An Empirical Study of ESG's Influence on Firm Performance

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Abstract. ESG performance is increasingly seen not only as a moral obligation but also as a key driver of business success and financial performance. This paper selects data from China's Shanghai and Shenzhen A-share listed companies from 2012 to 2023, uses the ESG scores of Huazheng and CNRDS to measure their ESG performance, and uses the multivariate linear regression method to empirically test the relationship and impact between ESG performance and corporate ROA performance. The test results confirm that excellent ESG performance can boost the ROA performance of enterprises. Moreover, corporate environmental responsibility (E), corporate social responsibility (S) and corporate governance (G) all have a significant promoting effect on corporate ROA performance. In addition, the ESG performance of enterprises in the mid-western regions, non-state-owned enterprises and enterprises with fierce market competition has a more significant positive impact on ROA performance. This paper enriches the existing literature in the field of ESG, and the research conclusions help provide a theoretical basis for enterprises to improve ROA by improving ESG performance.

Keywords: ESG; ROA; Enterprises; Regions; Property Rights; Market Competition.

1. Introduction

ESG was brought forward for the first time in 2006 by Hoepner Majoch and Zhou [1]. The ESG index comprehensively evaluates a company's sustainable development level from three dimensions: environmental (E), social (S) and governance (G), and is also an important means to enhance corporate ratings and social trust [2]. In essence, ESG is the expansion and enhancement of the ideas of responsible and green financing. Compared with the traditional investment model that focuses on analyzing corporate financial indicators and profitability, it further focuses on the importance of non-financial information in terms of environment, society and corporate governance. At the international level, the European Union has formulated the Sustainable Finance Disclosure Regulation (SFDR) and the Standardized Green Classification System (Taxonomy) to regulate the disclosure of environmental and social performance by financial market participants; at the domestic level, the Chinese government has launched a series of deployments around business ESG data posting and system construction, and the construction of ESG systems has achieved remarkable results under strong policy supply, encouraging listed companies to implement green development to promote the development of ESG; in addition, many financial institutions have also begun to launch ESG-related financial products and services such as green bonds and green funds. Overall, ESG has shown a booming trend both at home and abroad [3].

The relationship between ESG performance and corporate financial performance has always been a hot topic of discussion in academia. For example, Kim et al. found that ESG management was found to have a positive effect on financial performance by mediating job satisfaction [4]. Wang and Sarkis found that ESG performance has positive effects on financial performance [5]. Based on former studies, corporate financial performance is generally measured by ROA, so the link between ESG performance and ROA performance is explicitly examined in this article, and conducts robustness checks, heterogeneity checks and dimensional checks.

From the existing literature, in their summary and analysis of over 2,000 papers on the subject, Friede, Busch, and Bassen discovered that over 90% of them supported the idea that corporate ESG performance and ROA performance are positively correlated [6]. From a resource-based perspective, enterprises can actively assume social responsibilities to stakeholders and obtain resource support, especially financing support, from stakeholders, thereby promoting the establishment of a healthy

value-reciprocal relationship among stakeholders and improving the company's return on assets [7, 8]. From the perspective of responsibility, different types of stakeholders, such as investors, consumers, employees and suppliers, who have social responsibility preferences and awareness, can strengthen the responsible investment, responsible consumption and responsible operation mechanisms in the process of corporate operation and management [7], thereby improving the company's return on assets. Based on these, this paper proposes the following hypothesis:

H1: If other conditions are met, good ESG performance will promote corporate ROA performance.

H1a: If other conditions are met, corporate environmental responsibility can promote its ROA performance.

H1b: If other conditions are met, corporate social responsibility can promote its ROA performance.

H1c: If other conditions are met, corporate governance level can promote its ROA performance.

