
Intertemporal Dynamics of Sustainability Disclosures: Evidence of Contemporaneous and Lagged Performance Effects in Indian Firms

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Abstract: The paper investigates the linkage between corporate sustainability policies and the firm performance of companies listed on the NIFTY 50 index, over the post-BRSR period (2021-22 to 2024-25). Going beyond aggregate measures, the research uses a disaggregated approach by analyzing environmental, social, and economic dimensions individually, along with a general measure of sustainability. Furthermore, a one-year lagged framework is included to reflect delays in the outcomes of sustainability investments on financial performance. The pooled Ordinary Least Squares (OLS) regression is used to construct and analyze a near-balanced panel dataset supported by descriptive statistics and correlation analysis. Return on Assets (ROA) and Return on Equity (ROE) are used to measure firm performance, with firm size serving as a control variable. The results suggest the existence of a differentiated association of sustainability practices with the measures and dimensions of performance. The overall sustainability construct demonstrates a stronger association with operational performance (ROA) relative to individual dimensions, whereas no significant relationship is observed with shareholder returns (ROE). Moreover, the one-year lagged analysis indicates that sustainability practices are associated with effects that may be realized over time rather than immediately. The research contributes to the body of literature on sustainable development and performance identification by jointly analyzing both dimension-specific and aggregate impacts within a one-year lag framework. Using post-BRSR Indian firm-level data, it uncovers differential and intertemporal impacts of sustainability practices, highlighting their stronger influence on operational efficiency than on immediate shareholder returns.

Keywords: Financial performance (ROA, ROE), Indian firms, lagged model, NIFTY 50, panel data analysis, sustainability reporting.

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INTRODUCTION

Sustainability has become a “strategic imperative” and an integral part of corporate strategies in recent years (Adolph & Beckmann, 2024). Mounting pressure from stakeholders and regulators to function in an environmentally responsible, socially inclusive, and ethically governed manner has further fuelled the



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integration of sustainability into corporate culture (Sun, Sulemana, & Agyemang, 2025). This development has marked a significant shift in focus from the traditional profit-centric reporting to a more holistic model of value creation and responsible business conduct, marking “sustainability” as an important determinant for corporate success.

In the Indian context, the importance of corporate sustainability has gained momentum due to regulatory interventions like the introduction of Business Responsibility and Sustainability Reporting (BRSR) by the Securities and Exchange Board of India (SEBI) (Dhar & Imran, 2026). Under this framework, it is mandatory for the large listed corporations (top 1,000 by market capitalisation) to report their non-financial performance. BRSR increases the consistency, comparability, and reliability of non-financial information through offering a standardised and overarching reporting framework on environmental, social, and governance aspects (Kanhaiya, 2023). This evolution does not just promote firms to consider sustainability as part of strategic decisions, but it also provides a systematic framework regarding sustainability performance measurement (Mohanty, Priya, Paithe, & Mohanty, 2025), hence being of special interest in terms of empirical research in the Indian context. As a result of this regulatory shift, firms are increasingly adopting sustainability as a part of their strategic decisions, which makes it essential to evaluate the economic impact of such practices (Bhaskar, Chortane, Kumar, & Pandey, 2026).

While the relationship between sustainability reporting and firm performance or profitability has been widely studied, most researchers have focused on the aggregate score, which can conceal the distinct contributions made by each dimension (i.e., economic, environmental, and social). Additionally, the timing of benefits resulting from engaging in sustainable practices is rarely considered.

The financial benefits of investments in sustainability practices might be delayed, and the current performance metrics might not measure the actual effect (Tutar, Štreimikienė, & Mutlu, 2025). All these problems make the literature less consistent and thus encourage a more detailed analysis.

This paper responds to these shortcomings in terms of dimension-wise impacts of sustainability. Using the scores on environmental, social, and economic issues individually, it can determine which of these areas of ESG is most correlated with financial performance, and which dimensions are more consistently related in firms. The study further includes a lagged viewpoint, examining the impact of sustainability initiatives from previous years on current return on assets (ROA) and return on equity (ROE), thereby including the delayed value creation that most traditional studies fail to capture.

The study, based on a panel of NIFTY 50 companies from 2021-22 to 2024-25, contributes to the limited body of Indian firm-level evidence. Besides the direct effects, it highlights similarities in ESG impacts across dimensions, providing managers with insights into sustainability practices most likely to yield quantifiable financial results.

This research goes beyond the generic sustainability-profitability debate by incorporating dimension-wise analysis, lagged effects, and concentration on Indian listed companies to provide a more detailed perspective of the role of sustainability in corporate performance.

This research project has aimed to study the effect of both individual and integrated sustainability dimensions on firm performance, including lag effects, in the selected Indian firms.

This study contributes to the existing body of literature on sustainability reporting in three key ways. First, it provides a disaggregated analysis of environmental, social, and economic sustainability dimensions. Second, it incorporates a lagged framework to capture the temporal effects of sustainability practices. Third, it offers firm-level evidence from India in the post-BRSR regulatory environment.

