



Research article

Nexus between audit committee effectiveness and sustainability reporting quality in India: Evidence using a panel ordered logit model

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Abstract: Given the growing importance of effective corporate governance and high-quality sustainability reporting, this paper examined the association between audit committee effectiveness and the extent of sustainability reporting practices in India. To evaluate this relationship, an ordered logistic regression was performed on a balanced panel dataset of 250 companies from the NIFTY 500 index of the National Stock Exchange (NSE) in India, over 12 years (2013–2024). The results indicated that the existence of an effective audit committee increases the likelihood of companies publishing high-quality reports that reflect both internal and external scrutiny. This aligns with stakeholder theory, agency theory, and legitimacy theory, indicating that stakeholder pressure to adopt effective monitoring and publish credible reports increases the motivation for audit committees to mitigate management's opportunistic behaviour and thereby improve organisational legitimacy. Further analysis highlighted that this association does not vary significantly across firm types, supporting the existing uniform governance frameworks. It suggests the need to strengthen the existing governance by including sustainability-linked incentives for audit committee members, while also emphasising the need for increased sustainability awareness among them to ensure that the sustainability practices go beyond compliance and are not merely symbolic.

Keywords: audit committee effectiveness; sustainability reporting quality; sustainability assurance; ordered logistic regression; corporate governance

JEL Codes: G34, M14, Q56

1. Introduction

Over the years, financial and management fraud among corporate entities has been on the rise, as witnessed through the cases of HealthSouth, Enron, Worldcom, Transmile Group, Megan Media Holdings Berhad, Cadbury Plc, Satyam Computers, and many others (Adedeji et al., 2020; Pillai & Al-Malkawi, 2018; Wu, 2021). Rising corporate scandals across the globe reflect the failure of effective governance practices to curb managers' opportunistic thinking and safeguard the investors' interests (Saha & Kabra, 2022). The COVID-19 pandemic further intensified the need for business resilience and attention to the firm's broader impact on society and the environment (Ruziwa et al., 2025). Accordingly, stakeholder demand for transparent and credible information has increased, encompassing not only economic aspects but also the societal and environmental aspects of the companies (Erin et al., 2022). Recognising this shift in stakeholder expectations, a large number of companies have incorporated the practice of sustainability reporting (SR) (Sreepriya et al., 2023). The proportion of N100 companies that published sustainability reports in 2020 increased to 80% compared to a modest portion of 12% in 1993, indicating the change in the attitude of the companies towards addressing issues like climate change, social inequality, and others (KPMG, 2020). Several countries across the globe have introduced compulsory or voluntary norms to improve environment, social and governance (ESG) reporting (Goel, 2021). The Global Reporting Initiative (GRI), the global custodian of non-financial reporting standards, has developed the most widely accepted and used SR standards, with 78% of G250 companies adopting them. At the same time, countries like the United States of America, the United Kingdom, Canada, and others follow standards laid down by the Sustainability Accounting Standards Board (SASB). On the other hand, a quarter of the G250 countries adhere to the standards laid down by their respective stock exchanges, of which India is among the top five adopters (KPMG, 2022).

The Government of India introduced "National Voluntary Guidelines" (NVGs) in 2011 through its Ministry of Corporate Affairs to contribute to corporate sustainability (Kumar, 2022). In 2012, the Securities and Exchange Board of India (SEBI) enforced mandatory non-financial reporting for the top 100 listed companies through the implementation of the Business Responsibility Report (BRR). In the year 2015, the mandate was subsequently extended to the top 500 listed entities (Kumar et al., 2022). However, India's corporate responsibility reporting momentum accelerated following the mandatory corporate social responsibility (CSR) reforms in 2015 under the Companies Act 2013, which required businesses to contribute at least 2% of their average net income over the previous three fiscal years to social development programs (Kumar et al., 2021). Later, in a circular issued in 2021, SEBI emphasised that reporting on a company's sustainability-related performance is as important as reporting financial performance. Consequently, it replaced BRR with the Business Responsibility and Sustainability Report (BRSR), mandatorily applicable to the top 1000 listed companies from the financial year (FY) 2022–2023 (SEBI, 2021). In 2023, SEBI updated the BRSR format, introducing a subset called BRSR core, comprising key performance indicators, and mandated its disclosure by the

top 1000 listed entities from FY 2023–24. It also mandated the top 150 companies to carry out reasonable assurance to the BRSR core from the FY 2023–24, expanding it to the top 250 companies from FY 2024–25, the top 500 companies from FY 2025–26, and eventually covering the top 1000 entities from FY 2026–27 (SEBI, 2023).

