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The Impact of Environmental, Social, and Governance (ESG) Performance on Corporate Return on Investment: Evidence from China

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Abstract

Improving corporate return on investment and generating returns for shareholders are among the important operating objectives of listed companies. With the development of the stakeholder concept, corporate operations have paid greater attention to environmental, social, and governance (ESG) performance; however, whether ESG performance can improve return on investment remains to be studied. Using a sample of Chinese A-share listed companies from 2009 to 2023, this study constructs a two-way fixed-effects model to examine the relationship between corporate ESG performance and return on investment. The empirical results show that ESG performance can significantly improve corporate return on investment, and this result remains valid after a series of robustness tests. The heterogeneity analysis finds that the positive effect of corporate ESG performance on corporate return on investment is more significant among non-state-owned enterprises, large firms, and young firms. The mechanism tests show that ESG performance can improve corporate return on investment by increasing total factor productivity and promoting corporate green innovation. This study provides empirical evidence from Chinese listed companies for understanding the economic consequences of ESG performance and also provides a reference for firms seeking to improve operating performance.

Keywords

ESG performance, return on investment, stakeholder theory

1. Introduction

Return on investment reflects a firm's profitability and the return on shareholders' capital. It is an important indicator used by the capital market to evaluate the quality of a firm's operations and an important basis for investor decisions. How to continuously improve return on investment is an important issue in corporate operation and management. In recent years, with the advancement of China's "dual carbon" strategy and the development of the capital market, investors' evaluations of firms have no longer been limited to short-term financial performance. Corporate environmental, social, and governance (ESG) performance has gradually become an important basis for assessing long-term value. Regulatory authorities have also successively issued relevant guidelines to encourage listed companies to improve the quality of ESG information disclosure. Against this background, firms have increasingly emphasized responses to the demands of multiple stakeholders while focusing on profitability. However, whether ESG performance can improve corporate return on investment and through which channels it operates still require empirical examination.

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Whether ESG performance can create value for firms has attracted attention in corporate finance research in recent years. From an input perspective, ESG development requires firms to allocate corresponding financial resources and is essentially an investment activity characterized by long-term returns [1]. Previous studies have found that good ESG performance is positively associated with firm value and financial performance [2]. Other research based on samples of European firms has found a negative association between ESG performance and profitability, and this relationship is affected by the corporate information environment [3].

These differences indicate that the economic effects of ESG may vary with the market environment and firm characteristics, and the Chinese market still requires examination using local samples. This study uses Chinese A-share listed companies from 2009 to 2023 as the sample to examine the relationship between ESG performance and corporate return on investment and its mechanisms. Using a long-term sample, this study adds evidence from an emerging market, tests the two channels of total factor productivity and green innovation, and analyzes heterogeneity in ownership type, firm size, and years since listing, providing a reference for firms with different characteristics in formulating ESG strategies.

2. Theoretical Analysis and Research Hypotheses

2.1 Effect of ESG Performance on Corporate Return on Investment

Stakeholder theory holds that corporate value creation concerns shareholder interests and also depends on the support of investors, governments, consumers, the public, and other stakeholders. By responding to their demands and fulfilling ESG responsibilities, firms can improve internal and external relationships, increase information transparency, obtain trust and resource support, and reduce operating friction and risks, thereby promoting long-term development [4]. ESG performance reflects how firms fulfill stakeholder responsibilities in environmental, social responsibility, and corporate governance activities.

ESG performance can affect return on investment through external and internal channels. Externally, good ESG performance can alleviate information asymmetry, increase investor trust, ease financing constraints, and reduce operating and financial risks [5]. Internally, ESG governance can restrain managerial short-termism, reduce agency costs, improve employee benefits and the working environment, and increase production efficiency and resource allocation efficiency [6]. These effects may take a longer time to appear [7]. When net assets are relatively stable, an increase in net profit will increase return on investment measured by return on equity. Accordingly, this study proposes Hypothesis 1:

H1: Corporate ESG performance can improve corporate return on investment.

2.2 Mechanism of Total Factor Productivity

Total factor productivity (TFP) measures corporate production efficiency and reflects the contribution of technological progress, management level, and resource allocation efficiency to output beyond capital and labor inputs [8]. To respond to stakeholder demands for green development and operating efficiency, firms that fulfill environmental and social responsibilities may optimize production processes, eliminate inefficient capacity, and reduce resource misallocation, thereby increasing TFP [9]. ESG governance also helps improve internal management and resource-use efficiency [10]. Higher TFP allows firms to obtain more output from given inputs, reduce unit costs, and expand profit margins, thereby improving return on investment. Accordingly, this study proposes Hypothesis 2:

H2: ESG performance can increase corporate TFP, thereby improving corporate return on investment.