LITERATURE REVIEW

Sustainability and Firm Performance: The Conceptual Vs Empirical Debate

Firms are increasingly integrating economic, environmental, and social considerations into their strategic decision-making (Oza & Patekar, 2024). Due to this, the relationship between sustainability and firm performance is being discussed significantly. From a theoretical perspective, the stakeholder theory proposes

that firms that actively report their sustainable performance create long-term value as a result of fulfilling stakeholder expectations (Bajwa, Wood, & Rus, 2024). Similarly, legitimacy theory suggests that sustainability disclosures help improve a firm's credibility, which may affect the financial outcomes positively (Sehgal, Garg, & Singh, 2023).

The empirical evidence commonly shows that there exists a positive relationship between sustainability practices and performance of the firm (Bodhanwala & Bodhanwala, 2018, 2022). Studies have also found that while sustainability disclosures and firm performance show a positive correlation when measured by return on assets (ROA), they sometimes fail to show similar results when compared with other indicators (Velte, 2017). Similarly, several studies have shown mixed results, especially when measured in the short term.

These contradictions imply that the relationship between sustainability and performance is intricate and depends on measuring methods, timeframes, and firm-related aspects.

Measurement Approaches in Sustainability Research

In sustainability research, the method used to measure sustainability disclosure is an important concern. Diverse methods such as ratings by third parties or sustainability scores derived from analysing sustainability reports against some standards have been used in existing studies (Boiral & Henri, 2017; Drempetic, Klein, & Zwergel, 2020). Each approach has inherent advantages as well as limitations.

The ratings of external agencies are widely used in the studies as they are simple and comparable. However, such measures often rely on predefined weightings and external assessment methodologies, which may vary significantly across rating agencies and consequently, lead to inconsistency in empirical findings (Berg, Koelbel, Pavlova, & Rigobon, 2022).

The adoption of disclosure-based assessment of sustainability reporting derived from annual or sustainability reports is also common in firm-level studies, particularly in the emerging markets (Samarakoon, Mishra, Pradhan, Jayakumar, & Bagchi, 2025). In situations where ratings provided by external agencies are limited and inconsistent, this approach is generally considered more suitable.

Sustainability Dimensions: Fragmented Insights

Despite the multidimensional nature of sustainability, research that looks at particular dimensions is still scarce and dispersed. The environmental aspect of sustainability has been fairly investigated (Ambec, Cohen, Elgie, & Lanoie, 2013; Delmas, Hoffmann, & Kuss, 2011; Porter & van der Linde, 1995). There is some evidence that environmental programs have the potential to improve operational efficiency and lower long-term expenses, but this may not translate into short-term benefits.

The social aspect is commonly modelled using Corporate Social Responsibility (CSR) (Carroll, 1999; Kong, Antwi-Adjei, & Bawuah, 2020; Valiente, Ayerbe, & Figueras, 2012), and the key elements addressed by it include employee welfare, social interactions, and philanthropy. Nonetheless, CSR is not an exhaustive definition of the expanded concept of social sustainability that encompasses diversity, inclusion, human rights, and relationships with stakeholders. Consequently, the results of the CSR-based studies cannot be directly related to comprehensive sustainability frameworks.

The financial or political aspect has been more directly examined, especially regarding transparency, accountability, and financial discipline. Good governance mechanisms are linked to better firm performance due to low agency costs and proper strategic decision-making. Studies also observe that governance is relatively more strongly and consistently related to financial performance (Velte, 2017).

Time-Lag and Dynamic Effects in the Sustainability-Performance Relationship

The nature of sustainability practices is long-term in nature because the investments in the environmental, social, and economic activities are normally costly in the short run but realize the benefits over time (Morales-Raya & Muñoz, 2024). The benefits gained in the fields of operational efficiency, corporate reputation, and the relations with the stakeholders usually take some time before turning into the results that can be measured in

monetary terms (Nollet, Filis, & Mitrokostas, 2016). Consequently, the effect of sustainability on firm performance may not be adequately represented by contemporaneous analysis.

Studies have also found a non-linear relationship between sustainability reporting and firm value, which indicates that the positive effects may only start showing after a certain period (Nuber, Velte, & Hörisch, 2020). The short-term impacts can be a reflection of the cost of sustainability investment at the time of action, and the long-term impacts will encompass value creation in terms of competitiveness and reduction of risks.

Sustainability Studies in Terms of the Indian Context

Empirical studies on sustainability have been accelerating over the past few years, especially with growing regulatory attention on sustainability reporting. The introduction of the Business Responsibility and Sustainability Reporting (BRSR) framework by the Securities and Exchange Board of India (SEBI) has further strengthened sustainability disclosure practices by providing a standardized format for reporting environmental, social, and governance-related information (Sharma & Anawade, 2026). This has improved the consistency and comparability of non-financial disclosures among Indian firms (Mohanty et al., 2025).

Studies analysing sustainability reporting and firm performance have revealed a significant and positive relationship between the two, especially in the case of firms with greater transparency in sustainability reporting (Kumar & Firoz, 2022). However, certain studies highlighted that this relationship is not that strong in the case of emerging countries like India, as compared to developed markets like Japan (Laskar, 2018).

These results suggest that although sustainability practices are increasingly relevant to firm performance in India, most research relies on aggregated measures and cross-sectional designs. Consequently, the use of panel data, dimension-level analysis, and one-year lagged analysis remains limited within the Indian context.