Interestingly, studies have shown that decisions on disclosure of sustainability-related issues rely on the attitude and perceptions of management, as well as pressure from stakeholders (Thoradeniya et al., 2015). Ensuring management's responsibility towards stakeholders relies on accountability and transparency, which are considered the core pillars of corporate governance (CG). CG is a system of overlapping mechanisms that governs companies while accounting for stakeholders' interests. Thus, it plays a pivotal role in influencing sustainability disclosure (Buallay & Al-Ajmi, 2020; Erin et al., 2022). Studies on CG have highlighted the role of the audit committee (AC) by describing it as the cornerstone of the governance framework (Ruziwa et al., 2025). Effective ACs mitigate the risks associated with reports published by the entities by overseeing the reliability of such disclosures (Shaker et al., 2023). The International Federation of Accountants (IFAC) also emphasised the need to broaden the monitoring role of the AC to reinforce reliable and useful sustainability disclosures (Mahsina et al., 2025). Even in India, clause 49 of the listing agreement highlights the role of the AC as a part of the CG requirement of listed entities (SEBI, 2004).

Although studies on SR have increased rapidly, empirical research examining the role of AC traits on the quality of SR is limited (Farooq et al., 2021). Those limited studies highlight that the AC realigns the company's goals with societal commitments, as demonstrated in sustainability disclosures (Razali et al., 2025). The presence of a well-structured AC comprising expert and independent members improves the company's focus on sustainability and influences its decisions to publish credible ESG reports (Santonastaso et al., 2026). Likewise, regular meetings of the AC enrich the level of awareness and understanding among members and motivate them to disseminate sustainability information (Buallay & Al-Ajmi, 2020; Rustiarini et al., 2024). The effective size of the AC helps the company to get diverse expertise and strategic oversight to enhance corporate sustainability (Karim et al., 2024). In addition to this, through a strategy of external assurance, ACs enhance the quality and credibility of such disclosures, in turn mitigating concerns about selective disclosures on sustainability (Al-Hajaya et al., 2025; Al-Shaer & Zaman, 2018; Farooq et al., 2021). Thus, having an effective AC signals the company's interest in addressing stakeholders' demands through sustainability reports (Meutia et al., 2023). It is also understood that, by improving the accuracy and reliability of sustainability data in the reports, AC reduces information asymmetry (Santonastaso et al., 2026). Considering this, a study examining the impact of AC on the quality of SR becomes relevant, especially in a continually growing country like India, where regulations on SR and the constitution of the AC are evolving (Seth & Saxena, 2025). Recognising this gap in the literature, this study aims to examine the role of an effective AC in enhancing the quality of the SR in the Indian context. Based on this objective, the research question is framed as follows:

RQ: *Does the existence of an effective audit committee influence the quality of sustainability reporting in India?*

To answer the above question, this study employs a panel logistic regression model on data collected for the top-listed Indian entities over a 12-year time frame. Further, the study intends to examine whether the relationship between effective AC and quality of SR varies across firm size and

environmental sensitivity. Thus, through its findings and policy suggestions, this study gains practical importance against the backdrop of ongoing regulatory reforms on CG and SR in India.

The subsequent sections of the study are organised into four additional parts. Section 2 provides the literature review and theoretical background and formulates the research hypotheses. Section 3 describes the research design. Section 4 presents the findings of the study. Section 5 discusses the findings, followed by the conclusion in Section 6.