2.3 Mechanism of Green Innovation

Green innovation (GI) refers to innovative activities in which firms apply environmentally friendly concepts and technologies to product design and production processes to reduce resource consumption and pollutant emissions. Its outcomes include green patents [11]. Environmental regulation, demand for green consumption, and public requirements for environmental protection are external drivers of corporate GI. Firms with better ESG performance may increase green research and development investment and green patent output [12]. GI can reduce environmental governance costs and compliance risks, create advantages in green

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products or technologies, expand green markets, and improve corporate operating performance [13], thereby increasing return on investment. Accordingly, this study proposes Hypothesis 3:

H3: ESG performance can increase the level of corporate GI, thereby improving corporate return on investment.

3. Research Design

3.1 Data Sources and Processing

This study selects Chinese A-share listed companies from 2009 to 2023 as the research sample and applies the following procedures: (1) excluding listed companies designated as special treatment (ST) and *ST; (2) excluding firms in the financial industry; (3) deleting observations with missing data for the main variables; and (4) winsorizing the data at the 1st and 99th percentiles to reduce the effect of extreme values. After processing, an unbalanced panel dataset containing 41,733 observations is obtained. The data used in this study are from the China Stock Market & Accounting Research (CSMAR) Database.

3.2 Variable Definitions

(1) Dependent variable: corporate return on investment (roe), measured in this study by return on equity (ROE). ROE reflects a firm's ability to use shareholders' capital to obtain net profit. It is calculated as net profit / average net assets × 100 and is expressed as a percentage.

(2) Core explanatory variable: ESG performance (ESG), measured by the Huazheng ESG score. Based on global ESG evaluation frameworks and the characteristics of Chinese firms, Huazheng constructed a three-tier ESG rating system with evaluation criteria for environmental compliance, fulfillment of social responsibility, corporate governance, and other aspects. This study also uses the SynTao Green Finance ESG rating (ESG2) as a replacement variable in the robustness test.

(3) Control variables: With reference to previous research [14], this study introduces firm size (size), years since listing (lnage), ownership type (Ownership), growth (Growth), leverage (Leverage), ownership concentration (top1), and number of independent directors (Director) as control variables. The specific variable definitions are shown in Table 1.

Table 1: Variable Definitions

Variable category	Variable name	Variable symbol	Variable description
Dependent variable	Corporate return on investment	roe	Net profit / average net assets × 100 (unit: %)
Core explanatory variable	ESG performance	ESG	Huazheng ESG score
Control variable	Firm size	size	Natural logarithm of total assets
	Years since listing	lnage	Natural logarithm of years since listing plus 1
	Ownership type	Ownership	1 for state-owned enterprises and 0 otherwise
	Growth	Growth	Operating revenue growth rate
	Leverage	Leverage	Total liabilities / total assets
	Ownership concentration	top1	Shareholding ratio of the largest shareholder
	Number of independent directors	Director	Natural logarithm of number of independent directors plus 1

3.3 Model Specification

To examine the relationship between corporate ESG performance and return on investment, this study constructs the following baseline regression model with firm and year fixed effects:

$$roe_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + Control_{i,t} + Code_i + Year_t + \mu_{i,t}$$

In the model, i denotes a firm, t denotes a year, roe is the dependent variable and represents corporate return on investment, ESG is the core explanatory variable, Control denotes the vector of control variables, Code

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denotes firm fixed effects, and Year denotes year fixed effects; μ_{it} denotes the random error term. Standard errors are clustered at the firm level.

4. Empirical Analysis

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the main variables, each of which has 41,887 observations. The maximum value of roe is 33.255, the minimum value is -75.230, and the mean is 5.481, indicating substantial differences in return on investment among the sample firms. The maximum ESG score is 83.920, the minimum is 58.140, the mean is 73.268, and the standard deviation is 4.806, indicating that ESG performance also differs among the sample firms.