Pooled OLS is employed as the baseline estimation technique due to the short panel structure. However, it is recognized that this approach may not fully capture unobserved firm-specific heterogeneity inherent in panel data. This limitation associated with the method employed is acknowledged and discussed in the methodology section.

RESEARCH GAP AND OBJECTIVES

The analysis of the literature review shows that there are multiple constraints in the study of sustainability and firm performance.

Firstly, most of the studies are based on aggregated sustainability or ESG scores, which include the environmental, social, and governance dimensions into one index (Chelawat & Trivedi, 2016; Sharma, Pandey, Jain, & Dangwal, 2022). Although this method is easier to analyse, it has the tendency to blend the individual outcomes of various aspects, hence restricting the appreciation of the various aspects of sustainability that affect the performance of firms. Therefore, the relative comparisons on a dimension level are not thoroughly studied.

Second, the current body of evidence on the environmental, social, and economic dimensions is disjointed and heterogeneous, with studies often focusing on a single dimension or using different proxies, especially regarding the social dimension. The absence of a unified framework limits the ability to evaluate the relative importance and consistency of sustainability dimensions.

Third, empirical studies in the Indian context remain immature and mostly cross-sectional and unaggregated in nature. Besides, although sustainability investments are long-term investments (Da Cunha, Policarpo, De Oliveira, Abdala, & Do Nascimento Rebelatto, 2025), lagged effects are seldom considered, which partially confines the interpretation of the financial impact of sustainability investments.

Therefore, there is a gap in exploring the individual sustainability dimension in firm performance within the Indian context using a lagged and differentiated effect.

Objectives of the Study

- i. To analyse the impact of environmental, social, and economic sustainability dimensions on firm performance.

- ii. To examine the combined effect of sustainability on firm performance.
- iii. To evaluate the lagged impact of sustainability on firm performance.

MATERIALS AND METHODS

Data and Sample Selection

The study follows a quantitative research design. It examines the relationship between sustainability reporting and firm performance. The sample consists of companies listed in the NIFTY 50, representing large and actively traded firms in India.

A near-balanced panel dataset has been constructed for the study period, encompassing four financial years (2021-22 to 2024-25). Business Responsibility and Sustainability Reporting (BRSR) was introduced by the Securities and Exchange Board (SEBI) in May 2021. This regulatory change led to increased emphasis on structured sustainability disclosures in India. The study period was selected considering the recent regulatory shift in the country. Data on sustainability practices were collected from published annual reports, sustainability reports, and BRSR disclosures of the selected companies. Financial data were obtained from audited financial statements, which are part of published annual reports and reliable financial databases.

Companies with unavailable or incomplete data during the study period were excluded to ensure dataset consistency and reliability. Firms with missing observations for any year, such as newly listed firms with limited reporting history, were removed, resulting in a near-balanced panel dataset.

One firm (Jio Financial Services) was excluded as it was listed in 2023 and lacked complete data for the study period.

Variables and Measurement

The study includes measures of firm performance, sustainability indicators (encompassing all three dimensions of sustainability), and a control variable.

Dependent Variables

The firm's performance has been measured by using two accounting-based indicators:

Return on Assets (ROA): This indicator serves as a measure of the efficiency of asset utilization in order to generate profits.

Return on Equity (ROE): This indicator measures the returns generated on shareholders' funds.

Independent Variables

Sustainability performance has been measured across the three dimensions of sustainability as stated in the GRI series standards:

Environmental Score (ENV)

Social Score (SOC)

Economic Score (ECO)

A combined Sustainability Score (SUSTAINABILITY) has been constructed in order to assess the overall sustainability performance of a firm.

The economic dimension discussed in this study is based on the Global Reporting Initiative (GRI 200 series). It includes aspects such as financial performance, market presence, and anti-corruption practices. Although labeled "economic" following GRI classification, these indicators mainly reflect governance-related attributes like transparency, accountability, and ethical conduct. Consequently, the economic dimension broadly aligns with the governance (G) component in Environmental, Social, and Governance (ESG) literature.

Sustainability Scoring Method

A structured content analysis approach has been adopted based on GRI indicators and their mapping with the BRSR indicators. Each disclosure item has been scored in the following way:

0 = GRI indicator not reported and no reason provided.

1 = GRI indicator reported, and the indicator is mapped to mandatory BRSR requirements.

2 = GRI indicator reported, and the indicator is mapped to voluntary BRSR requirements.

3 = GRI indicator reported, and the indicator is not covered under BRSR requirements (indicating proactive sustainability practices).

Not Applicable (N/A) = Indicator not reported, but a valid reason has been provided.

The total sustainability score for each firm has been computed according to the above-mentioned scoring system. The scores were then adjusted for non-applicable indicators. The final score is then converted into a percentage. In order to perform statistical analysis, the percentages were subsequently transformed into decimal form. The construction of the sustainability disclosure index is supported by a systematic mapping of GRI indicators to BRSR disclosures, as detailed in Appendix A.

Given that the sustainability disclosure index is derived from standardized reporting frameworks (GRI and BRSR) and captures multiple dimensions of sustainability, the use of internal consistency measures such as Cronbach's alpha is not considered appropriate.

Control Variable

Firm Size (SIZE): Measured as the natural logarithm of total assets to control for firm-specific scale effects.