2. Methodology

2.1. Data Selection

This paper selects China's Shanghai and Shenzhen A-share listed companies from 2012 to 2023 as the study object, and screens and processes the samples on the basis of these three standards: (1) Financial enterprises were deleted; (2) ST and ST* companies were removed in order to exclude businesses that operate abnormally; (3) Deleted samples with missing data. By implementing these measures, the possible bias in the sample selection process is reduced, thereby improving the rigor of the article. In the end, it obtained 15710 panel data points from above 2984 companies.

This article refers to the practices of Wang et al. [8], using the Huazheng ESG score taken from Wind. Fangang Marketization grade is used to measure the intensity of market competition faced by the company. This is because the Fangang Marketization Index can comprehensively measure the intensity of market competition in five level; other data are taken from the CSMAR database.

2.1.1 Dependent Variable: ROA

The ratio of net profit to total assets is known as return on assets, or ROA. It is a metric for calculating the amount of net profit generated by each asset unit and assessing a company's profitability in relation to the total value of its assets. The higher the index, the better the company's asset utilization is, showing that it has done well in raising revenue and conserving cash. This indicator is often closely watched by investors, particularly banks, for the sake of strategic management. The ROA data from CSMAR is used in this paper.

2.1.2 Key Independent Variable: ESG

Three factors—environmental, social, and governance—are used to assess how sustainable corporate activities are and how they affect societal values. ESG performance is widely used by investment firms to screen or evaluate companies in their various funds and portfolios.

2.1.3 Control variables

In order to improve the accuracy of the research, this paper adds a series of control variables. The detailed variables and their definitions are shown in Table 1.

Table 1. Description of variables

Type	Variable	Symbol	Definition of variable
dependent	Return on assets	ROA	Net profit as a percentage of total assets
independent	ESG	ESG	Huazheng ESG score devided by 100
	Region	Province	If the company's registered address is in the eastern regions, it is 1; if it is in the mid-western regions, it is 0.
	Property rights	SOE	If a state-owned company is listed, the value is 1; if not, it is 0.
	The intensity of market competition	Intensity	The number is 1 if the marketization score of the company's region is higher than the average, and 0 otherwise.
Control	Firm size	size	The total assets logarithm
	Current ratio	current	Current assets devided by current liabilities
	Asset-liability ratio	lev	Total assets devided by total liabilities
	Fixed asset ratio	fixed	The ratio of net fixed assets to total assets
	Corporation growth	tobinq	Market value as a percentage of total assets
	Ownership concentration	top5	The total of the greatest five investors
	Firm age	age	The logarithmic value of (the present year less the year the business was founded and plus one)

2.2. Modeling

Based on the above research hypotheses, in order to test the positive impact of corporate ESG performance on ROA, this paper constructs the following econometric model:

$$\mathrm{ROA}_{i,t} = \alpha_0 + \alpha_1 \mathrm{ESG}_{i,t} + \sum \mathrm{Controls}_{i,t} + \sum \mathrm{Industry} + \sum \mathrm{Year} + \varepsilon_{i,t} \quad (1)$$

Where $\mathrm{ROA}_{i,t}$ symbolizes the company's asset interest rate at time t, $\mathrm{ESG}_{i,t}$ reflects the company's ESG performance at time t, $\mathrm{Controls}_{i,t}$ stands for each of the previously listed control variables, and $\varepsilon_{i,t}$ is the name for random disruption. To improve the reliability of the regression, virtual variables at the industry and time levels are added to the model to eliminate the interference of unobservable factors at the time and industry levels.

3. Empirical Results

3.1. Descriptive Statistics

Table 2 presents the descriptive statistics of all variables, including ROA, ESG, and control variables.

