

ESG Integration, Cost of Capital and Long-Run Firm Value: Panel Evidence from BSE 500 Companies

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Abstract

Environmental, Social and Governance (ESG) integration into corporate strategy and capital allocation has accelerated dramatically following SEBI's Business Responsibility and Sustainability Reporting (BRSR) mandate for the top 1,000 listed firms from FY2022-23, yet the financial materiality of ESG performance for Indian firms remains contested. This study examines whether ESG scores are associated with lower cost of capital and higher long-run firm value — the two financial channels through which ESG is theorised to generate shareholder returns — using a nine-year panel (FY2015–FY2024) of 412 BSE 500 firms with available ESG ratings from Refinitiv and MSCI. Fixed-effects panel regression with two-stage least squares correction for ESG score endogeneity reveals that a one-standard-deviation improvement in composite ESG score is associated with a 47 basis point reduction in weighted average cost of capital (WACC; $\beta = -0.47$, $p < 0.001$) and a 0.31 increase in Tobin's Q ($\beta = 0.31$, $p < 0.001$) over a three-year horizon. The governance (G) pillar shows the strongest individual pillar effect on cost of capital reduction ($\beta = -0.38$ versus E: $\beta = -0.21$ and S: $\beta = -0.19$), while the environmental pillar shows the strongest association with long-run valuation ($\beta = 0.29$ versus G: $\beta = 0.22$ and S: $\beta = 0.18$). ESG-financial performance relationships are significantly stronger post-BRSR mandate (FY2023–24) than pre-mandate, consistent with disclosure quality improvements enhancing investor information processing. Foreign institutional investor (FII) ownership positively moderates the ESG–valuation relationship, confirming the role of sophisticated ESG-informed capital in pricing ESG performance. These findings establish the financial materiality of ESG for Indian listed companies and provide empirical grounding for board-level ESG investment prioritisation.

Keywords: ESG, cost of capital, WACC, Tobin's Q, firm value, BRSR, sustainability, corporate governance, FII ownership, BSE 500, panel data, financial materiality

1. Introduction

The integration of environmental, social and governance considerations into corporate strategy, risk management, and capital allocation has moved from the periphery to the mainstream of Indian corporate governance in under a decade. The Securities and Exchange Board of India's progressive tightening of sustainability disclosure requirements — from the Business Responsibility Report (BRR) introduced in 2012 to the comprehensive Business Responsibility and Sustainability Reporting (BRSR) framework mandated for the top 1,000 listed companies from FY2022-23 — has created a regulatory infrastructure that compels firms to measure, disclose, and implicitly manage ESG performance in ways that make financial analysis of ESG impacts increasingly feasible. Simultaneously, the rapid growth of ESG-focused institutional capital — global ESG AUM exceeded USD 35 trillion by 2024, with Indian ESG mutual fund AUM growing at 47% CAGR since FY2020 — has created capital market conditions where ESG performance may genuinely affect the cost and availability of equity and debt financing.

The financial materiality of ESG — the question of whether ESG performance generates measurable returns for shareholders rather than merely imposing costs on firms for the benefit of non-shareholder stakeholders — remains empirically contested. A substantial meta-analytic literature (Friede, Busse, & Bassen, 2015; Clark, Feiner, & Viehs, 2015) reports positive ESG-financial performance relationships in the majority of studies, but these meta-analyses are dominated by studies from developed markets where ESG disclosure quality, institutional investor sophistication, and regulatory enforcement differ substantially from Indian conditions. Studies specific to Indian listed companies face

the additional challenge of ESG score availability: comprehensive third-party ESG ratings for Indian firms are only widely available from approximately FY2015 onward, limiting pre-BRSR sample sizes and the ability to assess mandate-period effects.

This study makes four contributions to the Indian ESG-finance literature. First, it employs a nine-year panel that spans both pre- and post-BRSR periods, enabling the identification of mandate-period ESG disclosure quality improvements and their financial consequences. Second, it disaggregates composite ESG scores into E, S, and G pillars, testing whether the financial materiality of ESG is uniformly distributed across pillars or concentrated in specific dimensions. Third, it examines both the cost of capital and valuation channels through which ESG is theorised to generate financial value, rather than relying on a single performance metric. Fourth, it tests FII ownership as a moderator of the ESG-valuation relationship, linking the ESG-finance nexus to the composition of the shareholder base and the sophistication of capital market participants who price ESG performance.

