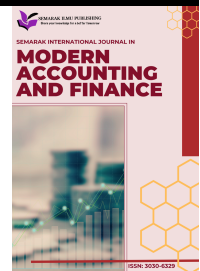




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Environmental Risk Management and Financial Resilience in Indian Listed Firms: Evidence from BRSR Disclosures

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ABSTRACT

Indian capital markets have moved environmental governance from a voluntary gesture to a regulated obligation through the Securities and Exchange Board of India's Business Responsibility and Sustainability Reporting (BRSR) mandate. Whether the environmental risk management capability captured by these disclosures translates into firm financial resilience remains unclear, particularly in emerging markets, where the evidence is thin and often contradictory. This study builds two composite indices from audited disclosures: an Environmental Risk Management Index (ERMI) assembled from ten governance dimensions and a formative Financial Resilience Index (FR) covering profitability stability, liquidity, leverage resilience, and solvency. It tests whether ERMI is associated with FR across a balanced panel of 200 listed Indian firms observed over three financial years (FY2022-23 to FY2024-25, 600 firm-year observations). The ERMI showed strong internal consistency (Cronbach's $\alpha = 0.918$) and a coherent two-factor structure explaining 80.2% of the variance. At the bivariate level, ERMI and FR were not positively related; once sector and firm size were controlled, the association turned positive and significant, though modest (standardized $\beta = 0.012$, $p = 0.003$), a sign reversal consistent with Simpson's paradox driven by sectoral composition. Two boundary conditions strengthened this relationship: operational efficiency (interaction $p = 0.002$) and credit rating stability (interaction $p = 0.014$). A model combining ERMI, the two moderators, and controls explained more variance than a controls-only baseline ($\Delta R^2 = 0.064$; $f^2 = 0.13$; $F(5,467) = 12.25$, $p < 0.001$), and the effect held under a one-year lag. Environmental governance supports financial resilience in Indian firms conditionally rather than universally, and internal efficiency and external credit standing are the relevant conditions. The implications for corporate boards, investors, and BRSR disclosure policy are discussed.

1. Introduction

For most of the last two decades, environmental disclosure by Indian companies has been a voluntary act of goodwill. This changed when the Securities and Exchange Board of India (SEBI) made

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Business Responsibility and Sustainability Reporting (BRSR) mandatory for the top 1,000 listed entities from the 2022-23 financial year. Environmental governance is now a reported obligation with a standard format, which, for the first time, gives researchers a comparable, audited window into how Indian firms manage environmental risk. The practical question this raises for boards, lenders, and investors is simple to state and hard to answer: Does the environmental risk-management capability that BRSR now makes visible actually help a firm stay financially resilient?

The wider literature offers encouragement but provides little certainty. Friede *et al.*, [1] synthesize more than 2,000 empirical studies and report a broadly positive link between environmental, social, and governance (ESG) activity and financial outcomes, while Ortiz-de-Mandojana and Bansal [2] shift the outcome variable and show that sustainability practices support organizational resilience over long horizons rather than short-run profit. However, the evidence from emerging markets is thinner and more mixed. Maji and Lohia [3] examine climate-sensitive Indian corporates and find a measurable financial effect of ESG disclosure within that exposed subset, whereas Rao *et al.*, [4] work with a broader cross-section of Indian firms and report a positive but weaker association. The divergence between the two is instructive: the estimated effect in India appears to depend heavily on which firms enter the sample and how ESG is measured rather than on any settled underlying relationship. Two problems recur in this literature. First, most studies treat ESG as a single rating purchased from a data vendor, which buries the specific question of environmental risk management inside a broad score. Second, the outcome is usually profitability or market value, not resilience, even though resilience is what regulators and long-term investors claim to care about.

