The Impact of Corporate ESG Performance on Financial Performance: An Empirical Analysis Based on U.S. Technology Companies

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Abstract:

This study examines the impact of Environmental (E), Social (S), and Governance (G) (ESG.) performance on the financial profitability of U.S. technology companies. Based on stakeholder theory, the resource-based view, and the shareholder value perspective, this paper analyzes how ESG activities may create strategic opportunities for firms while also potentially incurring short-term costs. Using panel data from publicly listed United States technology companies and employing a fixed-effects regression model, the paper tests the relationship between ESG scores and return on assets (ROA). The empirical results show a significant negative correlation between environmental performance and profitability, supporting the short-term "cost effect" hypothesis, while the impacts of the social and governance dimensions are not significant. By adopting robustness checks with comprehensive ESG scores and balanced panel data, the study further validates the reliability of the conclusions. This research enriches the literature on the relationship between ESG and financial performance, particularly from the perspective of the technology sector, emphasizing the importance of ESG issues such as carbon emissions and data security. The findings provide theoretical and practical insights for managers, investors, and policymakers when balancing sustainable investment with financial performance.

Keywords: ESG performance; financial performance; technology companies; empirical analysis; cost effect.

1. Introduction

In the global capital market, Environmental (E), Social (S), and Governance (G) (ESG) have gradually become core factors in corporate strategy and investment decision-making. ESG investment has shown rapid growth worldwide. This trend indicates that a company's non-financial performance is no longer merely a requirement of social responsibility, but an important dimension for evaluating its long-term competitiveness and risk management capability.

Although ESG has been gaining increasing importance in practice, its relationship with corporate financial performance remains highly controversial. On the one hand, some studies argue that fulfilling ESG responsibilities can enhance a firm's reputation, strengthen stakeholder relationships, and bring long-term competitive advantages, which is consistent with the stakeholder perspective. On the other hand, traditional shareholder theory emphasizes that the primary responsibility of a firm is to maximize profits. Therefore, if ESG investment cannot be quickly transformed into economic returns in the short term, it may be regarded as an additional cost that undermines profitability. This theoretical divergence is also reflected in empirical studies: some support ESG as a driver of value creation, while others highlight its "cost effect."

At the industry level, the ESG performance of technology companies is particularly worth attention. Technology firms are critical engines of global innovation and economic growth, playing a central role in digital transformation and industrial upgrading. At the same time, they are at the center of issues such as carbon emissions, energy consumption, data privacy, and supply chain governance. For example, the widespread application of cloud computing and artificial intelligence, while improving efficiency, has also brought tremendous pressure on energy consumption. Therefore, technology companies may achieve synergy between ESG and financial performance through green innovation, but they may also face short-term financial shocks due to high energy consumption and compliance pressures. Against this background, the objective of this study is to systematically examine the effects of the three ESG dimensions on the financial performance of U.S. technology companies, focusing on whether ESG investment entails a short-term "cost effect." The study takes U.S. publicly listed technology companies as samples, applies a fixed-effects panel regression model, and determines model specification through the Hausman test. Furthermore, two robustness checks are conducted: first, using the comprehensive ESG score as a substitute variable to avoid potential multicollinearity among sub-dimensions; second, constructing a balanced panel sample to eliminate bias caused by firm entry and exit.

The contributions of this paper are threefold. First, theo-retically, by re-examining the relationship between ESG and financial performance, it enriches empirical evidence on ESG research in the context of the technology industry. Second, empirically, it highlights the distinctiveness of technology companies in issues such as carbon emissions, data governance, and supply chain compliance, thereby providing references for understanding industry differences. Third, in practice, the findings not only help managers balance short-term costs and long-term value when formulating ESG strategies but also provide useful insights for investors and policymakers in capital allocation and policy-making.

2. Theoretical Analysis and Research Hypotheses

The relationship between ESG performance and corporate financial outcomes can be explained from multiple theoretical perspectives.