Table 2. Description Statistics

Variable	Obs	Mean	S.D.	Min	Median	Max
ROA	36558	0.031	0.296	-30.688	0.037	10.401
ESG	36558	0.733	0.051	0.366	0.735	0.929
size	36558	22.115	1.360	14.942	21.924	28.636
current	36558	2.684	3.475	0.006	1.738	144.000
lev	36558	0.425	0.982	0.008	0.405	178.345
fixed	36558	0.208	0.158	0.000	0.175	0.954
tobinq	36558	2.143	5.977	0.611	1.606	729.629
top5	36558	53.708	15.377	2.979	53.635	99.230
age	36558	3.224	0.235	2.079	3.258	4.205

According to Table 2, the average ROA is 0.031, the standard deviation is 0.296, and the range is -30.688 to 10.401, indicating that there are certain differences in ROA among listed companies; the mean ESG performance is 0.733, the median is 0.735, the maximum is 0.929, and the minimum is 0.366, indicating that the overall ESG performance of the sample is at an upper-middle level; among the control variables, the size mean is 22.115 and 1.360 is the standard deviation, proving that the sample of this article covers companies of different sizes. Other control variables' descriptive statistical findings mostly concur with the body of existing literature, indicating that the data source of this article is reasonable.

3.2. Regression Results

Table 3 displays the findings of the benchmark regression using firm ROA performance as the dependent variable.

Table 3. Regression result

Variable	(1)ROA	(2)ROA	(3)ROA
ESG	0.557***	0.253***	0.269***
	(18.231)	(10.461)	(10.824)
size		0.007***	0.007***
		(6.949)	(6.773)
current		-0.002***	-0.002***
		(-6.261)	(-6.175)
lev		-0.197***	-0.196***
		(-163.164)	(-160.830)
fixed		-0.017**	-0.047***
		(-2.202)	(-4.808)
tobinq		-0.001***	-0.001***
		(-5.219)	(-5.190)
top5		0.001***	0.001***
		(9.246)	(7.606)
age		0.015***	0.003
		(2.916)	(0.465)
Industry	NO	NO	YES
Year	NO	NO	YES
_cons	-0.377***	-0.292***	-0.256***
	(-16.788)	(-10.159)	(-7.740)
N	36558	36558	36558
R^2	0.0090	0.4332	0.4366

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

Without adjusting for other factors, column (1) shows that ESG improves ROA performance. The regression coefficient is 0.557, which is significant at the 1% level. After adjusting for individual factors, column (2) shows that the ESG regression coefficient is 0.253, which is significant at the 1% level. Following the addition of dummy variables to control the model, column (3) reveals that the ESG regression coefficient is 0.269, which is significant at the 1% level.. Therefore, there is a positive correlation between enterprise ESG performance and ROA performance, and hypothesis H1 is verified.

3.3. Robustness Check

3.3.1 Lagged independent

Considering that the impact of ESG scores on corporate ROA performance may have a lag, this paper analyzed ESG for the current period, one period behind, and two periods behind to study this lag effect:

Table 4. Regression results of ESG's lag value

Variable	(1)ROA	(2)ROA	(3)ROA
ESG	0.269***		
	(10.824)		
L.ESG		0.118***	
		(4.328)	
L2.ESG			0.099***
			(4.241)
size	0.007***	0.011***	0.010***
	(6.773)	(8.782)	(9.631)
current	-0.002***	-0.002***	-0.001***
	(-6.175)	(-4.219)	(-2.973)
lev	-0.196***	-0.197***	-0.176***
	(-160.830)	(-155.216)	(-164.842)
fixed	-0.047***	-0.042***	-0.049***
	(-4.808)	(-3.819)	(-4.979)
tobinq	-0.001***	-0.001***	-0.001***
	(-5.190)	(-5.609)	(-7.382)
top5	0.001***	0.001***	0.001***
	(7.606)	(7.709)	(9.378)
age	0.003	-0.001	-0.001
	(0.465)	(-0.148)	(-0.171)
Industry	YES	YES	YES
Year	YES	YES	YES
_cons	-0.256***	-0.235***	-0.227***
	(-7.740)	(-6.336)	(-6.794)
N	36558	31485	27060
R^2	0.4366	0.4547	0.5172

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

With a regression coefficient of 0.118, which is significant at the 1% level, column (2) in Table 4 indicates that ESG, which is lag-affected by one period, ESG_1, has a favorable effect on ROA performance. ESG_2, which is two periods behind ESG, likewise has a beneficial effect on ROA performance in column (3). At the 1% level, this effect is substantial, with a regression coefficient of 0.099. These demonstrate that companies ROA performance is positively impacted over the long run by ESG scores. It investigates the connection between the two using a lagged approach, which aids in the explanation for most endogeneity problems. This method demonstrates that endogeneity is unlikely to have a substantial impact on the findings.