Model Specification

To examine the relationship between sustainability practices and firm performance, three regression models are estimated.

Model 1: Disaggregated Sustainability Model

$$ROA/ROE = \beta_0 + \beta_1 ENV + \beta_2 SOC + \beta_3 ECO + \beta_4 SIZE + \epsilon$$

Model 2: Combined Sustainability Model

$$ROA/ROE = \beta_0 + \beta_1 SUSTAINABILITY + \beta_2 SIZE + \epsilon$$

Model 3: Lagged Sustainability Model

$$ROA/ROE_t = \beta_0 + \beta_1 SUSTAINABILITY_{(t-1)} + \beta_2 SIZE + \epsilon$$

Analytical Techniques

The study employs statistical techniques suitable for panel data analysis. Descriptive statistics are used to summarize the dataset, while correlation analysis is conducted to examine initial relationships among variables. Regression analysis is performed using the pooled Ordinary Least Squares (OLS) method. The pooled OLS approach treats the panel dataset as a combined cross-sectional sample and is appropriate for estimating the average effect of sustainability practices across firms and over time, given the short time horizon of the study and the near-balanced structure of the panel dataset after excluding firms with incomplete observations. One company had to be excluded from the dataset due to incomplete data. This exclusion resulted in 196 firm-years observed for this study.

Variance Inflation Factor (VIF) and tolerance values were used to determine multicollinearity. VIF values ranged from 1.004 to 2.096, well below the accepted threshold of 10. Tolerance values were above 0.1, confirming no multicollinearity. Other diagnostics, including the condition index, were below the critical threshold, with no problematic clumping of variance.

The Breusch-Pagan test was applied to test the heteroskedasticity. The findings show that there is no heteroskedasticity ($F = 1.163$, $p = 0.328$); therefore, the assumption about equal error variance is met.

The Durbin-Watson statistic was also used to assess autocorrelation. The baseline ROA model showed positive autocorrelation. However, it was significantly decreased ($DW = 1.632$) after including a lagged dependent variable, making the model more reliable.

To ensure robustness, Fixed Effects and Random Effects models were also estimated. The outcomes of the Random Effects were generally in line with pooled OLS, especially in the ROA model, whereas Fixed Effects estimates showed firm-specific heterogeneity. Due to the short panel structure and the consistency of results, pooled OLS is maintained as the baseline model. The results have been interpreted in the context of these robustness checks.

It is worth mentioning that the empirical model is a pooled OLS estimate with related robustness tests. Based on this, the findings must be viewed as reflecting statistical relationships but not causal ones. Although the lagged specifications allow us to gain some insights into time, it may not be possible to completely exclude the possibility of endogeneity and unobserved heterogeneity.

RESULTS AND DISCUSSION

Impact of Environmental, Social, and Economic Sustainability Dimensions on Firm Performance

Table 1 presents the descriptive statistics of the study variables. The table offers preliminary insights into the distribution and variability of the study variables across the sample firms.

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Eco	196	0.316	1.000	0.544	0.129
Env	196	0.326	0.974	0.668	0.130
Soc	196	0.356	1.000	0.645	0.147
ROA	196	-13.40	39.44	7.915	7.901
ROE	196	-25.67	409.35	20.480	32.413
Ln(Size)	196	2.482	15.805	11.674	1.997

The results of the descriptive statistics show moderate variation across sustainability dimensions and firm performance variables (ROA and ROE). Among the sustainability measures, environmental performance exhibits the highest mean value, followed by social and economic dimensions. This suggests that environmental disclosure among sample firms is relatively stronger than the rest.

The firm's performance measures show considerable dispersion. Especially in the case of ROE, the descriptive statistics reflect high variability, meaning shareholder returns vary significantly across firms. ROA demonstrates relatively lower variability, indicating a more stable asset-based performance. Firm size was measured as the natural logarithm of total assets. Results show reasonable variation, which confirms the presence of both small and large firms within the sample.

Table 2: Correlation Analysis

Variables	ROA	ROE	ECO	ENV	SOC	Ln(Size)
ROA	1	0.409**	0.291**	0.219**	0.220**	-0.403**
ROE	0.409**	1	0.060	-0.049	-0.010	-0.178*
Eco	0.291**	0.060	1	0.659**	0.652**	-0.032
Env	0.219**	-0.049	0.659**	1	0.649**	0.010
Soc	0.220**	-0.010	0.652**	0.649**	1	0.019
Ln(Size)	-0.403**	-0.178*	-0.032	0.010	0.019	1

Note: ** $p < 0.01$, * $p < 0.05$.

Table 2 presents the results of the correlation analysis among the study variables. The analysis indicates that all three dimensions of sustainability, environmental, social, and economic, are positively and significantly

associated with firm performance measured by ROA. Among these, economic sustainability shows the strongest relationship ($r = 0.291$, $p < 0.01$), followed by social and environmental dimensions.

In contrast, none of the sustainability dimensions show a significant relationship with ROE. This suggests that sustainability practices may not directly influence shareholder returns at the bivariate level.

Firm size is found to be negatively and significantly correlated with both ROA and ROE. Thus, indicating that larger firms tend to exhibit lower profitability.