2. Literature review

CG is a framework of interconnected mechanisms that hold the company accountable to its stakeholders to ensure the overall sustainability of the firm (Erin & Ackers, 2024). It strikes a balance between profitability and morality in the activities of the organisations (Dwekat et al., 2022). Effective governance practices paired with sustainability policies lead to the formulation of comprehensive corporate strategies that align with social and ethical standards (Nandi et al., 2023). An expert AC, as a mechanism for CG, is found to improve the quality of financial reporting (Hoitash et al., 2009). Interestingly, research underscores that the AC, as a fundamental component of CG, not only enhances the quality of financial reporting but also improves ESG reporting (Fahad & Rahman, 2020; Ruziwa et al., 2025). Besides, an active internal AC encourages companies to adhere to the guidelines of the GRI (Masud et al., 2025). Surveys conducted by the researchers revealed that sustainability issues are increasingly important to AC members, as they are expected to oversee the value of sustainability disclosures (Al-Shaer & Zaman, 2018). Companies face criticisms for sustainability reports published merely to improve their brand image and for greenwashing rather than being a credible source of social and environmental information. This intensified the need for an effective AC as an internal control mechanism in enriching the quality of SR (Al-Hajaya et al., 2025). Thus, in addition to having an effective board and committee on sustainability, the presence of an effective AC provides incremental support in obtaining assurance on sustainability reports and improving their quality (Al-Shaer & Zaman, 2018).

Despite the relevance of the AC in strengthening the sustainability disclosures, little focus is given on empirically testing the impact of AC attributes on non-financial disclosures (Nandi et al., 2023). This void has attracted scholarly attention, prompting researchers to explore the impact of AC existence, as well as its features, on the quality of sustainability reports (Velte, 2023). A few researchers have found that the AC size positively influences the CSR disclosure (Farah Freihat & Al-Hiyari, 2025; Mohammadi et al., 2021), whereas a few other studies have found a negative or insignificant impact (Fahad & Rahman, 2020; Rustiarini et al., 2024). Studies have demonstrated that frequent AC meetings facilitate enhanced knowledge sharing and stronger monitoring commitment, in turn positively impacting the quality of SR (Erin & Ackers, 2024; Rustiarini et al., 2024). It was found that an AC composed of independent expert members who meet regularly promotes better assurance statements (Farooq et al., 2021). However, studies examining the relationship between the independence of the AC and non-financial disclosure have highlighted the insignificant impact of independent members on non-financial disclosure (Velte, 2023). Studies on Indian firms found this relationship to be significantly negative, suggesting that the companies should instead constitute multifaceted ACs comprising members with diverse knowledge on the environment, society, and sustainability (Nandi

et al., 2023, 2025). However, a study conducted on GCC banks revealed that financial expertise among the AC is not a prerequisite for effective ESG disclosure (Buallay & Al-Ajmi, 2020). Existing studies on AC have focused more on individual measures rather than considering the combined influence of those measures. However, due to the complementary nature, individual AC characteristics provide only a partial reflection of the effectiveness of AC and may lead to error (Al-Jaifi et al., 2019; Elmashtawy et al., 2022; Qaderi et al. 2024). This motivated the present study to determine if the effectiveness of AC as a combined measure results in improved SR in a unique setting like India.

2.1. Agency theory

Jensen & Meckling (1976), in their work "Theory of the Firm", explain the relationship between shareholders and management as a form of principal–agent ties, highlighting the emergence of conflicts of interest when the agent acts against the principal's interest. This acknowledges the importance of control systems that align the managerial interests with the interests of the outside shareholders, thereby reducing information asymmetry. The Cadbury Committee 1992 report emphasised that governance through the board of directors, accounting, and auditing act as mechanisms for controlling the firm's activities (Al-ahdal et al., 2020; Dwekat et al., 2022). Specifically, it suggested that companies constitute an AC to scrutinise the financial records of the entity. However, the problem of information asymmetries between shareholders and managers is not only linked with financial reporting but also with CSR reporting (Velte, 2021). Accordingly, studies have underscored the prominence of the AC under the realm of agency theory in facilitating the credibility of SR (Arif et al., 2020). Further, agency issues are controlled when the AC has a larger number of independent directors and members who meet regularly to oversee the reporting (Mohd Ariff et al., 2023). It was evidenced that AC characteristics, as key factors influencing the quality of ESG reports, reduce information asymmetry and minimise agency costs (Qaderi et al., 2023; Ruziwa et al., 2025).