3.3.2 Winsorized variables

This section performed winsor processing for all of the continuous variables with 1% and 99% percentiles to lessen the influence of extreme values in order to assess the model's robustness. The specific regression results are shown in Table 5 below.

Table 5. Winsorized and replaced regression

Variable	(1)ROA	(2)ROA_w	(3)ROA
ESG	0.269***		
	(10.824)		
ESG_w		0.112***	
		(15.770)	
ESG_1			0.047***
			(3.365)
Controls	YES	YES	YES
Industry	YES	YES	YES
Year	YES	YES	YES
_cons	-0.256***	-0.130***	-0.097***
	(-7.740)	(-10.236)	(-3.231)
N	36558	36558	36558
R^2	0.4366	0.2448	0.4350

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

In Table 5, Variable ESG_1 is defined as CNRDS's ESG socores devided by 100. Column (2) shows the regression results of wirsorized ESG performance, ESG_w, on winsorized ROA performance, ROA_w. The projected coefficient of ESG_w is 0.112 and it is significant, which means that ESG performance can also significantly promotes ROA performance after stripping out the extreme values.

3.3.3 Replaced the source of ESG

The academic community has not yet formed a unified standard for evaluating ESG performance. This article refers to the approach of Li and Chen and performs robustness testing by replacing the source of ESG ratings [9]. The difference is that the ESG ratings replaced in this article are taken from the CNRDS database. In Table 5, it also replaced ESG scores with ESG_1 scores from CNRDS, which is widely used in economic and investment analysis. Column (3) shows the regression results of CNRDS ESG performance, ESG_1, on ROA performance. At the 1% level, the predicted ESG_1 coefficient of 0.047 is significant. This shows that ESG performance significantly promotes ROA performance. Thus the regression results in this paper are robust.

3.4. Heterogeneity Analysis

This section performs group regression analysis on enterprises based on regions, property rights, and the level of market competition to confirm whether the promotion effect of ESG performance on corporate ROA performance has distinct effects depending on the heterogeneity of enterprises. Table 6 displays the results in the regression:

Table 6. Regression results in different groups

Variable	(1) Eastern	(2) Mid-western	(3) State-owned	(4) Non-state-owned	(5) High-compitation	(6) Low-compitation
ESG	0.165***	0.492***	-0.014	0.368***	0.144***	0.364***
	(10.048)	(6.619)	(-0.684)	(10.053)	(6.006)	(8.942)
size	0.009***	0.006*	0.017***	0.007***	0.008***	0.007***
	(12.012)	(1.771)	(10.957)	(4.222)	(7.293)	(3.796)
current	-0.002***	-0.003*	-0.007***	-0.002***	-0.003***	-0.002***
	(-8.850)	(-1.899)	(-12.292)	(-4.450)	(-7.150)	(-3.450)
lev	-0.191***	-0.194***	-0.358***	-0.195***	-0.207***	-0.195***
	(-41.328)	(-92.272)	(-59.676)	(-133.095)	(-30.936)	(-128.456)
fixed	-0.056***	-0.034	-0.068***	-0.046***	-0.071***	-0.039**
	(-8.417)	(-1.189)	(-7.079)	(-2.880)	(-7.071)	(-2.462)
tobinq	0.005***	-0.001***	0.003***	-0.001***	-0.000**	-0.002***
	(11.287)	(-4.080)	(3.978)	(-4.808)	(-2.030)	(-4.737)
top5	0.001***	0.001***	-0.000	0.001***	0.001***	0.001***
	(12.915)	(2.753)	(-0.966)	(6.356)	(7.567)	(4.973)
age	0.006	0.003	-0.000	0.003	0.003	0.003
	(1.640)	(0.176)	(-0.027)	(0.326)	(0.607)	(0.269)
Industry	YES	YES	YES	industry	YES	YES
Year	YES	YES	YES	year	YES	YES
_cons	-0.235***	-0.395***	-0.098*	-0.348***	-0.177***	-0.311***
	(-11.265)	(-3.566)	(-1.933)	(-6.661)	(-5.676)	(-5.636)
N	25999	10559	12305	24253	16300	20258
R^2	0.1130	0.4884	0.2418	0.4487	0.0925	0.4799

