The Empirical Study of ESG Performance on Listed Firms' Financial Performance — From Innovative Behavior's Mediating Role

*Qiao Zhang[1,a], Jiancong Chang[2,b]

*[a]17354145046@163.com, [b]jiancongchang@126.com

[1]Business School, Shanghai Dianji University, Shanghai, China
[2]Business School, Shanghai Jian Qiao University, Shanghai, China

Abstract. As China transitions from rapid growth to prioritized quality development, sustainability has emerged as a pivotal factor. Environmental, Social, and Governance (ESG) performance has become a vital benchmark for assessing a company's sustainability. This study, drawing from data spanning 2009 to 2022, conducts an empirical analysis to explore the impact of ESG on corporate performance, particularly the intervening role of innovation. The findings reveal a positive association between ESG practices and financial performance, with innovation serving as a catalyst in this relationship.

Keywords: ESG performance financial performance innovative behavior mediating effect

1. Introduction and literature review

As China's economy focuses on quality development, relying on traditional financial indicators alone is no longer sufficient, and ESG performance is becoming increasingly important. However, domestic and international research on the overall value effect of ESG is still in its infancy, and the number of empirical studies is limited. Duque-Grisales observes a negative or neutral relationship, echoing neoclassical economic theory[1]. Conversely, Yan Weixiang et al. contend that ESG performance positively affects financial distress, operational efficiency, and profitability, especially among non-state-owned enterprises, small and medium-sized enterprises (SMEs), and manufacturing firms[2]. Tao Yanlin discovers a positive correlation between ESG and financial performance, mediated by debt financing costs[3]. Pu Ganlin notes a positive yet nonlinear relationship in emerging markets. Despite the acknowledged importance of innovation, there is a scarcity of research examining how ESG impacts firm performance through its influence on innovative behavior[4]. Zhang Xue and Wei Hong suggest that corporate social responsibility (CSR) fosters innovation, particularly in the short term[5]. Zhou Yi and Zhang Weiargue that innovation significantly drives firm performance, with technological innovation's impact intensifying with internationalization and firm size[6]. Zhang Kanglong finds that new technologies enhance retail business performance[7]. Zhang Zhenggang et al. demonstrate that digital innovation improves firm performance by reconfiguring digital capabilities, with innovation serving as a mediator in this relationship[8]. Cerviño Goretti and Mendi Pedro's study finds that ESG-driven firms perform better on innovation and do not lose out to non-ESG firms on other key performance measures[9]. Preeti Sharma et al. found that ESG disclosure has a

MSEA 2024, May 24-26, Jinan, People's Republic of China

DOI 10.4108/eai.24-5-2024.2350209

positive impact on the governance of BSE listed companies in India, and that increasing the level of disclosure helps to improve firm performance[10].

2. Theoretical analysis and research hypotheses

Stakeholder theory emphasises prioritising the interests of stakeholders to achieve sustainable growth. Environmental, Social and Corporate Governance (ESG) practices are consistent with this and safeguard stakeholder interests. ESG performance promotes green development, attracts support, fosters social relationships, addresses agency issues, and ultimately improves financial performance. In addition, based on resource-based theory, this paper hypothesises that superior ESG performance increases firm performance (H1) and assumes that innovation plays a mediating role in this (H2).

3. Research design

3.1 Sample selection and data sources

The financial data in this paper is from the Guotai Junan database, and the ESG performance index is from CSI's ESG assessment data. The target of this paper is companies listed in Shanghai and Shenzhen from 2009 to 2022, excluding ST, *ST and ESG. The data of 40736 listed companies are finally obtained.

3.2 Definition of variables

Explained variable: firms' financial performance (ROA)

Unlike ROE, ROA reflects a company's profitability from the combined funds of shareholders and creditors. Therefore, this thesis is based on the work of Peng Manru, ROA is selected as an index to measure the company's financial performance[11].

Explanatory variables: ESG performance (ESG)

CSI has created a comprehensive three-tier ESG index system, exceeding other domestic systems. This paper utilizes CSI's ESG ratings to assess enterprise performance, with grades ranging from AAA to C. For empirical analysis, these ratings are assigned numerical values, with AAA=9 and C=1.

Mediating variable: innovative behavior (Innovation)

Measurement of innovation behavior falls into two main categories: input level and output level. Fang Xianming and Hu Ding posit that the natural logarithm of the number of patents, utility models, and designs filed by listed companies serves as a metric for assessing the level of innovation[12]. In this publication, we follow this approach using data from the CNRDS database.