2.2. Stakeholder theory

One of the most widely used theories in understanding CSR initiatives of the company, stakeholder theory reinforces the role played by shareholders, customers, employees, and other stakeholder groups in corporate decision-making (Qaderi et al., 2023; Singhanian et al., 2024). It asserts that the firms do not operate in isolation solely for their self-interests but are expected to create benefits for their stakeholders (Wahyuningrum et al., 2022), based on the relationship between firms and stakeholders, where the interests of a variety of stakeholders strongly influence firms' strategies (De Gzraaf & Stoelhorst, 2013; Freeman, 1984). Stakeholders pressurise the companies to disseminate social and environmental information about the company (Ben Fatma & Chouaibi, 2021). The CSR disclosure thus serves the purpose of reducing stakeholder pressure by ensuring that the stakeholders' interests are understood and their information needs are met (Qaderi et al., 2023). Stakeholder theory establishes a connection between the Board of Directors and SR by explaining the board's key role in building a robust internal control system that guarantees the efficient dissemination of information to all stakeholders (Singhanian et al., 2024). Researchers have connected this theory to behavioural

accounting research, as it posits organisational accountability to a diverse network of stakeholders whose interests influence or are influenced by firms' decisions and actions (Manetti & Bellucci, 2025). Hill & Jones (1992), in their stakeholder–agency theory, recognise the need for institutional control mechanisms to reduce the power differential between the managers and stakeholders. Remarkably, it was found that the AC oversees the disclosures on financial and non-financial aspects and holds significant importance from the stakeholders' perspectives (Fiandrino et al., 2022; Velte, 2023). Robust governance in the form of oversight from a larger and independent AC promotes a culture of accountability in the organisation and builds trust among stakeholders (Karim et al., 2024).

2.3. *Legitimacy theory*

Researchers identify legitimacy theory as the predominantly used theoretical framework in understanding the antecedents of CSR reporting (Ali et al., 2017). According to this theory, organisations consistently aim to act in accordance with social norms and environmental expectations. As these norms evolve, organisations are required to remain flexible to sustain their legitimacy, without which they will be penalised (Brown & Deegan, 1998). Organisations use social responsibility disclosures to legitimise their existence and operations (Ben Fatma & Chouaibi, 2021; Lamanda & Tam, 2024). Studies have identified that CSR activities boost the legitimate, fair, and ethical business conduct in line with the expectations of society (Cosa, 2024). To ensure the legitimacy of the organisation, the Board of Directors undertake sustainability disclosures that reflect the environmental and social issues addressed by the companies (Lewa et al., 2024). However, researchers have also expressed concern that CG, in the form of ACs, may be more symbolic or compliance-based than genuine in promoting legitimacy and sustainability (Ruziwa et al., 2025). Thus, it is interesting to know whether effective AC improves SR to uphold organisational legitimacy.

Notably, researchers have highlighted the need to extend agency theory in AC and SR research by using the stakeholder–agency theory, as AC oversight is relevant for stakeholders who not only need credible financial reporting but also sound SR (Velte, 2023). Further, prior literature points out that the legitimacy theory and stakeholder theory, rather than competing, interact with each other in enhancing knowledge regarding corporate social reporting (Buallay & Al-Ajmi, 2020; Gray et al., 1995). While agency theory underscores the importance of monitoring, stakeholder and legitimacy theories emphasise the need for the organisation to align their operations with stakeholder expectations and societal norms. Thus, the complementary nature of agency, stakeholder, and legitimacy theories suggests a strong connection between AC and SR. Based on the theoretical background and prior literature, the following hypothesis is formulated:

H1: Audit committee effectiveness has a significant positive association with sustainability reporting quality.