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

Each of the three groups is analyzed one by one below.

3.4.1 Group regions

Due to the vast territory of China, there are certain differences in social and economic policies between the eastern regions and the mid-western regions. In Table 6, column (1) indicates that the coefficient of ESG on ROA for companies in the eastern regions is 0.165 , which is significant; column (2) shows that the coefficient of ESG on ROA for companies in the mid-western regions is 0.492, and at the 1% level, it is significant. By comparing the coefficients of the two, it found that the latter's ESG performance has a greater role in promoting ROA performance. This may be because the existence of extensive economic development in the mid-western regions has led to low economic development quality, and at the same time there are problems such as low resource utilization efficiency, limited innovation capabilities, and serious environmental pollution [10]. Therefore, most companies with good ESG performance are large companies that can shoulder social responsibilities. They have good performance in the three aspects of environmental protection, social responsibility and corporate governance.

3.4.2 Group property rights

A key factor influencing ESG performance, resource allocation, and making choices is company ownership [11]. Businesses' attention on and management of ESG will vary greatly depending on their property rights, which will have an effect on ROA performance. In order to determine if the two types of enterprise property rights would have distinct impacts on ROA performance, it splits the collection among entities that were owned by the state and those that weren't. According to Table 6 column (3)，the regression coefficient of ESG on ROA for state-owned enterprises is -0.014, which

is not significant; for non-state-owned companies, the regression coefficient is 0.368, which is significant at the 1% level. This is due to the fact that state-owned businesses frequently face restrictions from government action and are responsible for a variety of tasks, including employment and economic development, which makes their operations and decision-making more complicated and difficult. Therefore, ESG performance has little to do with the ROA performance of state-owned enterprises. In contrast, non-state-owned enterprises often take profit as their first goal and do not need to bear as heavy social responsibilities as state-owned enterprises. This is starting to change, though, as more and more non-state-owned businesses are starting to focus on ESG performance. This assists them recruit top personnel, enhance their corporate brand, and provide better outcomes [12].

3.4.3. Group the intensity of market competition

There are differences in the intensity of market competition faced by enterprises. The more market-oriented a region is, the more developed its market competition mechanism is, and the more intense the market competition is. Conversely, the less market-oriented a region is, the less intense the market competition is. Therefore, this paper uses the marketization index of the area where the corporation resides to represent the intensity of market competition it faces. As seen in Table 6, column (5) indicates that the coefficient of ESG on ROA for high-competition businesses is 0.144, and is significant at the 1% level; column (6) shows that the regression coefficient of ESG on ROA for low-compitation enterprises is 0.364, and is significant at the 1% level. By comparing the coefficients of the two, it found that the latter's ESG performance has a greater role in promoting ROA performance. This is because in regions with a lower degree of marketization, enterprises improve total factor productivity through the effective drive of ESG [13], thereby improving the company's ROA performance.