Control variables:

This paper combines the control variables used in previous studies of related literature and selected firm size (Size), cash flow ratio (Cashflow), growth in total assets (AssetGrowth),

proportion of independent directors (Indep), participation of the first largest shareholder (TOP1) and year of establishment (FirmAge) were selected. Table 1 lists the research variables relevant to this paper.

Table 1. Definitions of main variables

Variable type	variable name	variable symbol	Description of variables
Explained variable	Corporate financial performance	ROA	Net profit/average total assets
Explanatory variable	ESG performance	ESG	CSI ESG Evaluation Data
Intermediary variable	Innovative behavior	INN	Ln (sum of number of patent applications + 1)
Control variable	Enterprise size	SIZE	Natural logarithm of total assets for the year
	Cash flow ratio	Cashflow	Net cash flows from operating activities/total assets
	Total asset growth rate	AssetGrowth	Total assets for the current year/total assets for the previous year - 1
	Founding Years	FirmAge	Ln (current year - year of incorporation + 1)
	Shareholding ratio of the largest shareholder	TOP1	Number of shares held by the largest shareholder/total number of shares
	Percentage of independent directors	Indep	Number of independent directors/directors

3.3 Modeling

To investigate the impact of ESG performance on firm performance, model (1) is constructed:

$$\mathrm{ROA}_{i,t} = \alpha_i + \beta_1 \mathrm{ESG}_{i,t} + \sum \mathrm{Control}_{i,t} + \delta_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

In equation (1), 'i' represents the firm, and 't' represents the time year. The explained variable, ROAi,t, signifies the return on total assets for firm 'i' in year 't'. ESGi,t represents the assigned ESG scores. Controli,t encompasses both firm-level and city-level control variables. δi represents individual fixed effects, δt represents year fixed effects, and Ɛi,t represents the randomized disturbance terms.

Further, in order to explore whether innovative behavior is the path of ESG performance on firm performance, this paper introduces innovative behavior (Inn) as a mediator variable to construct model (2), model (3) and model (1) together for testing.

$$\mathrm{inn}_{i,t} = \alpha_i + \beta_1 \mathrm{ESG}_{i,t} + \sum \mathrm{Control}_{i,t} + \delta_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

$$\mathrm{ROA}_{i,t} = \alpha_i + \omega_1 \mathrm{ESG}_{i,t} + \omega_2 \mathrm{ESG}_{i,t} \times \mathrm{inn}_{i,t} + \sum \mathrm{Control}_{i,t} + \delta_i + \delta_t + \varepsilon_{i,t} \quad (3)$$

$\mathrm{inn}_{i,t}$ denotes firm i's innovation in year t , i.e., the number of patents, and$\mathrm{ESG}_{i,t} \times \mathrm{inn}_{i,t}$denotes the interaction term between firm ESG and innovation.

4. Empirical results and analysis

4.1 Descriptive statistical analysis

Table 2 presents descriptive statistics for the key variables of the sampled firms. ROA ranges widely from -0.37 to 0.25, reflecting the diverse financial performance of the companies and enhancing the reliability of the regression analysis. The standard deviation of 0.066 indicates a stable financial performance among firms. The mean ESG performance score is 4.1323, with a low standard deviation of 1.050, indicating consistent ESG performance across Chinese listed companies. The sampled firms exhibit significant variation in their innovation behavior, with an average score of 2.6968. The distribution of other variables such as size and firmage is relatively uniform. When it comes to corporate governance, there is a high concentration of equity capital, with the largest shareholder holding an average of 34.3192% of the shares.

Table 2. Descriptive statistics of the main variables

Variable name	sample size	Average value	(statistics) standard	mini-mum	upper quartile	maximum values
ROA	37640	0.0401	0.066	-0.37	0.04	0.25
ESG	39611	4.1323	1.050	1.00	4.00	7.00
inn	40337	2.6968	1.759	0.00	2.83	7.41
Size	40376	22.1438	1.299	19.32	21.95	26.45
Cashflow	40376	0.0465	0.070	-0.22	0.05	0.28
AssetGrowth	37640	0.1771	0.381	-0.38	0.09	5.12
FirmAge	40376	2.8817	0.361	1.10	2.94	3.61
TOP1	40338	34.3192	14.873	8.02	32.13	75.84
Indep	40335	37.5628	5.366	25.00	36.36	60.00

4.2 Baseline regression analysis

Employing panel fixed effects analysis on a comprehensive dataset comprising 40,376 samples spanning from 2009 to 2022. The results presented in Table 3 provide robust evidence to support Hypothesis H1. Furthermore, the inclusion of control variables strengthens this positive relationship. Among the control variables, factors such as cash ratio, total assets growth, and shareholder concentration exhibit a positive influence on financial outcomes. Conversely, company age and the proportion of independent directors have a negative impact on financial performance.