This study addresses both of these problems in the Indian setting. It builds an Environmental Risk Management Index (ERMI) directly from the BRSR and related disclosures, covering ten governance dimensions rather than a purchased composite, and measures the outcome as a Financial Resilience Index (FR) assembled from four dimensions of financial health. It then asks whether ERMI is associated with FR across a balanced panel of 200 listed firms and under what conditions any association is stronger. The theoretical anchor is the natural-resource-based view, in which Hart [5] treats environmental capability as a firm resource that can lower risk and protect performance. Revisiting that framework fifteen years later, Hart and Dowell [6] conclude that its central claim has held up empirically, while its clean-technology strand remains the least tested. From this base, this study argues that the value of environmental governance is not uniform. It should depend on whether a firm has the operational capability to convert governance into outcomes and whether external credit markets recognize and reward that governance.

Three findings motivate this contribution. The relationship between environmental governance and financial resilience in this sample is not the large, unconditional effect that a casual reading of the ESG literature might predict. At the raw level, it is absent. It appears only once sectoral composition and firm size are accounted for, and even then, it is modest. The relationship is shaped by two boundary conditions: operational efficiency and credit-rating stability. This study contributes a transparent, disclosure-based measure of environmental risk management for an emerging market and provides evidence that environmental governance supports resilience conditionally through internal capability and external credit standing rather than as a blanket effect. The remainder of this section develops the measurement logic and hypotheses.

1.1 Environmental Risk Management as a Firm Capability

The natural-resource-based view holds that a firm's relationship with the natural environment can be a source of competitive advantage when it rests on capabilities that are valuable and hard to

imitate [5]. Pollution prevention, product stewardship, and clean strategies are not costless compliance items; they are organizational routines that lower exposure to regulatory, operational, and reputational shocks. This extends the general argument of Barney [7] that valuable and hard-to-imitate resources sustain advantage, with Hart and Dowell [6] making the narrower case that environmental routines qualify because they are socially complex and accumulate slowly. Environmental risk management, understood in this way, is a governance capability rather than a single policy. It spans board oversight, risk assessment, compliance systems, emissions and waste handling, disclosure, and integration of environmental concerns into financial decisions. Because these routines share a common origin in a firm's commitment to managing environmental risk, they tend to move together, which is what makes a composite index a reasonable way to capture them.

The link between this capability and financial resilience runs through several channels. Firms that manage environmental risk well avoid fines, shutdowns, and clean-up costs, and they are less likely to face the sudden liabilities that damage cash flow. Russo and Fouts [8] show that this discipline translates into higher returns on assets, and more strongly in high-growth industries. They also tend to enjoy a steadier access to capital. Attig *et al.*, [9] find that firms with stronger social and environmental performance receive higher credit ratings, and Goss and Roberts [10] show that comparable firms borrow more cheaply and pay measurably lower spreads on bank loans. Both effects operate through the rating channel that Kisgen [11] documents, in which proximity to a rating threshold shapes a firm's financing behavior. Over longer horizons, sustainability-oriented firms have shown greater capacity to absorb shocks and recover. DesJardine *et al.*, [12] find that firms with strategically embedded social and environmental practices suffered less severe losses and recovered faster during the 2008 financial crisis. Similarly, Ding *et al.*, [13] report an analogous pattern for the COVID-19 shock, where pre-pandemic environmental and social strength predicted milder declines. Financial resilience is the natural outcome variable for these mechanisms because it captures the ability to withstand and adapt, rather than simply earn. It is better represented by stability across profitability, liquidity, leverage, and solvency than by any single ratio.

The Indian context sharpens this question. The BRSR has produced, for the first time, a standardized environmental disclosure that is comparable across firms and audited within the annual reporting cycle. This removes much of the measurement noise that troubles cross-country ESG work, where ratings from different vendors often disagree on. At the same time, Indian firms operate under real environmental pressure, from water stress and air quality regulation to climate exposure, and under a capital market that is still learning to price these factors. Therefore, whether environmental governance pays off in resilience is an open empirical question in this setting, not a settled one. This leads to the study's first hypothesis, stated as a conditional association rather than a raw effect, for reasons that the results will make clear.

H1: After accounting for sector and firm size, environmental risk management (ERMI) is positively associated with financial resilience (FR) among Indian listed firms.