Further, SR is essential to the survival of firms belonging to environmentally sensitive industries. Thus, CG in the form of AC in those entities is expected to reduce the agency costs, address the legitimacy issues, and meet stakeholder needs through reliable sustainability disclosures (Kumar et al., 2021; Kumar et al., 2022). Moreover, larger firms have more visibility and attract a higher level of scrutiny from the stakeholders. As per the legitimacy theory, these firms prioritise accountability in the

disclosures to protect their legitimacy (Martínez et al., 2024). Therefore, to know if the nexus between the existence of an effective AC and the quality of SR varies across firms' environmental sensitivity and their size, the following sub-hypotheses are framed:

H1_a: The association between audit committee effectiveness and sustainability reporting quality varies across environmentally sensitive and less environmentally sensitive firms.

H1_b: The association between audit committee effectiveness and sustainability reporting quality differs between large firms and small firms.

3. Materials and methods

3.1. Sample selection and data

A quantitative research approach is employed in this study. It utilises secondary data relating to firms listed on the Nifty 500 index, as it captures a significant portion of the total turnover of the National Stock Exchange (NSE) in India (Kumar et al., 2021, 2022). Besides, these firms are subjected to more scrutiny from the stakeholders and are expected to incorporate better governance and disclosure practices (Katarachia et al., 2018). The study takes into account non-financial firms only, considering the regulatory heterogeneity in governance and accounting practices of financial entities (Doshi et al., 2024; Singhanian et al., 2024). Data was extracted over a time span of 12 years from 2013 to 2024. The study identified 2013 as the starting year, owing to the AC stipulations introduced by the Companies Act 2013, as well as the introduction of SEBI's mandatory Business Responsibility Reporting regulations for listed companies in 2012. Thus, by using a 12-year time frame, the study also captures the transition in the CG and SR norms in India. After eliminating financial firms and companies with missing values, the final sample consisted of a balanced panel of 250 companies with 3000 firm-year observations in total. Multiple sources were used for data extraction. The Bloomberg Database was used to obtain data relating to the AC, return on assets, firm size, and leverage. Variables regarding the age of the company and the quality of SR were manually measured using information obtained from multiple corporate reports, retrieved from the CMIE Prowess IQ database and the official websites of the companies.

3.2. Measures

The dependent variable of the study, sustainability reporting quality (SRQ), was measured using an existing coding scale that scores the quality of the sustainability reports using five thresholds, ranging from 0 to 4. Instead of using third-party sustainability scores, this study relied on the manual SRQ scores obtained through content analysis of SR, BRR, BRSR, and CSR reports, as well as the integrated annual reports of the companies, following the literature (Al-Shaer & Zaman, 2016; Erin et al., 2022; Erin & Ackers, 2024; Van et al., 2025). Past studies have identified the need to modify the existing scale as per the regulatory frameworks in the countries of interest. Thus, in line with Singhanian et al. (2024), in this study, SRQ is an ordinal categorical variable scored using the scale modified to suit the Indian context. Under this system of coding, a score of 0 indicates that the company does not

publish any form of sustainability report. A score of 1 indicates that a standalone sustainability report or BRR/BRSR is published. A score of 2 represents companies that not only publish sustainability reports but also have a committee to oversee matters of sustainability. A score of 3 is assigned for companies that obtain third-party assurance for their sustainability reports. When a company obtains high-quality external assurance of its sustainability reports by Big 4 or other reputed audit firms, the highest score of 4 is allotted. The attainment of higher-level scores necessitates the fulfilment of other criteria (Al-Shaer, 2020). The motivation behind this measure is its ability to capture the multiple dimensions of SR regulations, ranging from the non-existence of SR to the publishing of externally assured reports. Thus, it is suitable to measure the quality and depth of SR in accordance with the Indian context (Singhania et al., 2024; Van et al., 2025).