Table 2: Descriptive Statistics

	(1)	(2)	(3)	(4)	(5)	(6)
VarName	Obs	Mean	SD	Min	Median	Max
roe	41887	5.481	13.713	-75.230	6.890	33.255
ESG	41887	73.268	4.806	58.140	73.450	83.920
size	41887	22.182	1.308	19.790	21.984	26.262
lnage	41887	2.067	0.918	0.000	2.197	3.367
Ownership	41887	0.367	0.482	0.000	0.000	1.000
Leverage	41887	41.852	20.629	5.177	41.011	89.188
Growth	41887	0.358	0.976	-0.679	0.120	6.905
top1	41887	34.333	14.899	8.660	32.070	74.450
Director	41887	1.414	0.126	1.099	1.386	1.792

4.2 Baseline Regression Analysis

Table 3 presents the baseline regression results.

Table 3: Baseline Regression Analysis

	(1)	(2)	(3)	(4)
	roe	roe	roe	roe
ESG	0.571***	0.257***	0.288***	0.090***
	(41.788)	(10.261)	(20.424)	(3.826)
size			2.344***	4.009***
			(36.844)	(13.954)
lnage			-1.358***	0.164
			(-15.870)	(0.674)
Ownership			-0.314**	-2.214***
			(-1.995)	(-3.089)
Leverage			-0.178***	-0.317***
			(-48.255)	(-24.113)
Growth			0.763***	1.243***
			(11.797)	(12.359)
top1			0.087***	0.134***
			(19.424)	(7.870)
Director			1.431***	-1.340
			(2.684)	(-1.103)
_cons	-36.346***	-13.342***	-62.535***	-79.442***
	(-36.234)	(-7.273)	(-43.599)	(-12.377)
Firm_FE	NO	YES	NO	YES
Year_FE	NO	YES	NO	YES
N	41887	41887	41887	41887
r2	0.040	0.306	0.123	0.368

*Note: t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The same applies to the tables below.*

Column (1) includes neither control variables nor fixed effects; Column (2) includes firm and year fixed effects; Column (3) includes only the control variables; and Column (4) includes the control variables and firm

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and year fixed effects. The ESG coefficients are significantly positive in all columns. The coefficient in Column (4) is 0.090 and is significant at the 1% level, indicating that ESG performance remains significantly positively associated with return on investment after controlling for firm characteristics and fixed effects. This result supports Hypothesis 1 of this study.

4.3 Robustness Tests

This study conducts four robustness tests by replacing the explanatory variable, adjusting the sample period, adding industry-by-year interaction fixed effects, and using the next-period dependent variable.

(1) Replacing the explanatory variable. The SynTao Green Finance ESG rating (ESG2) is used to replace the Huazheng ESG score. Column (1) of Table 4 shows that the coefficient of ESG2 is 0.287 and is significant at the 5% level, which is consistent with the baseline regression result.

(2) Adjusting the sample period. Regressions are conducted using the 2012-2023 and 2009-2019 subsamples. Columns (2) and (3) of Table 4 show that the ESG coefficients are 0.069 and 0.106, respectively, and both are significant at the 1% level, indicating that the results remain stable across different sample periods.

(3) Adding industry-by-year interaction fixed effects. Industry-by-year interaction fixed effects are added to the original model to control for time-varying factors such as industry policies and industry cycles. Column (4) of Table 4 shows that the ESG coefficient is 0.086 and is significant at the 1% level, which is consistent with the baseline regression result.

(4) Using the next-period dependent variable. To reduce the effect of reverse causality between ESG and corporate return on investment, roe in the next period is used as the dependent variable. Column (5) of Table 4 shows that the ESG coefficient is 0.100 and is significant at the 1% level, indicating that the research result is robust.