The capability logic gains force when read alongside three complementary theories that the empirical ESG literature commonly invokes. The institutional account of DiMaggio and Powell [14] explains why Indian firms adopt environmental governance in the first place: regulatory and normative pressure, now formalized through the BRSR, pushes firms toward common practices. Stakeholder theory, as set out by Freeman [15], explains why governance can protect value, as managing the claims of regulators, communities, and capital providers reduces the risk of costly conflict. Dhaliwal *et al.*, [16] supply the disclosure link; the other two leave implicit, showing that initiating credible non-financial reporting lowers a firm's cost of equity capital by reducing information asymmetry. None of these displaces the resource-based core; together, they describe

the same capability from the angles of why it is adopted, how it protects the firm, and why its disclosure matters.

Financial resilience deserves its own definition because it is easily confused with performance. Resilience is the capacity to absorb shocks and keep functioning, not the level of profit earned in a good year. A firm can be highly profitable and fragile or modestly profitable and durable. For that reason this study does not reduce resilience to a single ratio. It combines profitability stability, which captures the steadiness of earnings; liquidity strength, which captures the ability to meet short-term obligations; leverage resilience, which captures the cushion against debt service stress; and solvency position, which captures long-run viability. Ortiz-de-Mandojana and Bansal [2] link sustainable practices to lower financial volatility and higher long-term growth rather than to higher short-run profit, and DesJardine *et al.*, [12] show the same practices shortening recovery time after a shock. Both point to durability rather than earnings, which is why resilience, and not profitability, is the outcome tested here.

The empirical record on environmental governance and financial outcomes is large but uneven. Flammer [17] exploits close-call shareholder votes on social and environmental proposals as a regression discontinuity and finds that narrowly passing such a proposal improves subsequent operating performance, which is among the strongest causal evidence available in this literature. Reviewing the corporate finance evidence more broadly, Gillan *et al.*, [18] conclude that the association between ESG activity and firm value is real but heterogeneous and highly sensitive to how ESG is measured. Evidence from periods of market stress is more consistent. Alongside the crisis and pandemic findings already noted, Broadstock *et al.*, [19] show that high-ESG portfolios in China outperformed during the COVID-19 downturn, suggesting that the pattern is not confined to developed markets. The Indian evidence remains thinner than either, shaped by the shift from voluntary reporting to the BRSR regime and by the small number of comparable-data years available so far [3]. This study contributes to the thinner strand with a purpose-built environmental measure and a resilience outcome, and it treats the relationship as contingent rather than fixed, which the following two boundary conditions make precise.

1.2 Boundary Conditions: Operational Efficiency and Credit Standing

If environmental governance is uniformly valuable, its effect on resilience will be the same for every firm. Resource orchestration theory suggests otherwise. Sirmon *et al.*, [20] argue that holding a resource is not the same as extracting value from it, and that firms must structure, bundle and leverage resources before those resources produce an outcome. A firm with strong environmental policies on paper but weak operational discipline may never convert those policies into lower costs or a steadier cash flow. Operational efficiency, measured through operating margin, asset turnover, and returns on assets, captures this capacity for execution. Where efficiency is high, the routines that make up environmental governance are more likely to translate into financial stability; where it is low, the same governance may remain idle. In other words, environmental and operational capabilities are complementary.

H2: Operational efficiency positively moderates the ERMI-FR relationship, such that the association is stronger for more operationally efficient firms.

The second boundary condition was external. Credit ratings aggregate a great deal of information about a firm's risk and repayment capacity and act as gatekeepers to the cost and availability of debt [11]. As set out above, this is also the channel through which corporate social and environmental performance has been shown to register, both in the ratings themselves [9] and in the price of bank credit [10]. A firm whose creditworthiness is stable is one that lenders already monitor closely and

trust, and in that environment, environmental governance is more likely to be noticed and rewarded through steadier financing terms. Where credit standing is unstable, the same governance improvements may be drowned out by more pressing concerns regarding repayment. Credit-rating stability should therefore amplify the resilience benefit of environmental governance. This study measures it as the stability of a firm's rating over the observation window rather than as a simple investment-grade flag because stability better captures the continuity of market trust that the mechanism requires.

