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Asymmetric Effects of ESG on Firm Performance: Insights from Indian Capital Markets

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Abstract

This paper examines the relationship between Environmental, Social, and Governance (ESG) performance and the financial outcomes of firms in India, focusing on a balanced panel of 27 NSE-listed companies from 2015 to 2022. ESG scores were sourced from Bloomberg, while firm performance was measured using ROA, ROE, stock price, EPS, Tobin's Q, and NOPAT, alongside firm-specific and macroeconomic controls. To address non-normality, autocorrelation, and firm-level heterogeneity, the study employs Generalised Estimating Equations (GEE), complemented with Quantile Regression to capture distributional differences across performance levels.

The findings reveal a nuanced relationship between ESG and finance in emerging markets. Governance scores are negatively correlated with accounting-based measures, suggesting potential short-term trade-offs between compliance costs and profitability. In contrast, environmental scores gain significance in the post-COVID period, aligning with the increasing attention of investors to sustainability. Quantile regressions confirm asymmetric impacts: ESG integration benefits firms at specific performance tiers more than others, suggesting that ESG adoption does not create uniform financial outcomes.

By combining population-averaged and distribution-sensitive methods, the study offers fresh empirical evidence on the evolving financial relevance of ESG factors in India. Beyond contributing to the growing literature on sustainable finance, the results hold practical implications. For investors, they highlight the importance of ESG-sensitive portfolio strategies; for firms, they underscore the need to balance governance costs with long-term sustainability benefits; and for policymakers, they provide evidence to refine ESG disclosure norms and align corporate behaviour with Sustainable Development Goals.

Keywords: ESG Performance, Sustainable Finance, Financial Performance, Emerging Markets, India, Policy Implications

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Introduction

Sustainability has emerged as a requirement in the current financial environment as well as a distinction. Frameworks of Environmental, Social, and Governance (ESG), formerly on the periphery of the corporate strategy, now lie at the centre of evaluating the long-term sustainability of a company and its ethical practices (Atkins et al., 2022). Companies are no longer measured only on the basis of profitability but on the capacity to conduct themselves responsibly, manage risks and in line with development at a large scale. This transition has been accelerated by the post-pandemic environment, with stakeholders increasingly demanding that firms prioritise social and environmental interests in critical strategic choices and not as a form of compliance (Aldowaish et al., 2022).

This change is especially complicated in emerging economies like India. The corporate world exists in a dynamic sustainability structure and has to strike a balance between international competitiveness, regulatory changes, and shareholder demands (Kajal & Bansal, 2024). The last ten years have seen regulators such as the Securities and Exchange Board of India (SEBI) and the Ministry of Corporate Affairs institutionalise the idea of sustainability reporting via various frameworks, including the Business Responsibility and Sustainability Reporting (BRSR), which are now compulsory for the top-listed companies. This evolution of regulation is an indication of India's intent to combine corporate transparency and sustainable development. However, it is still not apparent whether these initiatives can produce tangible financial results (Aggarwal & Singh, 2018).

The ESG debate is characterised by two opposing accounts. One of them indicates that the integration of the ESG improves efficiency, minimises risk, and attracts investors, thus creating long-term value. The other posits that ESG implementation, particularly the early adoption, increases the cost of reporting and restructuring, which may lower its short-term profitability. This situation is exploited most in the emerging markets, where the availability of capital, the maturity of investors, and institutional preparedness are very different. The Indian capital market is therefore a relevant setting to study whether the ESG practices create financial value, transitional cost, or a different impact on firms (Mulchandani et al., 2022; Bodhanwala & Bodhanwala, 2018).

Current studies regarding the nexus between ESG and financial performance tend to take homogeneity as a given and engage in regression models relying on the mean, which conceals the heterogeneity of firms. As a matter of fact, financial performance varies across firms based on the size of the firms, governance ability, and sustainability maturity. That same ESG action can assist some smaller firms to establish credibility and leave larger ones with compliance costs. Such variations would necessitate analytical instruments that would examine effects other than average effects (Mahanta et al., 2024; Minutolo et al., 2019; Lee & Suh, 2022).

This paper takes on this kind of perspective. It analyses how ESG performance relates to firm financial outcomes when applying Generalised Estimating Equations (GEE) and Quantile Regression (QR). The GEE model approximates the total relationship that exists between ESG aspects, which are Environment, Social, and Governance, and such financial metrics as ROA, ROE, stock price, Tobin's Q, EPS, and NOPAT. The QR analysis, in its turn, is more detailed, as it recognises distributional differences, showing how the ESG effects are different in low-, mid, and high-performing firms. A combination of these strategies informs whether ESG brings benefits to weaker firms, transitional issues to stronger firms, or both.

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The paper acknowledges that sustainability does not have homogenous outcomes, but it is processed by the firm level diversities, market perception and institutional strength. The COVID-19 pandemic is a pivotal moment in this process, making investors and stakeholders focus on environmental and social concerns more urgently, and prompting the discussion of the sustainability and profitability compatibility in times of uncertainty.

Dwelling upon 27 NSE-traded Indian companies, which reported ESG data throughout the years 2015-2022, the research compares the pre- and post-pandemic periods to determine how the financial relevance of ESG changed. It discusses three major questions:

Are environmental, social, and governance dimensions related to the profitability of the firm and market valuation in India?

What has changed concerning these relationships following COVID-19?

Do these impacts across firms vary, or are they asymmetric?

The research adds to the body of literature that is building upon the idea that sustainable business practices, though expensive in the short term, are the basis of the long-term competitiveness and resilience of emerging economies. Table 1 summarises the variables and measurements used in the empirical analysis. The main estimation results from the Generalised Estimating Equations (GEE) and Quantile Regression (QR) models are reported in Tables 2–7 and are discussed in Section 4.