According to stakeholder theory, firms are responsible not only to shareholders but also to employees, customers, suppliers, communities, and the environment [1]. Good ESG practices represent an active response to the concerns of stakeholders, helping to enhance reputation, reduce conflict costs, and thereby improve profitability. From the perspective of legitimacy theory, companies conduct and disclose ESG activities to maintain social legitimacy. This is particularly important for technology companies, which face higher levels of public scrutiny regarding data privacy, cybersecurity, and environmental impact.

In addition, the resource-based view suggests that excellent ESG practices—such as green innovation, advanced technologies, and talent attraction—can themselves constitute rare and inimitable strategic resources, thereby providing firms with sustainable competitive advantages [2]. In contrast, traditional shareholder theory emphasizes that a company's sole responsibility is to increase profits within the framework of the law, serving the goal of maximizing shareholder wealth [3]. From this perspective, ESG investment is often seen as an additional cost. If it cannot be directly and immediately converted into profit, it may reduce shareholders' short-term returns. Recent empirical studies provide evidence for this view: Ifada and Jaffar, for instance, found in Asia-Pacific samples that environmental cost expenditure is significantly negatively correlated with profitability, indicating that environmental investment may bring financial pressure in the short term [4].

In summary, although different theoretical perspectives provide divergent explanations for the mechanisms of ESG, overall, higher ESG performance may still positively influence corporate financial performance. This forms the theoretical basis for the hypotheses of this paper.

Meanwhile, recent meta-analysis research shows that the relationship between ESG and financial performance varies significantly across countries and contexts, suggesting that ESG investment may appear weak or insignificant in certain environments [5].

Therefore, this paper proposes the following hypotheses:

H1: Corporate ESG performance helps to improve financial performance.

The environmental dimension primarily involves carbon emission management, resource conservation, green innovation, and pollution control. From the stakeholder perspective, investment in environmental protection not only addresses the concerns of the public, government, and consumers, but also helps establish a good corporate reputation, thereby attracting more investors and customers. From the RBV perspective, green technology and environmental capabilities can become scarce and difficult-to-imitate strategic resources, bringing long-term competitive advantages. Although these measures may increase short-term costs, they help reduce regulatory risks and compliance costs in the long run and improve market recognition. Therefore, environmental performance is expected to be positively related to financial performance.

H2: Corporate social performance is positively related to financial performance.

The social dimension covers issues such as employee rights protection, supply chain management, product safety, data privacy, and diversity and inclusion. Stakeholder theory argues that fulfilling social responsibility enhances relationships with employees, customers, and communities, which improves productivity, reduces employee turnover, and enhances customer loyalty. Furthermore, responsible practices help companies build an image of accountability and trustworthiness in the public eye, potentially opening new market opportunities. The RBV also highlights that social capital and human capital are important resources that can strengthen organizational cohesion and external partnerships, creating long-term value. Therefore, social performance is expected to positively influence financial performance.

H3: Corporate governance performance is positively related to financial performance.

The governance dimension involves board independence, shareholder rights protection, transparency of information disclosure, and anti-corruption mechanisms. According to legitimacy theory, sound corporate governance allows firms to gain recognition from capital markets, regulators, and the public, improving financing access and investor confidence. Agency theory suggests that good governance helps to alleviate conflicts of interest between management and shareholders, reduces agency costs, and enhances decision-making efficiency. The RBV further emphasizes that high-quality governance practices themselves constitute institutional resources that are difficult to replicate, enabling firms to maintain a stable competitive advantage. Therefore, improvements in governance are expected to positively affect financial performance.

3. Research Design

3.1 Sample Selection and Data Sources

This study takes publicly listed companies in the U.S. technology sector as research objects. The industry range is determined according to the Global Industry Classification Standard (GICS), covering subsectors such as software & services, technology hardware & equipment, semiconductors, and internet services. The sample period is from 2013 to 2023. During this period, ESG rating systems became increasingly mature, allowing for a more comprehensive reflection of corporate sustainability performance. The time span also covers both economic expansion and contraction phases, which ensures representativeness.