Table 4: Robustness Tests

	(1)	(2)	(3)	(4)	(5)
	roe	roe	roe	roe	F.roe
ESG		0.069***	0.106***	0.086***	0.100***
		(2.658)	(3.566)	(3.716)	(3.928)
ESG2	0.287**				
	(2.483)				
size	4.050***	5.274***	3.746***	3.865***	-1.726***
	(14.072)	(15.083)	(10.621)	(13.805)	(-5.478)
lnage	0.132	-1.355***	1.172***	-0.020	-1.431***
	(0.540)	(-4.628)	(3.855)	(-0.083)	(-5.172)
Ownership	-2.202***	-1.971**	-2.560**	-2.092***	-2.551***
	(-3.066)	(-2.464)	(-2.503)	(-3.050)	(-3.038)
Leverage	-0.319***	-0.372***	-0.287***	-0.308***	-0.055***
	(-24.248)	(-24.360)	(-17.589)	(-23.824)	(-4.434)
Growth	1.241***	1.369***	1.172***	1.221***	0.630***
	(12.338)	(11.964)	(10.760)	(12.484)	(5.690)
top1	0.134***	0.132***	0.146***	0.145***	0.115***
	(7.860)	(6.312)	(7.450)	(8.669)	(5.985)
Director	-1.309	-1.046	-0.660	-1.650	-1.745
	(-1.077)	(-0.728)	(-0.448)	(-1.365)	(-1.379)
_cons	-74.872***	-101.906***	-78.221***	-75.906***	40.532***
	(-11.847)	(-13.135)	(-9.514)	(-12.011)	(5.782)
Firm_FE	YES	YES	YES	YES	YES
Year_FE	YES	YES	YES	YES	YES
Ind_Year_FE	NO	NO	NO	YES	YES
N	41887	34852	25524	41826	36839
r2	0.367	0.402	0.354	0.417	0.327

4.4 Heterogeneity Analysis

Based on the baseline regression, this study conducts grouped regressions by ownership type, firm size, and years since listing to examine the estimates for different firms.

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(1) Ownership type. State-owned enterprises and non-state-owned enterprises differ in operating objectives, decision-making methods, and channels for obtaining resources. Columns (1) and (2) of Table 5 show that the ESG coefficient for non-state-owned enterprises is 0.088 and is significant at the 1% level, while the coefficient for state-owned enterprises is 0.066 and is not statistically significant. Whether the coefficients differ significantly between the two groups still needs to be confirmed through a test of coefficient differences across groups. One possible explanation is that state-owned enterprises fulfill ESG responsibilities largely in response to policy requirements, and the financial returns may take longer to emerge. Non-state-owned enterprises face stronger market competition, and good ESG performance may improve profitability by easing financing constraints.

(2) Firm size. Firm size is related to resource reserves and the ability to convert ESG investment into results, and large and small firms differ in financial strength and governance conditions. The grouped results by firm size are shown in Columns (3) and (4) of Table 5. The ESG coefficient for the sample of small firms is 0.033 and is not statistically significant. The coefficient for the sample of large firms is 0.093 and is significant at the 1% level. In theory, large firms generally have more resources and sounder governance mechanisms, which allow them to continue ESG development and use reputation improvements to improve financing conditions. Small firms may face resource constraints, and ESG investment may require more time to generate financial returns.

(3) Years since listing. Years since listing reflect a firm's stage of development after listing. Newly listed firms and firms that have been listed for a longer period may differ in market recognition, governance pressure, and operating objectives. The results grouped by years since listing are shown in Columns (5) and (6) of Table 5. Column (6) represents young firms, and the regression result is significantly positive; the ESG coefficient is not significant among mature firms, indicating heterogeneity between the two groups. A possible explanation is that young firms face stronger market supervision and compliance pressure after listing and need to improve ESG performance to strengthen market trust and ease financing constraints, thereby increasing corporate roe. In contrast, mature firms have relatively stable market reputations and operating patterns, and the marginal effect of ESG improvement on roe is limited.

Table 5: Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	roe	roe	roe	roe	roe	roe
ESG	0.088***	0.066	0.033	0.093***	0.062**	0.023
	(3.442)	(0.987)	(0.876)	(2.963)	(2.187)	(0.633)
size	4.184***	3.609***	5.011***	4.872***	6.326***	3.514***
	(13.148)	(4.598)	(7.548)	(10.322)	(14.877)	(8.331)
lnage	0.191	0.804	-0.533	0.138	0.751**	8.734***
	(0.725)	(1.300)	(-1.364)	(0.303)	(1.993)	(3.225)
Ownership	-2.190***	-4.081	-1.187	-3.010***	-1.903	-1.496
	(-2.639)	(-1.023)	(-1.043)	(-3.053)	(-1.196)	(-1.629)
Leverage	-0.318***	-0.365***	-0.338***	-0.384***	-0.252***	-0.359***
	(-22.654)	(-8.165)	(-16.531)	(-18.449)	(-12.947)	(-18.859)
Growth	1.298***	0.893***	1.478***	0.978***	0.924***	1.286***
	(10.957)	(5.109)	(8.472)	(8.324)	(5.078)	(10.732)
top1	0.150***	0.106***	0.201***	0.111***	0.196***	0.111***
	(7.663)	(2.996)	(6.247)	(4.305)	(6.579)	(4.457)
Director	-0.763	-3.019	-1.446	-1.966	-0.158	-1.400
	(-0.562)	(-1.020)	(-0.751)	(-1.172)	(-0.092)	(-0.821)
_cons	-84.640***	-61.366***	-96.659***	-94.427***	-134.047***	-85.524***
	(-11.868)	(-3.730)	(-6.948)	(-8.733)	(-14.334)	(-7.122)
Firm_FE	YES	YES	YES	YES	YES	YES
Year_FE	YES	YES	YES	YES	YES	YES
N	36778	4960	20716	20771	20879	20840
r2	0.381	0.442	0.402	0.418	0.471	0.388