Literature Review

The relationship between ESG performance and financial performance has been transformed from a side topic in strategic finance to a primary theme. Past research considered ESG as an extension of corporate social responsibility, a moral or reputational initiative, which is directed toward goodwill, but not profit. This perception was enlarged over time with sustainability being associated with competitive advantage, investor perception and long-term risk-return. The focus on ESG is no longer about whether it is an issue or not, but rather how it creates value and at what time (Chen et al., 2023; Zhao et al., 2018; Pinheiro et al., 2023).

This evolution is framed in three theoretical perspectives. The stakeholder perspective understands the ESG as a means of harmonising business activities and stakeholder expectations to enhance trust and legitimacy and mitigate reputational risk (Saini et al., 2023). The legitimacy perspective states that to remain socially accepted and escape punishment, firms have to align with changing expectations and rules. The signalling view sees ESG as a communication mechanism whereby firms minimise information asymmetry, bring in investors, and also differentiate themselves in markets. These frameworks combine to make ESG an ethical investment and economic initiative (Pedersen et al., 2021; Leins, 2020).

Empirical evidence is, however, mixed. In established markets, the positive performance relationship between ESG and performance may be observed, with properly managed Green companies having lower capital cost and high valuation (Garcia & Orsato, 2020). However, these advantages are long-term and conditional on the level of institutionalism and investor awareness. In emerging markets, the effects can be watered down with weaker regulation systems and disclosures, and ESG programs can also add costs without short-term damages. The structural and contextual variations help understand why the ESG-finance relationship is less fixed among markets (Ting et al., 2019).

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ESG composition is also important. The long-term productivity and brand equity are promoted by environmental activities like energy efficiency or emissions reduction (Taddeo et al., 2024). Social initiatives enhance the relations and reputation of the workforce, but are unlikely to give immediate financial profits (Budsaratragoon & Jitmaneeroj, 2021). Governance enhances accountability and oversight but may create compliance costs (Xie et al., 2018). These dimensions are intertwined in complicated ways- by focusing on one dimension, the advantages of another can be negated- and so determining aggregate ESG indices does not reveal much about actual financial processes.

An emerging literature has also acknowledged the nonlinear nature of the financial impacts of ESG. According to the traditional models, all firms have equal influence, but this is not the case, as the results differ depending on the size of the firm, its profitability, and the strategy (Bruna et al., 2022). Companies performing well might run the risk of getting marginal returns from increasing ESG investment, whereas smaller companies might receive publicity and trust of shareholders associated with well-intentioned (though small) projects (Minutolo et al., 2019). This heterogeneity demands the analytical techniques that reflect the variability over the range of performance instead of the use of average effects.

The financial relevance of ESG is also further defined by context and timing. The COVID-19 pandemic increased the significance of corporate resiliency, where environmentally friendly and well-managed companies openly stood disruptions. However, this strength was at a short-term financial cost, especially in increased governance and compliance costs. The pandemic, therefore, underscored the dual nature of ESG, which is a stabiliser and a cost centre (Broadstock et al., 2021; Hwang et al., 2021; Marie et al., 2024).

Regulatory transitions in India enhance this complexity. ESG disclosure has become a structural imperative due to the introduction of mandatory sustainability reporting that is provided by the BRSR framework (Saini & Kharb, 2025). The bigger companies will get adjusted more readily, but the smaller companies will show a great deal of compliance issues, and the outcomes are not even (Kajal & Bansal, 2024). This gap gives us a solid platform to explore the issue of whether the benefits or the costs of ESG are disproportionately beneficial or detrimental according to the financial and operational power of a firm.

Indian studies generally use either a static panel model or a dynamic panel model, which captures average effects that ignore the fact that ESG can have a different impact on different performance tiers. The accounting indicators, such as ROA or ROE, might react opposite to the market indicators, such as stock price or Tobin's Q. Besides, the dynamics of effects, i.e., prior to or post-systemic shocks such as COVID-19, can change their meaning. These subtleties cannot be captured with simple models that cannot simultaneously deal with non-normality, autocorrelation, and heterogeneity in distributions.

This paper uses a two-layer model in order to cover these gaps. The initial layer involves Generalised Estimating Equation (GEE) to estimate the general ESG-financial associations. The latter uses Quantile Regression (QR) to display the variation of these relationships, depending on the level of performance. This conglomerate points to asymmetric impacts- where the dimensions of ESG can lead to better performances of certain firms and hamper others. It builds upon the existing body of literature by showing that sustainability is not a universal strategy but rather a contextual force behind the financial performance of the changing business environment in India. Appendix Table A3 maps the variables used in this study to the theoretical frameworks discussed above, clarifying why each measure is relevant for the hypotheses considered.

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3. Methodology

3.1 Research Design and Data Source

The study uses the longitudinal quantitative research design to investigate the effects of Environmental, Social, and Governance (ESG) dimensions on the financial performance of Indian firms. It uses a balanced panel of 27 NSE-listed companies that consistently disclosed ESG data between 2015 and 2022. The period can be divided into two stages: the pre-pandemic years (2015-2019) of a slow evolution of the regulations and the post-pandemic years (2020-2022) of increased stakeholder awareness and a more stringent compliance with the regulations within the Business Responsibility and Sustainability Reporting (BRSR) framework.

The results of the ESG scores were obtained through the Bloomberg Terminal[1]. The scale is scored on a 0 to 10 scale and is broken down into three sub-factors, including Environmental (E), Social (S), and Governance (G). The financial indicators were also fetched through Bloomberg to have a consistent dataset that combines the sustainability and financial metrics to conduct a total assessment.

3.2 Variables and Measurement

The firm's performance is measured by six dependent variables.

Accounting-based indicators: Return on Assets (ROA), Return on Equity (ROE), and Net Operating Profit After Tax (NOPAT), are used as efficiency and profitability indicators.

Market-based indicators: Stock Price, Tobin's Q, and Earnings Per Share (EPS), which represent the market's perception and valuation of a company.