H3: Credit-rating stability positively moderates the ERMI-FR relationship, such that the association is stronger for firms with more stable credit standings.

Finally, if the ERMI and its two boundary conditions each carry information about resilience, a model that combines them should explain financial resilience better than firm characteristics alone. This is not a mechanical restatement of earlier hypotheses. It tests whether the environmental and organizational variables add explanatory power over and above the sector and size controls that are known to drive financial outcomes.

H4: A model combining the ERMI, operational efficiency, credit rating stability, and their interactions explains significantly more variance in financial resilience than a controls-only baseline.

Taken together, these four hypotheses respond to the gap that Indian evidence has left open. Existing studies on environmental governance and financial outcomes in India rely on purchased ESG ratings, whose construction is opaque, test profitability or market value rather than resilience, and treat the relationship as unconditional rather than asking when it holds. The objective of this study is therefore to construct a transparent, disclosure-based measure of environmental risk management from mandatory BRSR filings, and to test whether, and under what conditions, that measure is associated with financial resilience across a balanced panel of Indian listed firms. Its significance is both methodological and practical. Methodologically, it supplies an auditable environmental measure that other researchers can reproduce from public filings rather than by purchase. Practically, it provides boards, lenders, and regulators with evidence of when environmental governance actually accompanies financial durability, instead of assuming that it always does. Section 2 sets out the data and methods, Section 3 reports the results, and Section 4 draws the conclusions and implications.

2. Methodology

2.1 Sample and Data

The sample is a balanced panel of 200 firms listed on the Bombay Stock Exchange (BSE), observed across three financial years from 2022-23 to 2024-25, giving 600 firm-year observations. The window begins with the first year of mandatory BRSR reporting, which fixes the point at which comparable environmental disclosures became available. Firms were drawn from five sectors selected for their varied environmental exposure: manufacturing (52 firms), financial services (45), information technology (37), healthcare (35), and energy (31). Selection required an unbroken listing and complete audited financial and sustainability disclosures for all three years. No firm was excluded on the basis of financial performance, so loss-making and highly leveraged firms remain in the sample to avoid a survivor bias toward stronger performers.

Data were assembled from audited annual reports, BRSR filings, exchange disclosures, and credit-rating reports from Indian agencies. The panel is short in its time dimension, with three years, but wide in its cross-section with 200 firms. For a study whose central variable is a slow-moving structural characteristic of the firm, this shape is appropriate. As Baltagi [21] sets out, asymptotic behavior in panel estimation comes from the cross-sectional dimension rather than the time dimension when

the panel is short. The sample size comfortably exceeds the conventional thresholds that Hair *et al.*, [22] recommend for regression with the number of predictors used here.

2.2 Measurement of Variables

The Environmental Risk Management Index is an independent variable. It is a composite of ten governance dimensions drawn from the BRSR and related disclosures: environmental policy, compliance, risk assessment, waste management, emissions management, board-level practices, external engagement and disclosure, stakeholder engagement, governance and financial integration, and risk and compliance integration. Each dimension was scored from the disclosure content, normalized, and combined into a single index on a zero-to-one scale. Because the ten dimensions are expected to share a common cause in the firm's environmental commitment, ERMI is treated as a reflective composite and validated accordingly, following the specification criteria of Coltman *et al.*, [23].

Scoring follows a disclosure content protocol applied uniformly across firms and years. Within each of the ten dimensions, a set of sub-indicators is coded from the BRSR filing and supporting reports according to whether the firm discloses the relevant policy, process, or outcome. The sub-indicator scores are aggregated and normalized to place each dimension on a common zero-to-one scale. The ten normalized dimensions were then averaged into the ERMI. Because the protocol reads disclosed content rather than assigning subjective ratings, two coders applying it to the same filing should reach the same score, which supports the index's replicability. This disclosure-based construction is the feature that separates ERMI from vendor ESG ratings, whose opacity and disagreement across providers Gillan *et al.*, [18] document in detail.