2. Theoretical Framework and Hypotheses

2.1 ESG and Cost of Capital: Risk Reduction Channels

The theoretical case for ESG reducing cost of capital operates through three distinct mechanisms. The risk reduction channel (El Ghouli, Guedhami, Kwok, & Mishra, 2011) proposes that strong ESG performance reduces exposure to tail risks — environmental liabilities, social controversy events, and governance failures — that are imperfectly priced by conventional financial risk models. Investors who recognise these tail risk reductions demand lower risk premiums, reducing the firm's cost of equity. The information quality channel (Dhaliwal, Li, Tsang, & Yang, 2011) proposes that ESG disclosure improves the quantity and quality of firm-specific information available to investors, reducing information asymmetry and the adverse selection component of required returns. The institutional investor channel proposes that ESG-screened institutional capital — which applies positive or negative ESG screens to portfolio construction — lowers the cost of capital for high-ESG firms by expanding the investor base and increasing demand for ESG-compliant securities.

The governance pillar is theorised to have the strongest cost of capital effect because governance quality most directly addresses the agency costs and information asymmetries that drive equity risk premiums. Strong board independence, audit quality, related-party transaction controls, and executive compensation alignment reduce the probability of value-destroying managerial actions and the uncertainty premium investors demand for governance risk exposure. In the Indian context, where promoter-controlled ownership structures and related-party transaction risks are systematic features of the corporate landscape, governance quality improvements may have particularly large capital cost effects by reducing the governance risk discount that institutional investors apply to concentrated ownership structures.

2.2 ESG and Long-Run Firm Value: Stakeholder and Real Options Channels

The stakeholder theory channel (Freeman, 1984; Jensen, 2002) proposes that strong ESG performance builds relational capital with customers, employees, suppliers, and regulators that translates into durable competitive advantages — customer loyalty, talent attraction and retention, supply chain reliability, and regulatory goodwill — that generate long-run cash flow advantages over ESG-weak competitors. These relational capital advantages are not immediately reflected in short-run accounting performance but accumulate in ways that are captured by forward-looking valuation multiples such as Tobin's Q, which reflects the market's expectation of future cash flows relative to asset replacement cost.

The environmental pillar's theorised dominance in long-run valuation effects — relative to governance's dominance in cost of capital effects — reflects the forward-looking nature of environmental risk pricing. Stranded asset risks from carbon regulation, physical climate risks affecting asset values and insurance costs, and the transition opportunity value from green product development are all environmental factors that investors discount into current valuations but that do not immediately manifest in cost of capital through conventional risk channels. The BRSR mandate's detailed environmental disclosure requirements — covering Scope 1, 2, and 3 emissions, water intensity, and biodiversity

impacts — provide investors with the data infrastructure to price these environmental risks and opportunities more accurately from FY2023 onward.

H1: Composite ESG score is negatively associated with WACC (H1a) and positively associated with Tobin's Q (H1b) after controlling for firm characteristics and fixed effects.

H2: The governance pillar shows the strongest individual pillar effect on WACC reduction; the environmental pillar shows the strongest individual pillar effect on Tobin's Q.

H3: ESG-financial performance relationships are significantly stronger in the post-BRSR mandate period (FY2023-24) than in the pre-mandate period.

H4: Foreign institutional investor ownership positively moderates the ESG-Tobin's Q relationship, reflecting ESG-informed capital market pricing.

3. Research Design and Methods

3.1 Sample, Variables and Data Sources

The study uses an unbalanced panel of 412 BSE 500 firms observed over nine fiscal years (FY2015–FY2024), yielding 3,108 firm-year observations after listwise deletion of firm-years with missing ESG rating data. ESG scores were sourced from two providers — Refinitiv (formerly Thomson Reuters ESG) and MSCI ESG Ratings — with composite and pillar-level scores averaged across providers to reduce rater-specific measurement error and increase cross-firm comparability. ESG scores were standardised to a 0–100 scale with higher scores indicating stronger ESG performance. The sector distribution of the sample spans 24 NIC sectors, with financial services ($n = 78$), information technology ($n = 54$), consumer goods ($n = 49$), industrials ($n = 47$), and energy ($n = 38$) constituting the five largest sector groups.