Table 3. Benchmark regression results

	No fixed effects and control variables	Add control variables	Plus control variables with individual, year fixed effects
	ROA	ROA	ROA
ESG	0.0088***	0.0088***	0.0057***
	(18.3554)	(22.9258)	(13.0612)
Size		-0.0037***	0.0004
		(-9.3315)	(0.3594)
Cashflow		0.2922***	0.2334***
		(39.5588)	(29.4622)

AssetGrowth		0.0441***	0.0390***
		(31.6019)	(28.8696)
FirmAge		-0.0167***	-0.0281***
		(-12.4204)	(-4.9467)
TOP1		0.0005***	0.0006***
		(13.9458)	(8.6399)
Indep		-0.0002***	-0.0001
		(-2.9086)	(-0.6465)
_cons	0.0071***	0.1047***	0.0430
	(3.2795)	(12.2034)	(1.6369)
N	37487	37485	37485
adj. R^2			0.201

t statistics in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

4.3 Mediating effects of innovative behavior

The mediating effect model, comprising equations (2) and (3), was estimated to analyze firms' innovation behavior. The results presented in Table 4 reveal a significant correlation between ESG scores and innovative behavior (coefficient of 0.0576 at a 1% significance level), indicating that ESG performance has an enabling effect on firms' innovative activities. Furthermore, Table 4 also demonstrates that ESG performance has a significant impact on financial performance (coefficient of 0.0053 at a 1% significance level). Notably, the positive and significant regression coefficient A of the interaction term between corporate innovation and financial performance suggests that innovation plays a mediating role in the relationship between ESG performance and financial outcomes. The estimates obtained from this analysis confirm Hypothesis H2.

Table 4. Test Results of the Mediating Effects of Innovative Behavior

	(1)	(2)
	inn	ROA
ESG	0.0576***	0.0053***
	(7.5002)	(10.2391)
Size	0.4956***	0.0001
	(19.9401)	(0.0978)
A		0.0001*
		(1.7156)
Cashflow	-0.0174	0.2334***
	(-0.1750)	(29.4465)
AssetGrowth	-0.0177	0.0391***
	(-1.1461)	(28.8719)
FirmAge	-0.0221	-0.0281***
	(-0.1753)	(-4.9602)
TOP1	0.0004	0.0006***
	(0.2299)	(8.6608)
Indep	-0.0015	-0.0001
	(-0.7011)	(-0.6366)

cons	-9.0576***	0.0499*
	(-15.3267)	(1.8652)
N	37478	37478
adj. R^2	0.292	0.201

t statistics in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

5. Robustness check

5.1 Substitution of explanatory variables

In this paper, ROA is replaced by ROE, and the results are shown in Table 5. Column (1) shows that ESG performance is significantly and positively related to firm performance at the 1% level with a regression coefficient of 0.0125, suggesting that ESG performance also contributes to firms' return on equity. This result is similar to the regression result in Table 3, which indicates the robustness of the findings of this paper.

Table 5. Test results of replacing explanatory variables

	(1)
	ROE
ESG	0.0125***
	(12.1816)
Size	0.0111***
	(4.2346)
Cashflow	0.4238***
	(24.7925)
AssetGrowth	0.0791***
	(26.7115)
FirmAge	-0.0025
	(-0.2032)
TOP1	0.0014***
	(8.8753)
Indep	-0.0001
	(-0.3919)
_cons	-0.2891***
	(-4.6904)
N	37485
adj. R^2	0.165

t statistics in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

5.2 Exclusion of outbreaks

In this paper, the sample is regressed again by excluding the year of the epidemic (the results are shown in Table 6), and the regression results are similar to those in Table 3, indicating that the regression results are robust.

Table 6. Excluding test results from epidemic years

	(1) ROA
ESG	0.0052***
	(9.7897)
Size	-0.0000
	(-0.0053)
Cashflow	0.1803***
	(21.6818)
AssetGrowth	0.0305***
	(24.2546)
FirmAge	-0.0365***
	(-5.6767)
TOP1	0.0006***
	(6.8162)
Indep	-0.0001
	(-0.7255)
_cons	0.0818**
	(2.4907)
N	25653
adj. R^2	0.172

t statistics in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

5.3 Endogeneity test

For possible endogeneity problems, this question examines the instrumental variable method. Industry average ESG performance is used as an instrumental variable to replace firms' ESG performance and regressed using two-stage least squares (2SLS). The results are shown in Table 7, and the regression coefficients are all significantly positive. The regression results are robust.