Regarding data, ESG information is obtained from the Morgan Stanley Capital International (MSCI) ESG rating database, while financial data are drawn from the Compustat Global database. The financial indicators include total assets, net income, operating revenue, total liabilities, stock codes, and industry classification. To ensure data quality, strict data cleaning procedures are applied: observations with missing key variables are deleted; firms under special treatment (ST/ST) are excluded; continuous variables are winsorized at the 1% level; and monetary values are unified in U.S. dollars. Finally, a balanced dataset is obtained with 322 technology companies and 2,213 firm-year observations from 2013 to 2023. The sample shows good balance and representativeness across time, industry, and region.

3.2 Variable Definitions

This table 1 selects Return on Assets (ROA), measured as net income divided by total assets, as the dependent variable to reflect corporate profitability. The core independent variables are the three ESG pillar scores, sourced from the MSCI ESG rating database: Environmental score (E): reflects firm performance in carbon emission control, energy efficiency, green technological innovation, and related areas. Social score (S): measures responsibility in employee rights protection, supply chain management, customer privacy and data security, and diversity and inclusion. Governance score (G): reflects the soundness of governance structures, including shareholder rights protection, board independence, and disclosure transparency. Control variables are introduced to mitigate omitted variable bias: firm size (Size), financial leverage (Lev), and growth (Growth). Firm size is measured as the natural

logarithm of total assets; leverage is defined as total liabilities divided by total assets; growth is measured as the percentage increase in operating revenue relative to the previous year. Additional controls include firm age (Age), calculated as the difference between observation year and IPO year. To further address unobserved heterogeneity and macroeconomic shocks, firm fixed effects (μ_i) and year fixed effects (λt) are included.

Table 1. Variable definitions

Variable Type	Variable Name	Code	Definition
Dependent variable	Return on Assets	ROA	Net income / Total assets
Independent variable	ESG performance	ESG	MSCI ESG rating data
Independent variable	Environmental score	Environmental	Environmental pillar score
Independent variable	Social score	Social	Social pillar score
Independent variable	Governance score	Governance	Governance pillar score
Control variable	Leverage	Lev	Total liabilities / Total assets
Control variable	Firm size	Size	Natural logarithm of year-end total assets
Control variable	Growth ability	Growth	(Current year revenue-Previous year revenue)/ Previous year revenue
Control variable	Firm age	Age	Observation year-IPO year
Fixed effects	Industry fixed effect	Industry	Industry dummy variable
Fixed effects	Year fixed effect	Year	Year dummy variable

This study constructs a multiple regression model, as shown in Equation (1).

$$ROA_{i,t} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Size_{it} + \beta_3 Lev_{it} + \beta_4 Growth_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

4. Empirical Analysis

4.1 Correlation Analysis

Table 2 reports the Pearson correlation coefficients among the main variables. The results show that social performance (S) is significantly positively correlated with corporate profitability (ROA) at the 1% level (coefficient = 0.067, p < 0.01), indicating that firms paying attention to social responsibility often demonstrate stronger financial performance. Environmental performance (E) is significantly positively correlated with financial leverage at the 5% level (coefficient = 0.051, p < 0.05), suggesting that corporate investment in environmental protection may be associated with debt financing behavior. Environmental and social performance are also significantly positively correlated (coefficient = 0.087, p < 0.001), showing that firms focusing on environmental protection also tend to pay attention to social responsibility, reflecting internal consistency across ESG dimensions. At the same time, financial leverage is significantly negatively correlated with corporate profitability at the 1% level (coefficient = -0.173, p < 0.001), which is consistent with capital structure theory suggesting that excessive debt financing can create financial risk.