The intercorrelations among the independent variables remain below the threshold level of 0.70. The results confirm the absence of multicollinearity and support the suitability of the data for regression analysis. Diagnostic tests do not suggest evidence of multicollinearity or violation of regression assumptions. This confirms the robustness of the results.

Table 3: Pooled OLS Regression Results – Impact of Sustainability Dimensions on Firm Performance

Variables	ROA	ROE
Economic (ECO)	0.206** (2.267)	0.160 (1.568)
Environmental (ENV)	0.046 (0.511)	-0.140 (-1.373)
Social (SOC)	0.063 (0.700)	-0.021 (-0.203)
Ln(Size)	-0.398*** (-6.307)	-0.171** (-2.420)
Constant	15.342*** (3.871)	57.208*** (3.134)
R ²	0.244	0.047
Adjusted R ²	0.228	0.027
F-statistic	15.416***	2.370
Sig. (F)	0.000	0.054
Observations (N)	196	196

Note:

- Values in parentheses are t-statistics
- *** $p < 0.01$, ** $p < 0.05$
- Dependent variables: ROA and ROE

Table 3 presents the pooled Ordinary Least Squares (OLS) regression results examining the impact of individual sustainability dimensions on firm performance measured by Return on Assets (ROA) and Return on Equity (ROE). The regression analysis results suggest that the model explaining ROA is statistically significant ($F = 15.416$, $p < 0.01$). An R^2 of 0.244 suggests moderate explanatory power. Among the sustainability dimensions, only economic sustainability exhibits a positive and statistically significant association with ROA ($\beta = 0.206$, $t = 2.267$, $p < 0.05$). In contrast, environmental ($\beta = 0.046$, $p > 0.10$) and social ($\beta = 0.063$, $p > 0.10$) dimensions do not demonstrate statistically significant effects. The results provide us with evidence that governance-related sustainability practices are positively associated with operational efficiency.

Firm size, on the other hand, is found to have a negative and highly significant relationship with ROA ($\beta = -0.398$, $t = -6.307$, $p < 0.01$). This indicates that larger firms may experience lower asset utilization efficiency. For the ROE model, the overall regression is not statistically significant at the 5% level ($F = 2.370$, $p = 0.054$). The model is also characterised by low explanatory power ($R^2 = 0.047$). This suggests that none of the sustainability dimensions exerts a statistically significant influence on ROE. However, firm size shows a negative and significant effect ($\beta = -0.171$, $t = -2.420$, $p < 0.05$), indicating that larger firms tend to generate lower returns to shareholders.

In terms of practical significance, a one-standard-deviation increase in economic sustainability (0.129) corresponds to an approximate 0.027 increase in ROA. Although the magnitude is modest, the result is

economically meaningful, considering the scale of firm-level profitability. It also supports the statistical significance of the relationship.

Overall, the findings suggest that sustainability practices, particularly the economic dimension, are associated with enhanced operational efficiency but do not translate into immediate improvements in shareholder returns. To further examine whether sustainability exerts a stronger effect when considered as a unified construct, the combined sustainability model is estimated.

Combined Effect of Sustainability on Firm Performance

Table 4: Pooled OLS Regression Results- Combined Sustainability and Firm Performance

Variables	ROA	ROE
Sustainability	0.276*** (4.396)	-0.003 (-0.040)
Ln(Size)	-0.401*** (-6.380)	-0.178** (-2.517)
Constant	15.080*** (3.840)	54.733*** (3.013)
R ²	0.238	0.032
Adjusted R ²	0.230	0.022
F-statistic	30.190***	3.168**
Observations (N)	196	196

Note:

- Values in parentheses are t-statistics
- *** p < 0.01, ** p < 0.05
- Dependent variables: ROA and ROE

Table 4 presents the pooled Ordinary Least Squares (OLS) regression results examining the combined effect of overall sustainability performance on firm performance measured by Return on Assets (ROA) and Return on Equity (ROE). The regression results indicate that the model explaining ROA is statistically significant ($F = 30.190$, $p < 0.01$), with an R^2 of 0.238, suggesting that the model explains a moderate proportion of variation in firm performance. The combined sustainability measure exhibits a positive and highly significant effect on ROA ($\beta = 0.276$, $p < 0.01$), indicating that firms with higher overall sustainability performance tend to exhibit better asset-based profitability.

Firm size shows a negative and statistically significant relationship with ROA ($\beta = -0.401$, $p < 0.01$), suggesting that larger firms tend to exhibit lower operational efficiency.

For the ROE model, the regression is statistically significant at the 5% level ($F = 3.168$, $p < 0.05$), although the explanatory power remains low ($R^2 = 0.032$). The combined sustainability measure does not exhibit a significant effect on ROE, indicating that overall sustainability performance does not directly influence shareholder returns. However, firm size continues to show a negative and significant impact ($\beta = -0.178$, $p < 0.05$).

Overall, the findings suggest that aggregate sustainability performance is positively associated with operational efficiency. However, it does not necessarily translate into immediate improvements in terms of equity-based returns.

The results of the analysis demonstrate that individual sustainability dimensions may not independently influence firm performance. However, findings indicate that their combined effect plays a more significant role. This suggests that sustainability operates as a holistic construct, where integrated environmental, social, and economic practices collectively enhance firm performance. The results reinforce the importance of a comprehensive sustainability strategy.