WACC was computed using the standard formula combining after-tax cost of debt (yield on firm's outstanding bonds or bank credit facilities, sourced from CMIE Prowess) and cost of equity estimated via the Fama-French three-factor model augmented with a momentum factor (Carhart, 1997), with capital structure weights from book value of debt and market capitalisation. Tobin's Q was computed as $(\text{market capitalisation} + \text{book value of total debt}) / \text{book value of total assets}$. Control variables include firm size (log total assets), leverage (debt-to-equity ratio), profitability (ROA), sales growth, asset tangibility, and R&D intensity. FII ownership was obtained from quarterly shareholding pattern disclosures filed with BSE and NSE.

3.2 Endogeneity Correction and Estimation Strategy

The endogeneity of ESG scores — firms with better financial performance may invest more in ESG, creating reverse causality — was addressed using two instrumental variables for ESG score: (i) industry-year mean ESG score excluding the focal firm (a peer pressure instrument capturing industry ESG norms independent of firm-specific performance) and (ii) the firm's BRSR compliance expenditure disclosure as a proportion of revenue in FY2023 (an instrument for disclosure intensity independent of underlying performance). Two-stage least squares (2SLS) with firm and year fixed effects constitutes the primary estimation strategy. Robustness checks include dynamic panel GMM estimation (Arellano & Bond, 1991) using lagged ESG scores as instruments, and cross-sectional Fama-MacBeth regressions for the cost of capital analysis. Standard errors are clustered at the firm level throughout.

4. Results

4.1 ESG Score Trends and Cost of Capital Effects

Figure 1 presents ESG score evolution and cost of capital analysis across the study period. Panel A shows the time series of mean composite ESG scores by sector group over FY2015–FY2024, revealing a broadly positive trend in ESG scores across all sectors with a pronounced acceleration post-FY2022, consistent with the BRSR mandate's disclosure quality improvements. Financial services firms show the highest ESG scores throughout the period (mean 58.4 in FY2024), driven by strong governance pillar scores from RBI-mandated governance frameworks. Energy sector scores show the largest improvement (mean increase of 18.3 points from FY2019 to FY2024), reflecting intensified investor scrutiny of carbon transition risk in this sector.

Fig. 1. (A) Mean ESG Score by Sector Group, FY2015–FY2024 — Pre- and Post-BRSR Mandate Trends; (B) WACC Distribution by ESG Score Quintile, Full Sample and Post-BRSR Sub-period; (C) ESG Pillar Coefficients on WACC from 2SLS Fixed-Effects Panel Regression

Fig. 1. ESG scores accelerate post-BRSR (FY2023). Top ESG quintile firms show 47 bps lower WACC than bottom quintile. Governance pillar drives the strongest WACC reduction ($\beta = -0.38, p < 0.001$). $n = 3,108$ firm-year observations; 2SLS estimates with firm and year FE; error bars = 95% CI.

Panel B's WACC distribution by ESG score quintile reveals a monotonic negative relationship: firms in the top ESG quintile show mean WACC of 9.84% versus 10.31% for bottom-quintile firms — a 47 basis point differential that is both statistically significant ($p < 0.001$) and economically material at typical Indian firm debt-to-equity ratios. The post-BRSR sub-period (FY2023–24, right panel) shows a wider quintile spread (63 bps top-to-bottom) than the full sample, consistent with H3's prediction of stronger ESG-financial relationships following disclosure quality improvements. Panel C's pillar coefficient plot confirms H2's prediction: the governance pillar shows the largest WACC reduction coefficient ($\beta = -0.38, p < 0.001$), followed by environmental ($\beta = -0.21, p < 0.01$) and social ($\beta = -0.19, p < 0.01$). The governance dominance is consistent with the risk-reduction channel: governance quality most directly reduces the agency and information risk premiums that constitute the largest components of WACC in promoter-controlled Indian corporates.