[1] The ESG data used in this study was sourced from the Bloomberg Terminal on 23rd May 2023, prior to Bloomberg's notification dated 30th November 2023 regarding the restriction of Indian ESG data distribution in response to the SEBI ESG Regulations, effective from 18th December 2023. Therefore, the data acquisition and use for this research comply with Bloomberg's policies effective at the time of access.

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The underlying dual structure allows the evaluation of the impact of ESG on both operational and market aspects of performance.

Three of the ESG sub-dimensions are taken as independent variables:

Environmental (E): management of the environment, emissions and resource efficiency.

Social (S): labour practices, employee relations and community engagement.

Governance (G): board composition, transparency of audit, and shareholder rights.

There are control variables, which are Total Assets (firm size), Number of Employees (scale), Firm Age (maturity) and GDP (macroeconomic condition), and sectoral dummies to represent heterogeneity in industries. This guarantees that ESG coefficients are based on the effects of sustainability and not the size and bias in the sector. A concise summary of these variables and their operational measures is provided in Table 1 below.

Table 1: Description of Variables and Measurement

Variables	*Labels*	*Measurement*
Dependent		
Return on Assets (ROA)	***roa***	***Net Income / Total Assets***
Return on Equity (ROE)	***roe***	***Net Income / Shareholders' Equity***
Stock Price	***s_price***	***Average annual closing share price***
Earnings per Share (EPS)	***eps***	***(Net Income – Preferred Dividends) / Weighted Average Shares Outstanding***
Tobin's Q	***tobins_q***	***Market Value of Firm / Replacement Cost of Assets***
Net Operating Profit After Tax (NOPAT)	***nopat***	***Operating Profit (EBIT) × (1−Tax Rate)***
Independent		
Environmental Score	***esg_e***	***Bloomberg Environment ESG Score out of 10***
Social Score	***esg_s***	***Bloomberg Social ESG Score out of 10***

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Governance Score	*esg_g*	*Bloomberg Governance ESG Score out of 10*
Control		
Total Assets	*t_assets*	*The total value of a firm's assets used in operations, scaled down by a factor of 10,000,000,000 for analysis (TA/10,000,000,000)*
Number of Employees	*num_emp*	*The total count of individuals employed by the firm during the reporting period.*
Firm Age	*firm_age*	*The number of years since the firm's incorporation, representing its maturity and operational history*
GDP of the Country	*gdp*	*Gross Domestic Product at base price (current prices, 2011–12 series), scaled down by 1,000,000 for analysis (GDP/1,000,000)*
Dummy Sector Variables		*Binary variables indicating the industry classification of the firm are used to control for sector-specific effects in the model*

3.3 Empirical Strategy

The analytical model combines Generalised Estimating Equation (GEE) and Quantile Regression (QR) to analyse various dimensions of the ESG finance relationship. GEE approximates population-averaged effects, whereas QR investigates the variation of these effects between levels of performance. Collectively, they constitute strong, distribution-conscious information.

3.3.1. Generalised Estimating Equations (GEE)

GEE is suitable since the panel data is non-normally distributed and exhibits autocorrelation, which is typical in repeated observations of firms. It is an AR(1) working correlation structure, and the closer the time points are to each other, the more they are correlated. The model is expressed as:

$$Y_{it} = \alpha + \beta_1 E_{it} + \beta_2 S_{it} + \beta_3 G_{it} + \gamma Z_{it} + \delta_t + \varepsilon_{it}$$

Where Y_{it} denotes the financial outcome for firm i in year t, E, S, and G represent the ESG components, Z_{it} is the vector of control variables, and δ_t captures time effects. The model is estimated using the identity link function and the Gaussian family distribution. The population-averaged nature of GEE enables inferences about how ESG dimensions affect the typical firm, rather than firm-specific deviations.

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It has an identity link and family distribution of Gaussian. Diagnostic tests confirmed the presence of autocorrelation and multicollinearity among the ESG dimensions. The outcome of the variance inflation factor (VIF) has led to a decline in the aggregate ESG index, retaining only E, S, and G to maintain the model's simplicity and ease of understanding. Detailed diagnostic outputs are reported in the appendix: VIF diagnostics are shown in Appendix Tables A4–A5, and correlation matrices in Appendix Tables A6–A7.

3.3.2 Quantile Regression (QR)

Whereas GEE shows the mean effects, QR shows variation at the level of firm performance. It approximates the conditional quantile function:

$Q_Y(\tau|X) = X'\beta_\tau, \quad \tau \in \{0.25, 0.50, 0.75\}$

Where $Q_Y(\tau|X)$ denotes the conditional quantile (e.g., 25th, 50th, 75th percentile) of the financial indicator Y given covariates X. Coefficients β_τ reflect how ESG dimensions influence the dependent variable at different levels of firm performance. This enables the detection of asymmetric effects, whether ESG exerts a more substantial influence among low-performing, average, or high-performing firms. Quantile regression estimates for the full sample are presented in Table 5, and period-wise quantile estimates are reported in Tables 6 (pre-COVID) and 7 (post-COVID).

3.4 Dual-Period Design

It is empirical and conceptual to divide the data into pre-COVID (2015–2019) and post-COVID (2020-2022) phases. The pandemic brought a break in the structure of corporate behaviour and investor priorities. Prior to 2020, the implementation of ESG was largely driven by compulsion; thereafter, it became a source of strategic differentiation. With this division, it is possible to explore the question of whether the financial relevance of ESG increased with the shift of sustainability to resilience.

3.5 Methodological Justification

A combination of GEE and QR is a complete picture. GEE is used to estimate correlated errors and offer population-averaged estimates, whereas QR is used to detect conditional and asymmetric impacts at different levels of performance. The two-fold nature of the approach therefore provides a deeper understanding of ESG in relation to the average firm and to whom these effects are greater or lesser to improve the analysis and applicability to the issue of ESG financial effects in the changing capital markets of India.