In order to look into whether the impact of sustainability practices is realized over time, a lagged model has been subsequently employed.

Lagged Impact of Sustainability on Firm Performance

Table 5: Pooled OLS Regression Results (Lagged Sustainability and Firm Performance)

Variables	ROA	ROE
Lagged Sustainability	0.300*** (4.287)	-0.008 (-0.094)
Ln(Size)	-0.436*** (-6.243)	-0.161* (-1.970)
Constant	16.296*** (3.833)	56.053** (2.443)
R ²	0.287	0.026
Adjusted R ²	0.277	0.013
F-statistic	29.415***	1.942
Observations (N)	149	149

Note:

- Values in parentheses are t-statistics
- *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$
- Dependent variables: ROA and ROE
- The reduction in observations in the lagged model is due to the loss of first-year data because of lag construction.

Table 5 presents the pooled Ordinary Least Squares (OLS) regression results examining the lagged effect of sustainability performance on firm performance measured by Return on Assets (ROA) and Return on Equity (ROE). The regression analysis results for the lagged model indicate that the ROA model is statistically significant ($F = 29.415$, $p < 0.01$). It also has an R^2 of 0.287, which demonstrates improved explanatory power as compared to earlier models. Results of analysis employing lagged sustainability show a positive as well as highly significant impact on firm performance ($\beta = 0.300$, $p < 0.01$). This suggests that sustainability practices are associated with improved firm performance over time rather than immediately.

In line with prior results, the firm size continues to show a negative and statistically significant relationship with ROA ($\beta = -0.436$, $p < 0.01$).

In contrast, the ROE model does not exhibit a statistically significant relationship ($F = 1.942$, $p > 0.05$). It also demonstrates a very low explanatory power ($R^2 = 0.026$). This means that lagged sustainability does not have a significant effect on ROE, which indicates that sustainability practices do not influence shareholder returns even when time lag is considered. Firm size is found to have a weak negative effect (at 10% significance level).

Overall, the results provide strong evidence that sustainability practices are associated with generating long-term improvements in operational performance. However, their impact on equity-based returns remains limited.

The findings across all models suggest a similar interpretation. They indicate that sustainability practices do not yield immediate financial benefits; however, they are associated with a significant contribution to firm performance when considering the time effect. Even though individual sustainability dimensions show limited effects, the impact becomes more pronounced when all dimensions are combined. The impact is even more significant in the lagged model. This suggests that sustainable practices tend to generate benefits that are realized gradually through improved operational efficiency rather than immediate gains in shareholder returns. Thus, it highlights the importance of adopting a long-term and integrated approach to sustainability.

This finding aligns with the theoretical perspective that sustainability investments involve upfront costs but yield benefits over time. These benefits are realized through factors like improved efficiency, reputation, and stakeholder trust.

CONCLUSION

This study examines the relationship between corporate sustainability practices and firm performance. It uses a near-balanced panel of NIFTY 50 firms over four years (2021-22 to 2024-25), which is the post-BRSR period. Regarding the individual sustainability dimension, the results show that economic sustainability only has a statistically significant positive effect on the performance of the firms in terms of ROA, whereas there is no independent effect of the environmental and social dimensions. This indicates that those sustainability practices that are governance-related and financially aligned are more immediately relevant in improving efficient operations. Conversely, all sustainability dimensions are not significantly associated with ROE, which shows that short-term results of sustainability strategies do not lead to higher returns for shareholders directly.

The effects of sustainability on firm performance are more evident when analyzed as a composite construct. The combined sustainability measure shows a positive and highly significant impact on ROA, indicating that applying environmental, social, and economic practices together yields more impactful performance results than when applied separately. This supports the idea that sustainability is a holistic approach, and integrating its dimensions enhances overall firm efficiency. However, when combining the two models, sustainability does not significantly influence ROE, suggesting that equity-based returns are less affected by sustainability performance.

The lagged analysis also demonstrates that the sustainability benefits are not realized immediately but over time. Sustainability lag shows a greater and very important positive influence on ROA, which implies that sustainability investments are associated with enhancing operational performance in subsequent time frames. This observation highlights that sustainability practices are long-term, meaning they do not produce instant returns but involve initial expenses that yield efficiency effects and improved performance over time. However, there are no significant lagged effects on ROE, indicating that these rewards are not reflected in shareholders' returns despite the time delay.

Overall, the study provides consistent evidence that sustainability practices are associated with improvements in firm performance primarily through enhancements in operational efficiency rather than immediate financial returns to shareholders. Although individual sustainability dimensions demonstrate less impact, their integration and ongoing operation are linked to higher, more enduring performance benefits. These findings suggest considering sustainability as a long-term strategic investment, with its value rooted in improving internal efficiency, resilience, and long-term firm performance.

These findings should be interpreted as indicative of statistical associations rather than definitive causal relationships.

IMPLICATIONS OF THE STUDY

Managerial Implications

The findings of this study provide some valuable implications for corporate managers who want to incorporate sustainability in their strategic decision-making.