The Financial Resilience Index is the dependent variable. It combines four dimensions of financial health: profitability stability, liquidity strength, leverage resilience, and solvency position. Unlike the ERMI, the FR is specified as a formative index. Its four dimensions are causes of resilience rather than interchangeable reflections of it; thus, a firm can be resilient through different combinations of the four. Diamantopoulos and Winklhofer [24] set out the construction rules for indices of this kind, and Coltman *et al.*, [23] specify the tests that distinguish a formative from a reflective specification. Following both, the FR is validated through the significance and independence of its components rather than through internal-consistency statistics, which would be inappropriate for a formative construct. The FR was also scored on a zero-to-one scale.

Each FR dimension is computed from the audited financial statements before normalization. Profitability stability is derived from the steadiness of returns rather than their level; thus, a firm with lower but steadier earnings is treated as more resilient than one with higher but volatile earnings. Liquidity strength is built from current and quick ratios, leverage resilience from debt-to-equity and interest-coverage measures, and solvency position from debt-to-asset and equity ratios. Because these four dimensions can substitute each other in producing overall resilience, they are combined formatively rather than averaged as reflections of a single latent trait. The construction deliberately avoids collapsing resilience into a single accounting ratio, which would lose the multidimensional character that makes the concept useful for policy.

Two moderators were used. Operational efficiency (OE) is a composite of operating margin, asset turnover, and return on assets. Credit-rating stability (CRS) is measured as one minus the standard deviation of a firm's numeric credit rating over three years, such that a higher value denotes a more stable rating. Firm size, measured as the natural logarithm of total assets, is included as a control because larger firms disclose more and differ systematically in their financial profiles. Year and sector fixed effects control for common macroeconomic shocks and structural differences across industries.

Leverage and liquidity are deliberately excluded as separate controls because they are constituent dimensions of the dependent variable, and including them would create a mechanical dependence between the predictors and the outcome.

2.3 Analytical Approach

The analysis was conducted in three steps. It first validates the two indices, then estimates the direct ERMI-FR association, and finally tests the two moderators and the combined models. Because ERMI is a stable structural characteristic that changes little within a firm over three years, its relationship with FR is identified mainly across firms rather than within them. The primary estimator is therefore pooled ordinary least squares (OLS) with year and sector fixed effects and firm size control, using standard errors clustered by firm. Fixed-effects, random-effects, and between estimators are reported alongside as a check on where the variation lies [21]. Moderation was tested by adding interaction terms between the standardized ERMI and each standardized moderator. The combined model was compared with a control-only baseline using the change in explained variance and an F-test, with Cohen's f^2 [25] as the effect size. A specification using one-year-lagged ERMI checks that the association is not an artifact of contemporaneous movements.

The estimated relationship takes the general form given by Eq. (1).

$$FR_{it} = \beta_0 + \beta_1 ERMI_{it} + \beta_2 M_{it} + \beta_3 (ERMI_{it} \times M_{it}) + \beta_4 \ln(TA_{it}) + \gamma_t + \delta_s + \varepsilon_{it} \quad (1)$$

where FR is the financial resilience of firm i in year t , ERMI is its environmental risk management index, M denotes a moderator (either operational efficiency or credit-rating stability), the interaction term carries the moderation test, TA is total assets, γ and δ are year and sector fixed effects, respectively, and ε is the error (residual) term. The direct-effect model omits moderators and interactions. Each moderator was entered in a separate model so that the correlation between moderators did not destabilize the coefficients, and the combined model then entered both moderators together to assess their joint contribution. Standardizing the ERMI and moderators before forming the interaction terms reduces non-essential multicollinearity and makes the interaction coefficients comparable. Reporting the pooled, between, fixed-effects, and random-effects estimates side by side is not redundant; the spread across estimators is evidence of whether the relationship lives across firms or within them. Baltagi [21] provides the formal basis for reading the between and within estimators as answering different questions. Bell and Jones [26] argue specifically that discarding between-firm variation, as a fixed-effects specification does, throws away the variation of interest when the explanatory variable is slow-moving, which is precisely the case here.