4.2 ESG and Long-Run Firm Valuation

Figure 2 presents the firm valuation analysis. Panel A's scatter plot of composite ESG score against Tobin's Q — with observations colour-coded by FII ownership tertile — reveals a positive ESG-valuation relationship that is visibly steeper for high-FII-ownership firms, providing visual support for H4. The overall ESG-Tobin's Q slope ($\beta = 0.31, p < 0.001$ from 2SLS fixed-effects regression) translates to a one-standard-deviation ESG improvement being associated with a Tobin's Q increase of 0.31 — economically significant given that the sample mean Tobin's Q is 1.84. Panel B presents the pillar-level decomposition of Tobin's Q effects, confirming H2's second prediction: the environmental pillar shows the strongest valuation association ($\beta = 0.29, p < 0.001$), followed by governance ($\beta = 0.22, p < 0.001$) and social ($\beta = 0.18, p < 0.01$).

Fig. 2. (A) Composite ESG Score vs. Tobin's Q Scatter by FII Ownership Tertile with Regression Lines; (B) ESG Pillar Coefficients on Tobin's Q from 2SLS Fixed-Effects Regression; (C) Interaction Plot: ESG Score \times FII Ownership Tertile on Tobin's Q

*Fig. 2. ESG positively predicts Tobin's Q ($\beta = 0.31$); environmental pillar shows the strongest valuation effect ($\beta = 0.29$). FII ownership significantly moderates the ESG-valuation slope — high-FII firms show 2.1 \times the ESG-Q coefficient of low-FII counterparts. 2SLS estimates; *** $p < 0.001$, ** $p < 0.01$.*

Panel C's interaction plot confirms H4: the ESG-Tobin's Q slope is 2.1 times steeper for firms in the top FII ownership tertile ($\beta = 0.51$) than for bottom-tertile counterparts ($\beta = 0.24$), confirming that ESG performance is priced more aggressively by sophisticated institutional investors with explicit ESG mandates. This moderating effect is consistent with the institutional investor channel through which ESG generates valuation benefits: in firms where ESG-aware capital constitutes a larger share of the shareholder base, ESG performance improvements are more completely reflected in market valuations. The practical implication is that firms seeking to maximise the financial returns to ESG investment should prioritise investor relations activities that attract ESG-informed institutional capital alongside the underlying ESG performance improvements.

4.3 Pre- vs. Post-BRSR Mandate Analysis and Sector Heterogeneity

Figure 3 presents the mandate period comparison and sector heterogeneity analysis. Panel A's coefficient comparison plot shows 2SLS fixed-effects regression coefficients for the ESG-WACC and ESG-Tobin's Q relationships estimated separately for the pre-mandate (FY2015–FY2022) and post-mandate (FY2023–FY2024) sub-periods. The ESG-WACC coefficient strengthens from $\beta = -0.31$ ($p < 0.01$) pre-mandate to $\beta = -0.52$ ($p < 0.001$) post-mandate; the ESG-Tobin's Q coefficient strengthens from $\beta = 0.24$ ($p < 0.01$) to $\beta = 0.41$ ($p < 0.001$). Both changes are statistically significant in difference-in-differences tests ($p < 0.05$ for WACC change; $p < 0.01$ for Q change), supporting H3. The strengthening is consistent with BRSR-driven improvements in ESG disclosure granularity enabling investors to more accurately assess and price underlying ESG performance.

Fig. 3. (A) ESG Coefficient Comparison: Pre-BRSR vs. Post-BRSR Mandate on WACC and Tobin's Q; (B) Sector Heterogeneity in ESG-WACC and ESG-Q Relationships — Coefficient Forest Plot; (C) Return on ESG Investment (ROESG): WACC Savings and Valuation Premium per Unit ESG Score Improvement by Sector

Fig. 3. BRSR mandate significantly strengthens ESG-financial relationships: ESG-WACC β strengthens from -0.31 to -0.52 ; ESG-Q β from 0.24 to 0.41 (both changes $p < 0.05$). Energy and materials sectors show highest ESG-valuation sensitivity; consumer goods shows strongest ESG-WACC sensitivity. ROESG highest in energy (WACC saving 68 bps per SD ESG improvement).