First, the significant and strong effect of economic (governance-related) sustainability on operational performance indicates that companies must consider making efforts to enhance governance systems, transparency, and financially material sustainability disclosures. These practices are associated with relatively stronger efficiency outcomes sooner and form the basis of corporate sustainability efforts.

Second, there is no substantial independent effect of environmental and social dimensions, which suggests that isolated or compliance-driven practices in these domains might not be enough to drive performance in a firm. Instead, managers ought to move towards a comprehensive strategy wherein strategies concerning environmental and social inclusion are aligned with the main company functions and long-term business value generation. The effectiveness of the composite sustainability measure is further supported by the significance of integration among the ESG dimensions, which provides consistent outcomes, indicating that

a combined implementation is associated with more reliable performance results compared to unintegrated efforts.

Third, the lagged model evidence emphasizes that the sustainability benefits are time-based. It is important to note that managers must understand that sustainability investments are long-term and may not pay off in the short term. This requires a calculated move out of short-term performance orientation toward long-term value maximization, which can be facilitated by long-term investments in sustainability initiatives. Companies need to integrate sustainability into their long-term plans, resource allocation, and performance assessment systems.

Lastly, the negative correlation between firm size and its performance is a constant that can suggest the possibility of operational inefficiencies in larger firms. In such companies, managers need to focus on enhancing resource efficiency, organizational effectiveness, and scaling sustainability programs. Overall, the findings indicate that sustainability should be viewed as a long-term investment to boost operational resilience and efficiency, rather than a short-term tool for increasing shareholder returns.

Policy Implications

The conclusion of this research proposes important policy implications for policymakers and regulators responsible for developing sustainability reporting processes. The findings suggest a positive correlation between sustainability performance and firm-level operational efficiency (ROA). This correlation is even more pronounced when "sustainability" is considered a composite measure comprising all three dimensions of sustainability. However, no significant correlation was found between sustainability performance and shareholder returns (ROE). This implies that sustainability reporting is associated with increased internal effectiveness and long-term value generation better than short-term market-based results.

The findings have the potential to aid in the further development and reinforcement of standardized sustainability reporting frameworks like the BRSR. Policymakers may aim to improve disclosure quality by implementing structured reporting guidelines and enforcing industry-specific sustainability standards. Gradual implementation of mandatory disclosure standards can also enhance the quality of disclosures. These steps may improve comparability, consistency, and reliability of sustainability information among firms.

The results showed an absence of a meaningful relationship between sustainability reporting and firm performance measured by Return on Equity (ROE). This indicates that market-based incentives might not be the only key factor prompting companies to adopt better sustainability practices. Regulators can provide specific policy tools like tax subsidies on sustainability-linked investments or preferential financing options to incentivize firms undertaking comprehensive sustainability practices. Initiatives such as providing preferential access to green financing and mandatory third-party assurance of sustainability reports might also be considered. These actions may help encourage firms to embrace sustainability as part of their strategic decision-making. They might also encourage reporting beyond mere mandatory requirements.

The results of the analysis involving the lagged association provide evidence that sustainability benefits tend to be derived in the long term. Thus, it indicates that the adoption of long-term assessment models is better suited to assess the impact of sustainability performance. Policymakers may aim at developing regulatory strategies that include multi-year disclosures and consider sector-specific disclosure templates. Periodic sustainability performance audits may also offer key insights to better reflect the lagging impact of sustainability investments.

Such policy directions are especially relevant for emerging economies where the development of sustainability reporting frameworks is in the early stages, and increased efforts are being made to align them with global standards.

This research is anchored in the Indian regulatory context. However, the findings may extend to similar emerging economies like Indonesia. These emerging economies are characterized by similar institutional environments as well as regulatory priorities. In such contexts, where sustainability disclosures are primarily influenced by evolving regulatory mandates as well as institutional pressures rather than fully mature market mechanisms, firm-level responses to sustainability reporting are likely to exhibit comparable patterns. As a result of heightened stakeholder awareness, increased focus is also being placed on improving sustainability

disclosures through regulatory intervention in both countries. Therefore, the findings and interpretations of the current research may provide relevant insights to Indonesian policymakers by offering valuable perspectives in the development of organized sustainability reporting frameworks. The study may also provide useful insights to enhance enforcement systems as well as unify sustainability reporting with the wider corporate governance and financial reporting framework.

In general, the results indicate that a successful approach to sustainability regulation must focus on creating long-term values, standardizing disclosures, and institutional support systems, rather than relying solely on market-based incentives.

LIMITATIONS OF THE STUDY

The study offers valuable insights into how corporate sustainability practices relate to firm performance. However, it is subject to certain limitations. To start with, the sample is limited to firms listed in the NIFTY 50 index. These firms are large and well-established companies, which increases the reliability and comparability of the data. However, the results may not be true for smaller firms, which may not have the same sustainability activity and performance dynamics.

Also, the study covers a fairly short timeframe (2021-22 to 2024-25). As observed from the analysis, the effects of sustainability practices are delayed. Therefore, even though the study potentially reflects the early stages of assessing the Business Responsibility and Sustainability Reporting (BRSR) model, it may fail to capture the long-term effects of sustainability practices comprehensively.

Moreover, even though the scoring method based on the constructed index aligns with regulatory frameworks, it assesses the coverage of indicators. Therefore, the construct might not fully reflect the qualitative richness of sustainability reporting practices. The increased disclosure levels may not always indicate better actual performance by firms, which constitutes a limitation of measurement.