4. Results and Discussion

The results indicate that the connection between ESG performance and the financial performance of firms in India is neither uniform nor linear. It represents a tradeoff between sustainability investment, regulatory adaptation and market interpretation. The analysis based on Generalised Estimating Equations (GEE) on population-averaged effects and Quantile Regression (QR) on the distributional insights reveals the impact of ESG on the overall and financial levels of the firm performance. The findings are presented in the context of India's sustainability transition following the pandemic.

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4.1 Descriptive Overview

The descriptive analysis reveals a high level of heterogeneity in ESG and financial variables among the firms. Appendix Table A8 provides full descriptive statistics for the panel, showing the dispersion and time trends discussed below. The ESG scores increased continuously from 2015 to 2022, and the governance scores were the most significant, as they reflect the institutionalisation of sustainability reporting. There was a broader spread in environmental and social aspects, which implies that there were disparities in the sectoral adoption. The financial indicators were also highly variable- particularly the market-based ones, such as stock price and the Tobin's Q, which could imply the differing perceptions and valuation systems of the various investors. Profitability ratios like ROA and ROE exhibited cyclical behaviour, which was related to macroeconomic factors. Such variations warrant the application of GEE to control correlation, as well as the use of QR in order to fit the differences in the distributions.

4.2 GEE Results: Average Effects

GEE outcomes offer a nationalised picture of the ESG-financial relationships. Table 2 reports the population-averaged GEE estimates for the full sample (2015–2022). Period-split GEE estimates appear in Tables 3 (pre-COVID) and 4 (post-COVID).

Table 2: Results of Generalised Estimating Equations (GEE): ESG and Firm Financial Performance (2015–2022)

Variables	*ROA*	*ROE*	*Stock Price*	*EPS*	*Tobin's Q*	*NOPAT*
ESG Env.	*-0.450**		*120.687***		*0.233***	*-12.392****
	(0.242)		*(61.134)*		*(0.094)*	*(4.315)*
ESG Social			*-143.981***	*-4.460***		
			(63.589)	*(2.159)*		
ESG Gov.	*-1.672****	*-4.154****		*-7.917***		
	(0.492)	*(1.399)*		*(3.886)*		
Model	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*
Link	*Identity*	*Identity*	*Identity*	*Identity*	*Identity*	*Identity*

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Family	***Gaussian***	***Gaussian***	***Gaussian***	***Gaussian***	***Gaussian***	***Gaussian***
Correlation	***AR(1)***	***AR(1)***	***AR(1)***	***AR(1)***	***AR(1)***	***AR(1)***
Control Variables	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***
Industry Dummies	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***
Prob > F	***0.0000***	***0.0000***	***0.0005***	***0.0067***	***0.0000***	***0.0000***
N	***176***	***176***	***176***	***176***	***176***	***176***

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

4.2.1 Governance: Two-Sided Dimension

As shown in Table 2, the scores of governance are negatively correlated with accounting metrics, such as ROA and ROE, which gain strength after 2020. Although the improved governance enhances compliance and transparency, it incurs short-term expenses in terms of reorganising boards, audits, and compliance in disclosures. This is indicative of the shift in India that was undergoing with the BRSR regime, where visible benefits are less than the immediate compliance costs. However, the long-term credibility and investor confidence that governance creates do not depend on accounting ratios; rather, they are essential to sustainability-driven growth.

4.2.2 Market Valuation and Environmental Performance

According to Table 2, environmental scores have a positive influence on market-based indicators, particularly following the COVID-19 pandemic. More investors are rewarding companies that exhibit environmental responsibility and efficient utilisation of resources. The difference between market and accounting metrics implies that the effects of environmental initiatives on profitability take place through a two-step process: reputation and investor confidence are affected initially, and they are then converted to profitability. This is a lag that is typical of emerging markets, where sustainability practices are overtaking compliance with competitiveness.

4.2.3 Social Performance: The Dimension of the Quiet

According to Table 2, Social scores are not particularly significant in both accounting and market indicators, indicating that workforce and community initiatives have not yet been translated into quantifiable financial benefits. Inadequate standardisation of social measures and disclosure can also lead to a lack of market sensitivity. However, as time passes, this dimension may become more relevant as stronger affiliations with social performance and productivity emerge.

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4.2.4 Shifts Across Phases

It becomes evident that there is a definite change between the two periods. Prior to COVID-19, the prevailing focus on ESG was governance, with the secondary focus on the environmental and social front. Following the pandemic, there was a shift towards the environmental dimension, reflecting the growing global interest of investors in climate resilience and sustainability. ESG thereby became a means of achieving symbolic compliance while differentiating strategy.

Tables 3 and 4 present GEE estimates separately for the pre-COVID (2015–2019) and post-COVID (2020–2022) sub-samples, highlighting structural shifts.

Table 3: Pre-COVID Comparison: GEE Results by Period (2015–2019)

Variables	*ROA*	*ROE*	*Stock Price*	*EPS*	*Tobin's Q*	*NOPAT*
ESG Env.						
ESG Social				*-3.893**		
				(2.251)		
ESG Gov.	*-1.185***					*26.302****
	(0.553)					*(9.965)*
Model	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*
Link	*Identity*	*Identity*	*Identity*	*Identity*	*Identity*	*Identity*
Family	*Gaussian*	*Gaussian*	*Gaussian*	*Gaussian*	*Gaussian*	*Gaussian*
Correlation	*AR(1)*	*AR(1)*	*AR(1)*	*AR(1)*	*AR(1)*	*AR(1)*
Control Variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

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Industry Dummies	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Prob > F	*0.0000*	*0.0000*	*0.0005*	*0.0067*	*0.0000*	*0.0000*
N	*176*	*176*	*176*	*176*	*176*	*176*

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

Table 4: Post-COVID Comparison: GEE Results by Period (2020–2022)