Table 2. Correlation matrix

Variables	(1) roa	(2) lev	(3)environmental_~e	(4) social_pillar_~e	(5) governance_pil~e
(1) roa	1.000				
(2) lev	-0.173	1.000			

	(0.000)				
(3) environmental_~e	0.028	0.051	1.000		
	(0.194)	(0.017)			
(4) social_pillar_~e	0.067	0.036	0.087	1.000	
	(0.002)	(0.096)	(0.000)		
(5) governance_pil~e	0.054	-0.032	0.016	-0.006	1.000
	(0.012)	(0.138)	(0.455)	(0.793)	

 $p<0.01$, $p<0.05$, $p<0.1$

All absolute values of correlation coefficients are less than 0.7, indicating no serious multicollinearity problems, thus laying a solid foundation for subsequent regression analysis. It should be noted that correlation analysis only reveals preliminary linear relationships among variables and does not imply causal effects. To further control for potential confounding factors and test robustness, fixed-effects panel regression models are employed. Based on the Hausman test results ($\chi^2 = 505.37$, $p < 0.001$), the fixed-effects model is chosen over the random-effects model as the main estimation approach.

4.2 Regression Analysis

The regression results made in this paper are shown in Table 3. The empirical results show that among the three ESG dimensions, only the environmental score is significantly related to financial performance. The coefficient is -0.0038 ($p < 0.05$), indicating that investment in environmental responsibility exerts a negative impact on profitability in the short term, consistent with the "cost effect" hypothesis. Social and governance scores do not show significant effects. This finding aligns with Hou et al., who used regression discontinuity methods and demonstrated that ESG investment often brings significant short-term costs to financial performance near policy thresholds [6]. This suggests that the financial benefits of social and governance practices are more likely to manifest in the long term.

Table 3. The impact of corporate ESG performance on financial performance (ROA)

Variables	(1)Environmental score	(2)Social score	(3)Governance score	(4)Comprehensive score
Dependent Variable: ROA	ROA	ROA	ROA	ROA
Environmental	-0.0037			-0.0038
	(-2.25)			(-2.28)
Social		-0.0010		-0.0012
		(-0.55)		(-0.68)
Governance			0.0001	0.0001
			(0.06)	(0.05)
Size	0.0454	0.0452	0.0451	0.0455
	(6.16)	(6.12)	(6.10)	(6.16)
Lev	-0.1273	-0.1281	-0.1286	-0.1266
	(-8.27)	(-8.31)	(-8.36)	(-8.21)
Growth	0.0790	0.0795	0.0796	0.0789
	(10.41)	(10.46)	(10.46)	(10.37)
Constant	-0.2884	-0.2998	-0.3038	-0.2849
	(-5.29)	(-5.50)	(-5.41)	(-5.02)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	1,811	1,811	1,811	1,811
Within R²	0.1659	0.1633	0.1631	0.1662

F-statistics	23.03	22.59	22.57	19.97

Notes: Robust t-statistics in parentheses; p<0.01, p<0.05, p<0.1

The control variables show expected results: firm size and growth have significant positive effects on ROA, while financial leverage significantly negatively affects profitability. The overall model fits well, with F-statistics significant at the 1% level, and results remain robust after controlling for firm and year fixed effects.

4.3 Robustness Tests

Table 4. Robustness - ESG total score

roa	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
esg_total	-.002	001	-2.33	021	-.004	0	
lev	-.139	086	-1.62	105	-.307	029	
size	078	036	2.18	03	007	148	
2013b	0						
2014	-.007	007	-1.08	28	-.02	006	
2015	-.023	011	-2.15	032	-.044	-.002	
2016	-.029	008	-3.50	001	-.046	-.013	
2017	-.044	011	-3.83	0	-.066	-.021	
2018	-.024	011	-2.24	026	-.046	-.003	
2019	-.038	017	-2.24	026	-.072	-.005	
2020	-.035	02	-1.79	075	-.074	004	
2021	-.025	028	-0.89	372	-.08	03	
2022	-.074	038	-1.96	05	-.147	0	
2023	-.069	038	-1.83	068	-.144	005	
Constant	-.491	242	-2.03	043	-.968	-.015	
Mean dependent var		-0.001		SD dependent var		0.213	
R-squared		0.100		Number of obs		2185	
F-test		4.466		Prob > F		0.000	
Akaike crit. (AIC)		-3275.590		Bayesian crit. (BIC)		-3201.628	