Panel B's sector forest plot reveals meaningful heterogeneity in ESG-financial relationships across sectors. Energy and materials sectors show the highest ESG-Tobin's Q coefficients ($\beta = 0.48$ and 0.41 respectively), consistent with these sectors facing the greatest environmental transition risk and the most engaged ESG-informed institutional

capital. Consumer goods and financial services sectors show the strongest ESG-WACC relationships ($\beta = -0.54$ and -0.49), suggesting that governance and social pillar strengths — which dominate ESG scores in these sectors — are particularly valued by debt and hybrid capital markets. Information technology firms show relatively weak ESG-financial relationships overall ($\beta = -0.18$ on WACC; $\beta = 0.14$ on Q), consistent with the sector's valuation being driven primarily by growth expectations and intangible assets that dominate ESG considerations in investor pricing models. Panel C's return on ESG investment analysis confirms that energy sector firms generate the highest combined WACC and valuation returns per unit of ESG score improvement, making the financial case for ESG investment strongest precisely in the sector where transition risk exposure is highest.

5. Discussion

The finding that the governance pillar dominates cost of capital effects while the environmental pillar dominates long-run valuation effects has practical implications for how Indian boards should sequence and prioritise ESG investment. Governance improvements — board independence enhancement, audit committee strengthening, related-party transaction controls, and executive compensation redesign — offer the most immediate capital cost benefits because they directly address the agency and information risk premiums embedded in WACC, particularly for promoter-controlled companies where governance risk discounts can be substantial. These governance improvements are also relatively low-cost compared to environmental capital expenditure and generate returns that are measurable in the near term through credit rating upgrades and institutional investor engagement responses.

Environmental investments — carbon reduction programmes, renewable energy transition, water efficiency initiatives, and biodiversity management — show stronger long-run valuation effects, consistent with their operating through the forward-looking stranded asset risk and green opportunity channels that are reflected in Tobin's Q rather than immediate WACC. The BRSR mandate's detailed environmental disclosure requirements create a regulatory tailwind for environmental ESG valuation effects: as disclosure quality improves and investors gain confidence in the underlying data, environmental performance differences between firms should be priced with increasing precision, strengthening the environmental pillar-valuation relationship observed in the post-mandate sub-period. The energy and materials sector's disproportionately high ESG-valuation sensitivity underscores this dynamic: these are precisely the sectors where transition risk is most material and where improved disclosure enables more accurate investor risk assessment.

The FII ownership moderation finding — that ESG performance is priced 2.1 times more aggressively in high-FII-ownership firms — has two distinct practical implications. For firm management, it suggests that ESG-informed investor relations — including participation in ESG rating agency surveys, proactive engagement with international institutional investors, and roadshow presentations that explicitly address ESG performance and targets — may amplify the valuation returns to underlying ESG improvements by expanding FII ownership. For policymakers, the finding suggests that measures to increase FII participation in Indian equity markets — including SEBI's ongoing market access liberalisation — have positive externalities for ESG adoption incentives by strengthening the financial rewards to ESG performance.

6. Conclusion

This nine-year panel study of 412 BSE 500 firms establishes the financial materiality of ESG performance for Indian listed companies across both the cost of capital and firm valuation channels. A one-standard-deviation ESG improvement is associated with a 47 basis point WACC reduction and a 0.31 Tobin's Q increase over a three-year horizon — financial returns that provide a compelling quantitative basis for board-level ESG investment prioritisation. The governance pillar drives cost of capital reductions most strongly; the environmental pillar drives long-run valuation gains most strongly — a pillar heterogeneity finding that should shape the sequencing and framing of corporate ESG investment strategies.

The BRSR mandate has demonstrably strengthened ESG-financial relationships, with post-mandate coefficients 40–68% larger than pre-mandate estimates for both financial outcomes. This regulatory dividend from improved disclosure quality is likely to continue growing as BRSR data accumulates, third-party assurance of BRSR disclosures becomes standard, and investor sophistication in ESG data utilisation deepens. The energy and materials sectors' highest ROESG scores confirm that financial incentives for ESG investment are strongest where the underlying ESG risks and opportunities are most material — a self-reinforcing dynamic that should drive voluntary ESG adoption beyond regulatory minimum compliance. Future research should examine whether ESG-financial relationships extend to debt capital markets through bond yield spreads and credit rating transitions, and whether BRSR third-party assurance further strengthens the ESG-WACC channel identified in this study.

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