Variables	*ROA*	*ROE*	*Stock Price*	*EPS*	*Tobin's Q*	*NOPAT*
ESG Env.	*-1.490****	*-2.227****		*-8.337**	*0.560****	
	(0.306)	*(0.7408)*		*(4.402)*	*(0.145)*	
ESG Social	*1.821****	*3.307****				
	(0.399)	*(0.978)*				
ESG Gov.	*-3.265****	*-12.187****				
	(0.709)	*(1.749)*				
Model	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*	*Generalised Estimating Equations*
Link	*Identity*	*Identity*	*Identity*	*Identity*	*Identity*	*Identity*
Family	*Gaussian*	*Gaussian*	*Gaussian*	*Gaussian*	*Gaussian*	*Gaussian*

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Correlation	***AR(1)***	***AR(1)***	***AR(1)***	***AR(1)***	***AR(1)***	***AR(1)***
Control Variables	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***
Industry Dummies	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***
Prob > F	***0.0000***	***0.0000***	***0.0005***	***0.0067***	***0.0000***	***0.0000***
N	***176***	***176***	***176***	***176***	***176***	***176***

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

4.3 Quantile Regression Results: Asymmetric Effects

The findings of the quantile Regression indicate that the effect of ESG on performance varies with the level of performance of a firm. The analysis of ROA, stock price, Tobin's Q and the 25th, 50th, and 75th percentiles of the sustainability outcomes reveals an asymmetrical outcome.

Table 5 presents the quantile regression estimates for ROA, Stock Price, and Tobin's Q at the 25th, 50th, and 75th percentiles. Tables 6 and 7 report the same quantiles for the pre- and post-COVID periods, respectively.

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Table 5: Regression Estimates: Asymmetric Effects of ESG on Firm Performance

Variables	*ROA (25th)*	*ROA (50th)*	*ROA (75th)*	*Stock Price (25th)*	*Stock Price (50th)*	*Stock Price (75th)*	*Tobin's Q (25th)*	*Tobin's Q (50th)*	*Tobin's Q (75th)*
ESG Env.		*-0.628***	*-0.423**	*49.56***					
			(0.223)	*(23.533)*					
		(0.273)							
ESG Soc.									
ESG Gov.	*-1.819***	*-1.110**	*-1.218***						
	(0.849)	*(0.554)*	*(0.453)*						
Control Variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Sector Dummies	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Obs.	*176*	*176*	*176*	*176*	*176*	*176*	*176*	*176*	*176*

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

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4.3.1. Accounting-Based Performance (ROA)

According to Tables 5, 6, and 7, during the pre-pandemic period, there was no significance of environmental and social scores in terms of quantiles, and there was a weak relationship between the two variables and operational efficiency. At the upper quantile, governance had a significant negative impact, which implied that the high-performing firms were pressured to become more profitable because of governance reforms. This trend is associated with the fact that the cost of early compliance is burdensome to old firms, and weaker firms were not so affected.

The mean environmental scores are negative at the median and higher quantiles after the pandemic, with a significant negative value implying that the cost of environmental compliance is higher among profitable firms. The issue of governance is still unfavourable to profitability at all levels. These results demonstrate that the cost of sustainability integration places greater short-term expenses on more robust companies, which accounts for the cost of responsibility that is characteristic of the initial transition of ESG in emerging markets.

4.3.2 Market-Based Performance (Stock Price)

The performance based on the stock price is market-based performance, as it is dependent on the stock price of the company in the market.

According to Tables 5, 6, and 7, the outcome of stock prices is the opposite. In the pre-COVID period, ESG dimensions were either weak or insignificant, indicative of insensitization on the part of the investors. Environmental scores, however, have a significant positive relationship in the lower quantile after COVID, which implies that investors would reward environmental signals of weaker firms. These companies earn respect and exposure by showing their concern towards the environment. The higher the quantiles, the less the relationship is because the higher the ESG differentiation between the already successful firms, the less the returns. ESG, therefore, is a reputational equaliser, which enhances the performance of lower-tier firms more than that of top performers.

4.3.3 Firm Value (Tobin's Q)

According to Tables 5, 6, and 7, the findings of Tobin's Q are indicative of the impacts of ESG on valuation. The positive impact of environmental scores on firm value in all quantiles before COVID-19 indicated a strong indication of green strategy being viewed as a growth-related indicator. This effect fades after 2020, with environmental practices becoming mainstream and no longer novel. Governance and social scores are not material, and this indicates that environmental performance is still more valued in the market in India than other ESG metrics.

Taken together, these trends confirm the fact that the financial impacts of ESG are nonlinear and asymmetric. The transitional strain on governance and environmental compliance is observed in high-performing firms, whereas the ESG was used to establish legitimacy and attract investors in lower-performing firms. The market gives rewards to the early adopters, but its marginal benefits fade away as sustainability becomes a common practice. This imbalance is an indication of the dynamic sustainable finance landscape in India, where prices are pegged to the size of firms, their maturity, and perceived legitimacy.

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Table 6: Quantile Regression by Period: Pre-COVID (2015-2019)

Variables	*ROA (25th)*	*ROA (50th)*	*ROA (75th)*	*Stock Price (25th)*	*Stock Price (50th)*	*Stock Price (75th)*	*Tobin's Q (25th)*	*Tobin's Q (50th)*	*Tobin's Q (75th)*
ESG Env.								*-0.301** (0.130)*	
ESG Soc.				*-38.562* (22.063)*					
ESG Gov.			*-2.080*** (0.671)*						
Control Variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Sector Dummies	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Obs.	*107*	*107*	*107*	*107*	*107*	*107*	*107*	*107*	*107*

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

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Table 7: Quantile Regression by Period: Post-COVID Effects (2020-2022)

Variables	ROA (25^{th})	ROA (50^{th})	ROA (75^{th})	Stock Price (25^{th})	Stock Price (50^{th})	Stock Price (75^{th})	Tobin's Q (25^{th})	Tobin's Q (50^{th})	Tobin's Q (75^{th})
ESG Env.				118.584**		372.903*	0.242**	0.403**	0.647***
				(50.830)		(204.857)	(0.103)	(0.188)	(0.148)
ESG Soc.						-435.611*			
						(251.438)			
ESG Gov.									
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	69	69	69	69	69	69	69	69	69

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

4.4 Discussion: ESG as a Transition Mechanism.

The evidence suggests that ESG is not a predetermined factor, but rather a mechanism of transition in the evolution of corporations. ESG adoption in the Indian post-pandemic context takes place under three overlapping phases, i.e., compliance, adaptation, and consolidation.

