediational analysis, it is evident that the mediating effect of financing constraints is crucial when assessing the link between ESG and the performance of firms. As such, investing in ESG can reduce financing constraints through greater transparency, high-quality governance, and increased investor confidence, which subsequently leads to better firm performance[11].

The differences among industries and company sizes demonstrate the situational nature of ESG efficiency. Companies in high-impact environments face strong government regulations, increased public attention, and higher stakeholder demands regarding sustainability activities[12]. This explains why companies in such industries exhibit higher levels of positive ESG impact. Large companies have a lot to gain from using ESG, as they have better resources to implement these practices in their strategy. At the same time, small and medium-sized firms benefit mainly because of the signaling effect, which improves their company value and image among investors but does not affect performance directly.

From the heterogeneity test results, it is evident that the ESG impacts differ according to industries and size of companies. For instance, ESG investments are found to produce relatively higher positive impacts in industries that have high environmental impact [13]. Moreover, ESG produces differentiated effects among large firms and SMEs. These results are consistent with the resource-based view and institutional approach[14][15].

5. Conclusion

Against the institutional background of China's "dual carbon" goals and policy-driven ESG development, this study systematically explores the relationship between ESG investment and corporate financial performance, the mediating role of financing constraints, and the heterogeneous moderating effects of industry type and firm size. The core research conclusions are summarized as follows:

ESG investment exhibits a differentiated nonlinear relationship with corporate financial performance, which is dependent on corporate performance dimensions. Financing constraints serve as a core mediating channel for the value transmission of ESG investment. Industry type and firm size generate significant differential moderating effects on the correlation between ESG investment and corporate performance.

This study provides comprehensive empirical evidence for the linkage between ESG investment and financial performance among Chinese listed companies and develops validated practical decision-making guidelines for balanced ESG investment.

6. Implication

Implications from the findings in the research can be summarized into several meaningful insights for companies, investors, and policymakers. From the perspective of companies, it is suggested that it is better to formulate specific ESG strategies tailored to their unique features and environments rather than adopting general ESG activities without clear direction or making inefficient investments in ESG-related practices.

For investors, it is not sufficient to base evaluations of ESG performance solely on the single score provided by ESG ratings but rather, to adopt a systematic approach based on the context-mechanism-capability view. For policymakers, it is essential to formulate differentiated and incentive-compliant institutional arrangements conducive to standardized ESG practice.

7. Future Research Suggestions

Despite its contributions, this study has several limitations that suggest avenues for future research. Relying solely on secondary data from Chinese listed firms limits the generalizability of its

findings, and cross-country or comparative studies could test whether the observed nonlinear ESG-performance relationship and its mediating mechanisms hold in other institutional contexts. Only financing constraints are examined as a mediating factor, leaving other potential mechanisms such as innovation capability, corporate reputation, digital transformation, and organizational resilience unexplored, which future research could incorporate to build a more comprehensive theoretical framework.

While the study analyzes heterogeneity across industries and firm sizes, it does not fully capture the dynamic nature of ESG investment, and dynamic modeling approaches like dynamic panel models could help account for the delayed effects of ESG engagement. Advanced techniques such as fuzzy set Qualitative Comparative Analysis (fsQCA) may also be applied to explore configurational relationships between ESG investment, firm characteristics, and external environmental factors.

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