p<.01, p<.05, p<.1

Table 4 presents regression results when using the ESG total score as a substitute for the sub-dimensions. The empirical results show that the ESG total score is significantly negatively correlated with corporate profitability at the 5% level, suggesting that overall ESG investment still exerts a suppressive effect on financial performance in the short term. This confirms the robustness of the research conclusions in terms of variable measurement.

Table 5 reports robustness results based on a balanced panel sample. The negative relationship between environmental performance and corporate profitability remains significant at the 5% level, with coefficients highly consistent with the baseline model. This indicates that the research conclusions are not driven by sample selection bias and demonstrate strong robustness. This also shows that the relationship between ESG and profitability varies significantly across market cycles and economic environments, sometimes displaying non-positive impacts [7,8].

Table 5. Robustness - balanced panel

roa	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
environmental_pill~e	-.006	003	-1.98	048	-.012	0	
social_pillar_score	-.002	002	-0.76	448	-.006	003	

governance_pillar_~e	001	002	0.49	623	-.003	006	
lev	-.138	085	-1.62	106	-.305	03	
size	078	036	2.16	032	007	149	
2013b	0						
2014	-.004	007	-0.56	575	-.017	009	
2015	-.014	014	-1.02	307	-.041	013	
2016	-.021	01	-2.03	043	-.042	-.001	
2017	-.035	011	-3.35	001	-.056	-.015	
2018	-.018	01	-1.78	076	-.039	002	
2019	-.034	016	-2.07	04	-.066	-.002	
2020	-.03	018	-1.64	101	-.067	006	
2021	-.019	026	-0.76	449	-.07	031	
2022	-.067	036	-1.88	061	-.137	003	
2023	-.063	037	-1.71	089	-.135	01	
Constant	-.496	25	-1.98	049	-.989	-.003	

Mean dependent var	0.008	SD dependent var	0.208
R-squared	0.103	Number of obs	2083
F-test	3.596	Prob > F	0.000
Akaike crit. (AIC)	-3068.646	Bayesian crit. (BIC)	-2984.023

p<.01, p<.05, p<.1

5. Conclusion

This study, based on a sample of U.S. technology companies from 2013 to 2023, empirically examines the impact of ESG dimensions on corporate financial performance. The results indicate that environmental responsibility scores are significantly negatively correlated with corporate profitability, suggesting that environmental investment is manifested as a cost effect in the short term and exerts certain downward pressure on ROA; whereas the scores of social responsibility and governance structure do not show significant effects, implying that the economic value of these two aspects may require long-term accumulation before it can be realized. Similar conclusions appear in the research of Lu et al., who found that high-ESG-rated firms in the hospitality industry did not immediately achieve profit improvement, but their value may be reflected in long-term performance. At the same time, the results of control variables are consistent with theoretical expectations: firm size and growth have significant positive effects on financial performance, while financial leverage significantly negatively affects profitability. The overall model is robust, indicating that the research conclusions are reliable.

Based on the above findings, this paper proposes the following policy recommendations. First, when formulating ESG strategies, firms should pay attention to long-term planning instead of targeting only short-term financial returns. Especially in terms of environmental protection, it should be regarded as a long-term investment to enhance competitiveness. Second, investors, when evaluating corporate value, should focus on the long-term potential and risk management function of ESG, rather than being limited to short-term profitability performance. Third, policymakers may consider measures such as tax incentives, green subsidies, or the optimization of disclosure systems to guide firms to increase ESG investment, reduce their short-term cost pressures, and thus promote sustainable economic and social development.

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