In compliance, it is the firms that react to regulation and incur upfront costs in terms of governance reforms and reporting. Sustainability is part of the operations in the process of adaptation, and it creates market value visible but on the middle ground, which is created by environmental signalling. Still in its infancy, ESG is integrated into the core strategy in consolidation and provides efficiency, innovation, and stability.

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These trends are reflected in the quantile results. The companies in the lower quantile are the pioneers, and they have reputational benefits because they comply with sustainability. Companies in the higher quantile are indicative of mature players who have more transformation costs as they institutionalise ESG. Therefore, ESG serves as the reflection of transition and the driver of transformation, between compliance and competitiveness, and sustainability. The empirical patterns discussed above are supported by the estimates in Tables 2–7 and the diagnostics in Appendix Tables A4–A8.

5. Conclusion and Policy Implications

The paper confirms once again that the financial implications of the ESG performance in India are multidimensional and asymmetric. Evidence of GEE and Quantile Regression reveals that although sustainability has a rising effect on firm performance, its costs and benefits are uneven. Governance reforms enhance institutional integrity but come at short-term financial costs, particularly to high-performance firms. Environmental efforts, in their turn, have become obvious signs of resilience and investor trust, especially following the pandemic. The social aspects are not so material in the financial sense, yet they still contribute to the reputational resilience of the firms.

Such results emphasise the idea of ESG integration as a process of transition and not a linear path to profitability. Sustainability in India is a form of balance, which is among regulation, stakeholder pressure and strategic adaptation. Short-term costs would be considered as long-term resilience and credibility investments. The effect of ESG on firms at various levels of performance is different, with the former enjoying visibility by engaging in sustainability signalling and the latter bearing the transitional costs of more intensive implementation. With the institutionalisation of ESG in governance and evaluation by investors, such asymmetries will reduce.

The ESG performance in emerging economies is largely determined by institutional preparedness, market maturity and regulatory implementation. The pandemic hastened this change, revealing the weaknesses of profit-based systems and making sustainability a source of corporate resilience. Companies that have adopted the environmental and governance reforms at an early stage are now in a better position to handle volatility. The BRSR model has given the foundation to standardised disclosure, but standardised valuation of sustainability is yet to be achieved.

Managerial Implications

The integration of ESG by managers should be done in a strategic and sequential manner. Environmental efforts can result in faster reputational returns; governance changes are expensive but, in the long term, establish a trustworthy relationship; and social efforts would aim to develop a quantifiable outcome, which enhances productivity and innovation.

Investor Implications

ESG needs to be considered by investors in firm-specific and performance settings. Weaker firms can provide growth opportunities due to observed sustainability changes, whereas more robust firms have to invest over extended periods of time to achieve unrealised ESG returns. ESG, therefore, is a portfolio diversification and stability tool in the long run.

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Policy Implications

The policymakers ought to stop using enforcement as a method of regulation and use promotion that is driven by incentives. Tax or financial incentives to reward open reporting, confirmed environmental effects, and innovation could help to reduce compliance costs, particularly when dealing with MSMEs, and lead to an inclusive industrialisation process.

Finally, sustainability and profitability may be combined. The transitional costs that are being experienced nowadays are investments in future competitiveness and resilience as a characteristic of sustainable business in the changing Indian economy.

6. Limitations and Future Scope

Although this paper can give important information about the asymmetric correlation between the financial results and ESG performance of a company in India, it has its limitations and thus creates a possibility for further research in the future. To begin with, the analysis is grounded on a balanced sample comprising 27 NSE-listed companies that reported on ESG data continuously between 2015 and 2022. Even though it guarantees the reliability and comparability of the data, it restricts the applicability of the findings to a broader context, i.e., non-large and well-managed companies. ESG adoption dynamics can vary significantly when it comes to mid-cap or unlisted companies, especially those that deal with resource-intensive industries or less-regulated ones. The external validity of the future analyses would improve if the sample were expanded to cover a wider range of enterprises.

Second, the paper is based on secondary information that is provided by Bloomberg, and it is standardised, yet might not be entirely representative of the qualitative aspects of ESG, including the level of stakeholder involvement, cultural congruence, or unofficial forms of governance. Future studies would integrate the use of primary data using surveys or interviews to understand the behavioural and managerial facets of implementing sustainability.

Third, the models utilised GEE and Quantile Regression, which do not provide causality but only capture association. Despite the fact that the dual method approach can address the statistical issues like non-normality and heterogeneity, it is possible that endogeneity problems with reverse causation or missing variables may arise. The future research can use dynamic panel techniques, including system GMM or difference-in-difference, to create more robust causal conclusions.

Lastly, the analysis only looks at the ESG impact at the firm level, ignoring the inter-firm connection and sectoral spillover. Future studies may investigate the network-based analysis or industry-specific dynamics to determine the role played by industry characteristics in moderating ESG finance relationships. Combining the carbon disclosure, environmental performance data, or measures of digital transformation with the latter may also give a more comprehensive picture of the role of sustainable business practices in resilience, competitiveness, and inclusive economic growth.