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4.5 Mechanism Analysis

The baseline regression results show a significant positive association between ESG performance and corporate return on investment. This study further examines the mechanisms from the two aspects of TFP and GI.

(1) TFP. TFP reflects a firm's production technology and resource allocation efficiency. Column (1) of Table 6 shows that the ESG coefficient is 0.003 and significantly positive, indicating that ESG performance can increase corporate TFP. Good ESG performance can improve corporate governance, promote technological innovation, and help firms obtain external resources. Higher TFP improves production efficiency and profitability, thereby increasing corporate return on investment.

(2) GI. This study uses the number of green patent applications to measure corporate GI. Column (2) of Table 6 shows that the ESG coefficient is 0.093 and significantly positive, indicating that ESG performance can promote corporate GI. ESG performance can advance green technology research and development and increase green patent output. Green patents help optimize production models, reduce environmental governance and production operating costs, create green competitive advantages, and improve profitability, thereby increasing ROE and corporate return on investment.

Table 6: Mechanism Analysis

	(1)	(2)
	TFP	GI
ESG	0.003***	0.093***
	(3.398)	(3.755)
size	0.587***	0.431*
	(38.035)	(1.707)
lnage	-0.028	0.082
	(-1.568)	(0.211)
Ownership	-0.026	0.090
	(-0.991)	(0.181)
Leverage	0.001	-0.008
	(1.596)	(-0.747)
Growth	-0.002	-0.005
	(-0.310)	(-0.145)
top1	0.000	0.011
	(0.550)	(0.804)
Director	0.013	-0.288
	(0.258)	(-0.182)
_cons	-4.902***	-13.534**
	(-14.805)	(-2.333)
Firm_FE	YES	YES
Year_FE	YES	YES
N	38248	37542
r2	0.905	0.721

5. Conclusions and Implications

Using a sample of Chinese A-share listed companies from 2009 to 2023, this study constructs a two-way fixed-effects model to examine the effect of corporate ESG performance on return on investment. The empirical results show that corporate ESG performance can improve corporate return on investment, and this result remains valid after a series of robustness tests. The heterogeneity analysis finds that the positive effect of corporate ESG performance on corporate return on investment is more significant among non-state-owned enterprises, large firms, and young firms. The mechanism tests show that ESG performance can increase corporate return on investment by increasing TFP and promoting corporate GI. Based on these findings, this study proposes the following three recommendations:

(1) The baseline regression results show that better ESG performance is associated with a higher return on investment. Firms may incorporate ESG development into long-term operating plans, improve governance structures and management systems, and reasonably arrange environmental and social responsibility

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investments in light of operating needs and resource conditions. Implementing ESG requirements in product research and development, production and operations, and corporate governance helps balance stakeholder demands and operating performance.

(2) The grouped regression results provide a reference for firms with different characteristics in carrying out ESG development. Firms may formulate corresponding strategies according to their ownership type, resource conditions, and stage of development after listing. Non-state-owned enterprises may improve communication with investors and other stakeholders by improving ESG information disclosure. Firms with a shorter listing history may build market reputation through ESG practices and information disclosure. Large firms may use their resource and management advantages, incorporate ESG requirements into internal assessment and incentive mechanisms, and improve the alignment between ESG development and operating activities.

(3) The mechanism analysis shows that ESG performance is significantly positively associated with TFP and the level of GI. When carrying out ESG development, firms may focus on improving production efficiency and applying green technologies. They may increase TFP by optimizing production processes, eliminating outdated production capacity, and improving resource allocation, and may conduct green technology research and development based on actual production needs to promote innovation in green processes and green products. Related investment should aim to improve production, operations, and environmental performance, and its costs and benefits should be continuously evaluated.

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Conflicts of Interest

The authors declare no conflict of interest.

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