3.5. Dimensional Check

In addition to the overall ESG score of the company, Huazheng also announced the scores of the company in three dimensions: environmental (E), social (S) and governance (G). Among them, the score of the corporate environmental dimension is the specific performance of the company in terms of environmental pollution, energy consumption and carbon emissions; the score of the corporate social dimension is the performance of the company in terms of human rights, women's rights and employee rights; the score of the corporate governance dimension is mainly reflected through the organizational structure of the company's board of directors. Therefore, this article measures corporate environmental responsibility (E), corporate social responsibility (S) and corporate governance level (G) respectively through the scores of the three dimensions of ESG, and estimates their impact on the high-quality development of the company. The results of the dimensional test are shown in Table 7.

Table 7. Dimensional regression

Variable	(1)ROA	(2)ROA	(3)ROA
E	0.039**		
	(2.217)		
S		0.047***	
		(3.394)	
G			0.084***
			(4.691)
size	0.009***	0.009***	0.010***
	(8.716)	(8.770)	(9.112)
current	-0.002***	-0.002***	-0.002***
	(-5.231)	(-5.203)	(-5.874)
lev	-0.197***	-0.197***	-0.197***
	(-161.575)	(-161.518)	(-160.835)
fixed	-0.051***	-0.049***	-0.050***
	(-5.137)	(-4.969)	(-5.077)
tobinq	-0.001***	-0.001***	-0.001***
	(-5.332)	(-5.288)	(-5.412)
top5	0.001***	0.001***	0.001***
	(8.977)	(8.978)	(8.133)
age	-0.001	-0.000	-0.000
	(-0.228)	(-0.037)	(-0.008)
Industry	YES	YES	YES
Year	YES	YES	YES
_cons	-0.115***	-0.128***	-0.168***
	(-3.786)	(-4.148)	(-5.100)
N	36558	36558	36558
R^2	0.4349	0.4350	0.4351

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

Based on Table 7, E's regression coefficient on ROA is 0.039, and at the 5% level, it is significant; S's regression coefficient on ROA is 0.047, and at the 1% level, it is significant; G's regression coefficient on ROA is 0.084, and at the 1% level, it is significant. This shows that corporate environmental responsibility, social responsibility and governance all have a significant role in promoting the high-quality development of enterprises, and hypotheses H1a, H1b and H1c are verified. By comparing the coefficients and significance levels of E, S and G, it also found that the level of corporate governance has the greatest role in promoting the performance of corporate ROA. This may be because compared with environmental and social responsibilities, the degree of business governance can better improve production efficiency, thereby increasing profit levels and thus improving ROA performance.

4. Conclusion

The influence of corporate ESG performance on ROA performance is empirically discussed in this article, which is based on microdata from 2012 to 2023 of A-share companies situated in Shenzhen and Shanghai. The research results show that: first, good ESG performance has a promoting effect on corporate ROA performance, and after considering a series of robustness tests such as instrumental variables, dummy variables, lagged explanatory variables, Windsorization, and replacement data sources, the above conclusions still hold; second, the results of heterogeneity analysis demonstrates that the boosting impact of corporate ESG performance on ROA performance shows a significant asymmetric effect under the influence of company region, property nature, and market competition

intensity. Mid-western companies, state-owned companies, and companies with intense rivalry, ESG performance clearly improves corporate ROA performance.; third, the dimensional test shows that corporate environmental responsibility (E), corporate social responsibility (S), and corporate governance (G) all have a significant promoting effect on corporate ROA performance.

This study still has limitations. First, there are a series of transmission mechanisms for the impact of corporate ESG performance on ROA performance, and this paper only studies the correlation between the two. Therefore, the in-depth analyses should be conducted to study this transmission mechanism by introducing mediating variables. Second, the ESG scoring data used in this paper has certain limitations. Different rating agencies have different evaluation standards and rating quality, which has a negative impact on the effectiveness of measuring corporate ESG performance. In the future, a unified and complete ESG evaluation index system needs to be established. Third, this paper has certain limitations in measuring the intensity of market competition for enterprises. To depict the level of market rivalry, it just utilizes the marketization index of the area in which the corporation exists. Further studies should use more comprehensive indicators to measure it.

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