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8. Appendix

Table A1: List of the Firms

S. No.	Name of the Firm	GICS Classification
1	Aurobindo Pharma Ltd	Health Care
2	Bharat Electronics Ltd	Industrials
3	Bharti Airtel Ltd	Communication Services
4	Cipla Ltd/India	Health Care
5	Coal India Ltd	Energy
6	Dabur India Ltd	Consumer Staples
7	DLF Ltd	Real Estate
8	Federal Bank Ltd	Financials
9	Godrej Properties Ltd	Real Estate
10	Hindalco Industries Ltd	Materials
11	Indian Oil Corp Ltd	Energy
12	Infosys Ltd	Information Technology
13	ITC Ltd	Consumer Staples
14	Jindal Steel & Power Ltd	Materials
15	JSW Energy Ltd	Utilities
16	Jubilant Foodworks Ltd	Consumer Discretionary

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17	*Kotak Mahindra Bank Ltd*	*Financials*
18	*L&T Finance Holdings Ltd*	*Financials*
19	*Lupin Ltd*	*Health Care*
20	*Mindtree Ltd*	*Information Technology*
21	*NLC India Ltd*	*Utilities*
22	*NTPC Ltd*	*Utilities*
23	*Oracle Financial Services Software Ltd*	*Information Technology*
24	*Reliance Industries Ltd*	*Energy*
25	*State Bank of India*	*Financials*
26	*Tata Steel Ltd*	*Materials*
27	*UltraTech Cement Ltd*	*Materials*

Source: Bloomberg (2015–2022)

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Table A2: Sector-wise Classification

S. No.	GICS Classification	No. of Firms
1	Communication Services	1
2	Consumer Discretionary	1
3	Consumer Staples	2
4	Energy	3
5	Financials	4
6	Health Care	3
7	Industrials	1
8	Information Technology	3
9	Materials	4
10	Real Estate	2
11	Utilities	3
	Total	27

Source: Bloomberg (2015–2022)

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Table A3: Importance of Variables in the Study

Variable Type	*Variable*	*Importance*
Dependent	*Return on Assets (ROA)*	*Measures operational efficiency and profitability using firm assets. Useful for understanding whether ESG practices contribute to internal value creation.*
	Return on Equity (ROE)	*Reflects how well a company generates profits from shareholders' equity. Helps assess whether ESG initiatives align with shareholder returns.*
	Stock Price	*Captures investor sentiment and market perception of firm value. Indicates how ESG signals affect investor confidence and share performance.*
	Earnings per Share (EPS)	*Represents profitability attributable to each share. A direct measure of financial return to equity investors influenced by ESG-driven risk mitigation or growth.*
	Tobin's Q	*Compares a firm's market value to the replacement cost of its assets. Indicates how ESG efforts influence market expectations and long-term valuation.*
Independent	*Environmental Score*	*Reflects a firm's performance on issues like emissions, energy use, and resource management. Vital for understanding ESG's link to operational resilience and efficiency.*
	Social Score	*Measures how a firm manages relationships with employees, communities, and stakeholders. Relevant to gauging internal culture, productivity, and reputational impact on finance.*

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	Governance Score	***Evaluates board structure, audit practices, and shareholder rights. Strong governance underpins transparency and accountability, influencing long-term financial stability.***
Control	***Total Assets***	***Accounts for firm size, as larger firms may have more resources for ESG initiatives.***
	Number of Employees	***Reflects workforce size, potentially influencing social responsibility commitments.***
	Firm Age	***Considers corporate maturity, as older firms may have more established ESG strategies.***
	GDP of the Country	***Controls for macroeconomic effects that impact ESG priorities.***
	Dummy Sector Variables	***Adjusts for industry-specific ESG trends and regulatory variations.***

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Table A4: VIF before variable adjustment

Variable	*VIF*	*1/VIF*
ESG	*32.07*	*0.03118*
ESG Env.	*13.56*	*0.073725*
ESG Social	*8.75*	*0.114244*
Total Assets	*2.67*	*0.375179*
Financial Leverage	*2.43*	*0.411623*
ESG Gov.	*1.91*	*0.522756*
GDP	*1.24*	*0.806776*
Firm Age	*1.06*	*0.941025*
Mean VIF	*7.96*	

Source: Bloomberg (2015–2022) and author's calculations.

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Table A5: VIF after removing aggregate ESG index

Variable	*VIF*	*1/VIF*
Total Assets	*2.58*	*0.386883*
Financial Leverage	*2.41*	*0.415121*
ESG Env.	*1.88*	*0.532217*
ESG Social	*1.73*	*0.577631*
ESG Gov.	*1.35*	*0.740608*
GDP	*1.24*	*0.809056*
Firm Age	*1.04*	*0.96516*
Mean VIF	*1.75*	

Source: Bloomberg (2015–2022) and author's calculations.

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Table A6: Correlation Matrix for Generalised Estimating Equations

	roa	*roa_lag1*	*roa_lag2*	*roa_lag3*	*roa_lag4*
roa	*1.000*				
roa_lag1	*0.894*	*1.000*			
roa_lag2	*0.832*	*0.909*	*1.000*		
roa_lag3	*0.831*	*0.849*	*0.913*	*1.000*	
roa_lag4	*0.817*	*0.818*	*0.856*	*0.933*	*1.000*
	roe	*roe_lag1*	*roe_lag2*	*roe_lag3*	*roe_lag4*
roe	*1.000*				
roe_lag1	*0.735*	*1.000*			
roe_lag2	*0.561*	*0.786*	*1.000*		
roe_lag3	*0.566*	*0.625*	*0.764*	*1.000*	
roe_lag4	*0.554*	*0.568*	*0.658*	*0.834*	*1.000*
	s_price	*s_price_lag1*	*s_price_lag2*	*s_price_lag3*	*s_price_lag4*
s_price	*1.000*				
s_price_lag1	*0.904*	*1.000*			
s_price_lag2	*0.839*	*0.884*	*1.000*		
s_price_lag3	*0.858*	*0.901*	*0.952*	*1.000*	