3. Results

3.1 Validation of the Measurement Indices

The Environmental Risk Management Index shows strong measurement property. The internal consistency across its ten dimensions is high, with a Cronbach's α of 0.918, well above the conventional threshold of 0.70 recommended by Hair *et al.*, [22]. The sampling adequacy was acceptable, with a Kaiser-Meyer-Olkin (KMO) statistic of 0.714. An exploratory factor analysis returned two factors with eigenvalues above one, 6.786 and 1.228, which together explained 80.2% of the variance in the ten dimensions. The first factor dominates, accounting for 59.7% of the variance on its own, which indicates that a single strong governance dimension runs through the index, while

a smaller second dimension captures disclosure and external engagement. The index is best understood as a coherent, higher-order construct rather than a set of unrelated items. Table 1 summarizes the validation results.

Table 1

Validation of the Environmental Risk Management Index

Statistic	Value	Threshold / note
Cronbach's α (10 dimensions)	0.918	> 0.70
Kaiser-Meyer-Olkin (KMO)	0.714	> 0.60
Factors retained (eigenvalue > 1)	2 (6.786, 1.228)	Kaiser criterion
Variance: Factor 1 / Factor 2	59.7% / 20.4%	—
Cumulative variance explained	80.2%	> 60%
FR inter-dimension correlation range	-0.092 to 0.232	Distinct (formative)

The Financial Resilience Index behaves as a formative construct. The correlations among the four dimensions are low to moderate, ranging from -0.092 to 0.232, which confirms that profitability stability, liquidity, leverage resilience, and solvency capture related but distinct aspects of financial health rather than a single underlying factor. This pattern supports the decision to model FR formatively and validate it through dimension independence rather than internal consistency, following the criteria of Coltman *et al.*, [23].

3.2 Descriptive Statistics

Table 2 reports the descriptive statistics for the main variables. The mean ERMI is 0.795 with a standard deviation of 0.214, showing that most firms in the sample disclose substantial environmental governance, while a meaningful minority lags. The mean FR is 0.256 with a standard deviation of 0.069, a comparatively tight distribution that reflects the composite, normalized construction of the index. Operational efficiency averages 0.253, and credit rating stability, available for 480 of the 600 observations, averages 0.866, indicating that most rated firms held stable ratings over the window. Firm size, measured by log total assets, averages 9.78.

Table 2

Descriptive statistics (N = 600 firm-year observations)

Variable	Mean	SD	Min	Max
ERMI	0.795	0.214	0.150	1.000
Financial Resilience (FR)	0.256	0.069	0.020	0.589
Operational Efficiency (OE)	0.253	0.068	0.002	0.668
Credit Rating Stability (CRS)	0.866	0.181	0.000	1.000
Firm Size (ln total assets)	9.779	2.034	5.045	15.714

3.3 The Direct Association between ERMI and Financial Resilience

The unconditional relationship between environmental governance and financial resilience was not positive. The simple correlation between ERMI and FR is -0.076, and a pooled regression without controls returns a small negative coefficient that is insignificant. The between-firm, fixed-effects, and random-effects estimators all return coefficients close to zero. Table 3 presents these results. Taken at face value, this suggests that environmental governance does nothing for resilience or even works against it.

Table 3

The ERMI-FR association across estimators

Specification	β (ERMI)	p	R ²
Raw Pearson correlation	-0.076	—	—
Pooled OLS (no controls)	-0.024	0.169	0.006
Between-firm (means)	-0.037	0.151	0.010
Fixed effects (within)	0.010	0.339	0.005
Random effects	0.007	0.509	~0
Controlled (size, year, sector), std.	0.012	0.003	0.412
Lagged ERMI (t-1), std.	0.013	0.001	—