Lastly, the analysis does not explicitly match industry-specific effects that could influence sustainability practices and financial performance. The relationship may therefore be affected by sector differences regarding regulatory pressure, environmental impact, and stakeholder expectations.

SCOPE FOR FUTURE RESEARCH

Based on the inherent limitations of this study, a number of future research avenues may be considered. Future studies may aim to increase the time horizon to more holistically evaluate the long-term impact of sustainability practices. The lagged relationship results in this study further highlight the importance of expanding the time frame. A more comprehensive panel dataset could better reflect the dynamic nature of the sustainability reporting and firm performance relationship.

Future research may also extend the study by analyzing mid-cap and small-cap companies. This would enable the results to be generalized and provide opportunities for comparison between firms of varying size and resource capacities.

Further studies may also aim to enhance the measurement of sustainability performance by incorporating a combination of qualitative measurements in addition to disclosure-based measures. This would improve the assessment of sustainability practices and consequently provide a more detailed understanding of their effects.

Lastly, empirical models could also be improved by further delving into sector-specific patterns. The application of other control variables, such as leverage, firm age, or market-based performance measures, may provide more detailed information about how sustainability practices affect firm performance.

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Appendix A. Thematic Alignment of GRI Standards with BRSR Disclosure Categories

Dimension	GRI Range	Key Thematic Area	BRSR Status	Level
Economic	201-1	Financial performance	Included	Essential
	201-2 to 201-4	Climate risk, benefits, and government support	Not Included	—
	202-1	Wage practices	Included	Essential
	202-2 to 203-2	Local hiring & economic impact	Not Included	—
	204-1	Procurement practices	Included	Essential
	205-1 & 205-2	Anti-corruption systems & training	Not Included	—
	205-3	Corruption incidents	Included	Essential
	206-1	Anti-competitive behaviour	Included	Essential
	207 (All)	Tax governance & transparency	Not Included	—
	301-1	Material consumption	Not Included	—
	301-2 & 301-3	Recycled and reused materials	Included	Essential / Leadership
	302-1 & 302-3	Energy consumption and intensity	Included	Essential

Dimension	GRI Range	Key Thematic Area	BRSR Status	Level
Environmental	302-2 & 302-5	External and product-level energy use	Not Included	—
	302-4	Energy reduction initiatives	Included	Leadership
	303-1 & 303-2	Water-related impact assessment	Not Included	—
	303-3 to 303-5	Water withdrawal, discharge, and consumption	Included	Essential / Leadership
	304-1	Operations in biodiversity-sensitive areas	Included	Essential
	304-2 & 304-3	Biodiversity impact and habitat restoration	Included	Leadership
	304-4	Threatened species disclosure	Not Included	—
	305-1 & 305-2	Direct and indirect GHG emissions	Included	Essential
	305-3	Value chain (Scope 3) emissions	Included	Leadership
	305-4 & 305-5	Emission intensity and reduction efforts	Included	Essential
	305-6 & 305-7	Ozone-depleting substances and air pollutants	Included	Essential
	306-1	Waste-related impacts	Not Included	—
	306-2 to 306-5	Waste management, generation, and disposal	Included	Essential
	Spill (2016)	Major spill incidents	Not Included	—
	308-1 & 308-2	Environmental screening and supply chain impact	Included	Leadership
	401-1	Employee hiring and turnover	Not Included	—
	401-2 & 401-3	Employee benefits and parental leave	Included	Essential
	402-1	Labour-management relations	Not Included	—
	403-1 & 403-2	OHS systems and risk management	Included	Essential
	403-3, 403-4, 403-7, 403-8	Extended OHS practices and coverage	Not Included	—
403-5 & 403-6	Safety training and health promotion	Included	Essential	
403-9 & 403-10	Workplace injuries and occupational illness	Included	Essential	

Dimension	GRI Range	Key Thematic Area	BRSR Status	Level
Social	404-1 to 404-3	Employee training and development	Included	Essential
	405-1	Workforce diversity	Included	Essential
	405-2	Gender pay equality	Not Included	—
	406-1	Discrimination incidents	Included	Essential
	407-1	Freedom of association	Included	Essential
	408-1 & 409-1	Child labour and forced labour	Included	Essential
	410-1	Security personnel human rights training	Not Included	—
	411-1	Indigenous rights violations	Included	Essential
	413-1	Community engagement initiatives	Included	Essential
	413-2	Community impact assessment	Included	Leadership
	414-1 & 414-2	Social screening and supply chain impact	Included	Leadership
	415-1	Political contributions	Not Included	—
	416-1	Product safety assessment	Not Included	—
	416-2	Safety-related non-compliance	Included	Essential
	417-1	Product/service labelling practices	Included	Leadership
	417-2 & 417-3	Labelling and marketing violations	Included	Essential
	418-1	Customer data privacy breaches	Included	Essential

Note: Since the Global Reporting Initiative (GRI) Standards and the Business Responsibility and Sustainability Reporting (BRSR) framework differ in structure, scope, and level of detail, the alignment presented below is based on thematic correspondence rather than exact indicator-level equivalence.