Table 7. Endogeneity tests (instrumental variables)

	(1)	(2)
VARIABLES	ESG	ROA
iv	0.815***	
	(41.99)	
ESG		0.013***
		(9.01)
Size	0.189***	-0.001
	(18.61)	(-1.46)
Cashflow	-0.076	0.234***

	(-1.05)	(54.61)
AssetGrowth	0.006	0.039***
	(0.49)	(56.52)
FirmAge	-0.341***	-0.026***
	(-5.40)	(-6.77)
TOP1	0.005***	0.001***
	(7.08)	(13.97)
Indep	0.012***	-0.000**
	(9.97)	(-2.12)
Constant	-1.943***	0.038*
	(-5.10)	(1.73)
Observations	37,485	37,485
R-squared	0.548	0.530

t statistics in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

6. Conclusions and recommendations

This paper empirically delves into the influence of ESG metrics on corporate financial performance, alongside the pivotal role of innovation in mediating this relationship. our key findings are threefold: (1) ESG performance positively impacts financial performance. (2) ESG performance fosters innovative behavior. (3) Innovation mediates the link between ESG performance and financial performance.

Based on the findings, the following recommendations are proposed: (1) Enterprises should integrate ESG into their core operations, moving beyond traditional CSR practices. They should strike a balance between long-term innovation and mitigating short-term financial losses, prioritizing both financial performance and sustainable development. Emphasizing ESG can strengthen a company's competitive edge. (2) Investors should establish a robust ESG investment framework, giving priority to governance, environmental protection, and social responsibility. Non-financial factors like these should be considered as crucial investment indicators. (3) Governments should strengthen the evaluation and disclosure system for ESG performance. They should reward enterprises that demonstrate improvements in this area and impose sanctions on those with poor performance. By optimizing the investment environment and enhancing the ESG disclosure mechanism, governments can encourage enterprises to enhance their ESG performance and disclose accurate information.

References

[1] DUQUE-GRISALES E,AGUILERA-CARACUEL J.Environmental,social and governance (ESG) scores and financial performance of multilatinas:moderating effects of geographic international diversification and financial slack[J].Journal of Business Ethics,2021,2(7):315-334.

[2] YAN Weixiang, ZHAO Yu, MENG Defeng. Research on the impact of ESG ratings on the financial performance of listed companies[J]. Journal of Nanjing Auditing University, 2023, 20 (06): 71-80.

[3] Tao Yanlin. An empirical study of the impact of ESG ratings on corporate financial performance--empirical evidence from A-share listed companies[J]. China Market, 2023, (34): 13-20.
[4] Pu Ganlin. A non-linear assessment of ESG and firm performance relationship: evidence from China[J]. Economic research - Ekonomska istraživanja, 2023, 36 (1):
[5] Zhang Xue, Wei Hong. Corporate social responsibility, environmental governance and innovation[J]. Statistics and Decision Making, 2021, 37 (18): 171-175.
[6] ZHOU Yi, ZHANG Wei. An empirical test of the impact of technological innovation on firm performance[J]. Statistics and Decision Making, 2022, 38 (17): 170-174.
[7] Zhang Kanglong. Measuring the impact of retail innovation development on firm performance[J]. Research on Business Economics, 2022, (08): 118-121.
[8] ZHANG Zhen-Gang, TOU An-Tao, YE Bao-Sheng. Research on the process mechanism of digital innovation in manufacturing enterprises and its impact on enterprise performance[J]. Foreign Economy and Management, 1-15.
[9] Cabaleiro Cerviño Goretti, Mendi Pedro. ESG-driven innovation strategy and firm performance[J]. Eurasian Business Review, 2024, 14 (1): 137-185.
[10] Preeti Sharma, Priyanka Panday, R.C. Dangwal. Is ESG disclosure related to corporate performance? Empirical evidence from Indian companies[J]. International Journal of Business and Globalisation, 2024, 36 (2-3): 186-200.
[11] PENG Manru, CHEN Jie, YIN Junming. ESG performance, innovation capability and firm performance[J]. Friends of Accounting, 2023, (07): 11-17.
[12] Fang Xianming, Hu Ding. Corporate ESG performance and innovation - Evidence from A-share listed companies[J]. Economic Research, 2023, 58 (02): 91-106.