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s_price_lag4	*0.780*	*0.830*	*0.870*	*0.933*	*1.000*

	eps	*eps_lag1*	*eps_lag2*	*eps_lag3*	*eps_lag4*
eps	*1.000*				
eps_lag1	*0.832*	*1.000*			
eps_lag2	*0.728*	*0.810*	*1.000*		
eps_lag3	*0.733*	*0.719*	*0.846*	*1.000*	
eps_lag4	*0.719*	*0.680*	*0.720*	*0.805*	*1.000*

	tobins_q	*tobins_q_lag1*	*tobins_q_lag2*	*tobins_q_lag3*	*tobins_q_lag4*
tobins_q	*1.000*				
tobins_q_lag1	*0.906*	*1.000*			
tobins_q_lag2	*0.855*	*0.897*	*1.000*		
tobins_q_lag3	*0.870*	*0.896*	*0.922*	*1.000*	
tobins_q_lag4	*0.811*	*0.878*	*0.858*	*0.931*	*1.000*

	nopat	*nopat_lag1*	*nopat_lag2*	*nopat_lag3*	*nopat_lag4*
nopat	*1.0000*				
nopat_lag1	*0.944*	*1.000*			

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nopat_lag2	***0.902***	***0.896***	***1.000***		
nopat_lag3	***0.823***	***0.854***	***0.846***	***1.000***	
nopat_lag4	***0.817***	***0.784***	***0.786***	***0.802***	***1.000***

Source: Bloomberg (2015–2022) and author's calculations.

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Table A7: Correlation Matrix

Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. ROA	*1.000*									
2. ROE	*0.791***	*1.000*								
3. Stock Price	*0.304***	*0.167**	*1.000*							
4. EPS	*0.349***	*0.288****	*0.762****	*1.000*						
5. Tobin's Q	*0.680***	*0.455****	*0.381****	*0.121*	*1.000*					
6. NOPAT	*-0.047*	*0.057*	*0.017*	*0.167**	*-0.179***	*1.000*				
7. ESG	*0.104*	*-0.001*	*0.124*	*0.005*	*0.013*	*0.251****	*1.000*			
8. ESG Env.	*0.187***	*0.069*	*0.152***	*0.041*	*0.090*	*0.185***	*0.906****	*1.000*		
9. ESG Social	*-0.131*	*-0.156***	*-0.016*	*-0.093*	*-0.168***	*0.343****	*0.833****	*0.598****	*1.000*	
10. ESG Gov.	*0.128*	*-0.018*	*0.077*	*-0.029*	*0.170***	*-0.265****	*0.162***	*0.122*	*-0.060*	*1.000*

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

Source: Bloomberg (2015–2022) and author's calculations.

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Table A8: Descriptive Analysis

S. No.	Variable		Mean	Std. Dev.	Min	Max	Observations	
1	firm_age	overall	52.69	30.81	7.00	138.00	N =	216
		between		31.23	10.50	134.50	n =	27
		within		2.30	49.19	56.19	T =	8
2	gdp	overall	19.46	4.02	13.77	26.95	N =	216
		between		0.00	19.46	19.46	n =	27
		within		4.02	13.77	26.95	T =	8
3	fin_lev	overall	3.66	3.39	1.12	17.18	N =	216
		between		3.40	1.31	15.86	n =	27
		within		0.53	2.10	5.21	T =	8
4	t_assets	overall	254.39	720.79	0.86	5177.55	N =	216
		between		711.30	1.87	3712.66	n =	27
		within		173.36	-929.35	1719.27	T =	8
5	No of emp	overall	42083.73	74381.63	567.00	346638.00	N =	176
		between		76532.62	1095.63	302548.00	n =	26
		within		17704.24	-10129.39	217928.10	bar =	6.76923
6	s_price	overall	826.48	1106.53	41.05	6737.95	N =	216
		between		1003.48	69.76	4328.11	n =	27
		within		500.22	-623.73	3711.65	T =	8

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7	*Nopat*	*overall*	*51.85*	*92.40*	*-202.26*	*683.03*	*N =*	*216*
		between		*81.82*	*0.91*	*395.44*	*n =*	*27*
		within		*45.40*	*-169.38*	*339.45*	*T =*	*8*
8	*eps*	*overall*	*24.95*	*39.87*	*-42.69*	*204.72*	*N =*	*216*
		between		*35.66*	*-4.62*	*157.82*	*n =*	*27*
		within		*18.96*	*-44.64*	*126.17*	*T =*	*8*
9	*roe*	*overall*	*14.75*	*12.43*	*-38.36*	*74.89*	*N =*	*216*
		between		*10.43*	*-4.82*	*42.08*	*n =*	*27*
		within		*7.02*	*-18.78*	*47.56*	*T =*	*8*
10	*roa*	*overall*	*7.22*	*7.11*	*-8.64*	*23.33*	*N =*	*216*
		between		*6.74*	*-0.70*	*20.03*	*n =*	*27*
		within		*2.58*	*-2.56*	*19.04*	*T =*	*8*
11	*tobins_q*	*overall*	*2.48*	*2.19*	*0.71*	*10.82*	*N =*	*216*
		between		*2.07*	*0.89*	*8.63*	*n =*	*27*
		within		*0.81*	*-0.11*	*7.04*	*T =*	*8*
12	*esg*	*overall*	*2.68*	*1.06*	*0.90*	*6.45*	*N =*	*216*
		between		*0.90*	*1.32*	*4.75*	*n =*	*27*
		within		*0.57*	*1.02*	*4.86*	*T =*	*8*
13	*esg_e*	*overall*	*1.88*	*1.59*	*0.00*	*6.93*	*N =*	*216*
		between		*1.33*	*0.00*	*4.88*	*n =*	*27*
		within		*0.91*	*-0.42*	*4.73*	*T =*	*8*

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14	*esg_s*	*overall*	*2.18*	*1.37*	*0.00*	*5.72*	*N =*	*216*
		between		*1.17*	*0.37*	*3.78*	*n =*	*27*
		within		*0.74*	*0.19*	*5.10*	*T =*	*8*
15	*esg_g*	*overall*	*5.09*	*0.72*	*3.17*	*6.98*	*N =*	*216*
		between		*0.63*	*4.00*	*6.33*	*n =*	*27*
		within		*0.38*	*3.87*	*6.25*	*T =*	*8*

Source: Bloomberg (2015–2022) and author's calculations.

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