This conclusion would be incorrect, and the reason is instructive. The negative raw association is a case of the reversal that Blyth [27] formalizes as the Simpson's paradox. Sector composition confounds the bivariate relationship: capital-intensive sectors, such as energy, face higher inherent financial volatility, which lowers FR, while regulation pushes them toward stronger environmental governance, which raises ERMI. The negative sign at the pooled level is therefore a sectoral artefact rather than a firm-level truth. Once sector and firm size are controlled, the sign reverses. In the controlled specification, the standardized ERMI has a positive and significant coefficient of 0.012 ($p = 0.003$), with the model explaining 41.2% of the variance in FR. The effect is modest in size, equivalent to roughly one-sixth of a standard deviation of FR for a one-standard-deviation increase in ERMI, but it is robust and correctly signed. H1, which posited a conditional association, was supported.

The estimator comparison in Table 3 also indicates this effect. The fixed-effects coefficient is near zero, which shows that little of the relationship comes from within-firm changes over three years. This is expected because environmental governance is a structural characteristic that moves slowly; therefore, its association with resilience is identified across firms, not within them. The one-year-lagged specification, in which ERMI in the prior year predicts FR in the current year, returns a positive and significant coefficient (standardized 0.013, $p = 0.001$). Bellemare *et al.*, [28] caution that lagging an explanatory variable does not by itself establish causality, but it does support the temporal ordering of the association reported here.

3.4 Operational Efficiency and Credit Standing as Boundary Conditions

The two moderators condition the relationship as predicted. Adding an interaction between the standardized ERMI and standardized operational efficiency produces a positive and significant interaction coefficient of 0.007 ($p = 0.002$). The association between environmental governance and financial resilience is stronger for firms that are more operationally efficient, consistent with the argument that firms need the capability to execute before environmental governance appears in financial stability. H2 is supported. Table 4 reports the moderation results of the study.

Table 4

Moderation of the ERMI-FR relationship

Moderator	Interaction β (std.)	p	n	Verdict
Operational Efficiency	0.007	0.002	600	Supported
Credit Rating Stability	0.010	0.014	480	Supported

Credit rating stability moderates this relationship in the same direction. The interaction between standardized ERMI and standardized credit-rating stability is positive and significant, with a coefficient of 0.010 ($p = 0.014$), estimated over the 480 observations for which ratings are available. Firms with more stable credit standings extract stronger resilience benefits from environmental governance, in line with the view that external credit markets must recognize governance before it is rewarded. H3 is supported. Both moderators were small in magnitude, in keeping with the modest direct association, but both were statistically robust and theoretically coherent.

3.5 Combined Model and Robustness

The combined model tests whether the environmental and organizational variables add explanatory power beyond controls. A baseline model containing only firm size, year, and sector explains 44.8% of the variance in financial resilience, which shows how much of FR is structural. Adding ERMI, the two moderators and their interactions raised the explained variance to 51.2%, an increase of 6.4 pp. The change is statistically significant, $F(5, 467) = 12.25$, $p < 0.001$, with a Cohen's f^2 of 0.13, a small-to-medium effect on the benchmarks Cohen [25] sets out. Table 5 reports the comparison. H4 is supported. The environmental and organisational block matters, though its contribution is incremental rather than dominant, sitting on top of a large structural base.

Table 5

Combined model versus controls-only baseline

Model	R ²	Change
Baseline (firm size, year, sector)	0.448	—
Combined (+ ERMI, OE, CRS, interactions)	0.512	$\Delta R^2 = 0.064$
Effect size / test	$f^2 = 0.13$	$F(5,467) = 12.25$, $p < 0.001$

Two robustness checks support the finding. The lagged specification already reported confirms that the association is not driven by contemporaneous co-movement. The agreement between the between-firm estimate and the controlled cross-sectional estimate, against a near-zero fixed-effects estimate, confirms that the relationship is a stable between-firm association rather than a within-firm dynamic. This is the honest character of the result: environmental governance distinguishes more resilient firms from less resilient ones across the cross-section, conditional on their sector and size, and more so when firms are efficient and credit-stable.

Taken together, the four hypotheses describe a coherent and defensible pattern. Environmental governance is not unconditionally tied to resilience, since the raw association is absent, but it is positively and significantly tied to resilience once the confounding role of the sector is removed (H1). This conditional tie is stronger for operationally efficient firms (H2) and for credit-stable firms (H3), with the combined model adding real explanatory power over controls (H4). The effects are modest in size throughout, which is consistent with a structural characteristic that shapes resilience at the margin rather than dominating it. Modest, well-identified associations of this kind are more credible in an observational panel than the large effects sometimes reported in single-sector or bivariate designs.

4. Conclusions

This study asked whether the environmental risk-management capability now visible through India's BRSR mandate is associated with firm financial resilience, and under what conditions. The answer was qualified. There is no unconditional relationship; at the raw level, environmental governance and resilience are not positively linked, and the negative bivariate association is a sectoral artifact. Once the sector and size are controlled, environmental governance is positively and significantly associated with resilience, although the effect is modest. The relationship is stronger for firms that are operationally efficient and have a stable credit standing. A model combining these elements explains materially more of the variation in resilience than firm characteristics alone.

This contribution is twofold. First, this study offers a disclosure-based Environmental Risk Management Index built from audited BRSR content rather than a purchased ESG score, with strong measurement properties and a transparent, replicable construction. For an emerging market where comparable environmental data are scarce, this is a usable measurement tool in its own right. Second, this study shows that the value of environmental governance for resilience is contingent. It works through internal operational capability, which is the mechanism Sirmon *et al.*, [20] describe when they argue that resources create value only once a firm structures, bundles, and leverages them, and through external credit recognition, which is the stakeholder channel Freeman [15] identifies in the relationship between a firm and its providers of capital. Locating the environment-finance relationship in these two mechanisms is more useful than treating it as a universal effect. The reversal from a negative raw association to a positive conditional one is itself a methodological caution for the Indian ESG literature, where bivariate or single-sector designs may be misleading.

The practical implications follow from this conditionality. For boards, the message is that environmental governance is more likely to pay off in resilience when it is paired with operational discipline; governance structures without execution are unlikely to influence financial outcomes on their own. For lenders and investors, environmental governance carries more information about resilience for firms that are already efficient and credit-stable, which argues for reading environmental disclosure alongside operational and credit indicators rather than in isolation. For SEBI and policymakers, the results support the value of standardized BRSR disclosure while cautioning that disclosure alone does not guarantee financial benefit; the benefit depends on firm capability.

However, several limitations of this study should be noted. The panel covers three years, which is enough to establish a stable cross-sectional association but not to identify long-run dynamics or firm-level change. The relationship is associational; the near-zero fixed-effects estimate and the absence of an instrumental-variables design mean the study does not claim that changing a firm's environmental governance will change its resilience. The ERMI is built from self-reported disclosure; therefore, it captures disclosed governance rather than independently verified environmental performance and may be affected by differences in reporting quality. The sample is confined to larger BSE-listed firms in five sectors and one country, which limits generalizability. Future work could extend the panel as more BRSR years accumulate, add independent verification of environmental performance, apply instrumental-variables or dynamic-panel methods to address endogeneity, and test whether the conditional pattern found here holds in other emerging markets.

The broader lesson is that environmental governance and financial resilience are connected in Indian firms, but through a narrower and more demanding channel than the headline ESG literature suggests. Environmental capability supports resilience when firms can execute and when markets are watching. This is a smaller claim than a universal effect and is more credible.

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Declarations

Ethics statement

This study used publicly available secondary data on listed firms and did not involve human participants, human data. Ethics committee approval was therefore not required.

Data availability statement

The data supporting the findings of this study derive from publicly available sources: mandatory Business Responsibility and Sustainability Reporting filings and audited financial statements published through the Bombay Stock Exchange, and credit-rating reports issued by Indian rating agencies (CRISIL, ICRA, CARE Ratings and India Ratings). The assembled firm-year panel is available from the authors on reasonable request.

Conflict of interest statement

The authors declare that they have no competing financial or personal interests that could have influenced the work reported in this paper.

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