Audit committee effectiveness (ACE) is the independent variable, which is a composite score developed using the individual AC characteristics (Alodat et al., 2024; Alshdaifat et al., 2024; Hashim & Amrah, 2016; Hoitash et al., 2009; Mahsina et al., 2025). Researchers have pointed out that, as individual mechanisms are interdependent, composite measures of CG mechanisms give better results than examining individual characteristics (Elmashtawy et al., 2024). Accordingly, three AC characteristics, namely, AC size, AC independence, and AC meetings, were used to evaluate the ACE. Each of these characteristics was assigned a dummy score of one when the actual measure for a company is greater than or equal to the sample median, and zero otherwise. Unlike the mean, the median is not affected by extremes of values of AC characteristics; therefore, in the absence of a threshold for measuring ACE, the median split is commonly used in the literature (Clark-Carter, 2005). These individual dummy scores were then summed to arrive at a composite score to measure ACE. The composite scores ranged from 0 to 3, with a higher score reflecting a higher level of effectiveness.

With the intention of ensuring the study was free from bias, certain firm-specific variables were included as control variables in this study (Ruziwa et al., 2025; Singhania et al., 2024). The effect of four variables—return on assets (ROA), firm size (FS), firm age (AGE), and leverage (LEV)—were controlled in the model, as specified in Table 1. Additionally, industry- and time-specific controls were considered to account for regulatory changes over the sample period and to control industry-specific effects.

Table 1. Variable description.

Variable	Measurement
Sustainability reporting quality	Categorical variables ranging from 0 to 4
Audit committee effectiveness	Composite score of AC size, independence, and meeting frequency ranging from 0-3
Return on assets	Net income to total assets
Firm size	Log of the total assets
Firm age	Number of years since incorporation
Leverage	Proportion of total debt divided by the total assets

3.3. Model specification

The study used a discrete categorical dependent variable, SRQ, with 5 ordered categories. Previously, researchers have noted that using ordinary least squares (OLS) for categorical

measurements yields invalid results, as the residuals fail to fulfil the normality, linearity, and homoscedasticity assumptions of OLS. In such cases, literature suggests the use of the ordered logistic regression model, as it assumes the ordinal nature of the dependent variable and is applicable for panel data (Lewa et al., 2024). The ordered logit model is preferred over the ordered probit model as it facilitates a clearer interpretation in the form of an odds ratio, and is free from the normality assumption (Erin & Ackers, 2024; Erin et al., 2022; Kateb & Youssef, 2025; Long, 1997; Singhanian et al., 2024). Additionally, the random effects ordered logit was chosen as it accounts for the unobserved differences among the individual entities in a panel data (Zheng et al., 2014). Thus, the following model was formulated to test the hypotheses:

$$SRQ_{it} = \beta_0 + \beta_1 ACE_{it} + \beta_2 ROA_{it} + \beta_3 FS_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \alpha_{ind} + y_t + e_{it} \quad (1)$$

where SRQ refers to sustainability reporting quality, β_0 is the intercept, ACE indicates audit committee effectiveness, ROA refers to return on assets, FS indicates the firm size, AGE indicates the firm age, and LEV points out the leverage. i indicates the firm, t indicates the year, α_{ind} refers to industry-specific effects, y_t refers to time-specific effects, and e_{it} is the error term.

Further, to interpret the results, the study applied marginal effects analysis, which shows the variations in dependent variables as a result of variations in independent variables without stress on the sign, degree, and statistical significance of change (Kateb & Youssef, 2025; Singhanian et al., 2024; Williams, 2012). Thus, it estimates the change in the likelihood of publishing high-quality sustainability reports in response to changes in the effectiveness of the AC.

4. Results

4.1. Main findings

The descriptive statistics in Table 2 show a mean SRQ score of 1.458 out of a maximum score of 4, indicating that Indian firms exhibit a low level of SRQ. The frequency value in Table 3 confirms this by indicating that only 8.27% of the sample companies achieve the top-level SRQ. The mean ACE score was 2.049, against a maximum of 3, indicating that the selected companies have effective ACs, with only 6.13% getting the lowest scores. Additionally, descriptive statistics on control variables (ROA, FS, AGE, and LEV) highlight that the selected sample includes a diverse set of companies.

Table 2. Descriptive statistics.

Variable	Observation	Mean	SD	Minimum	Maximum
SRQ	3000	1.458	1.206	0	4
ACE	3000	2.049	0.877	0	3
ROA	3000	0.082	0.099	-1.288	0.952
FS	3000	11.301	1.502	7.274	16.681
AGE	3000	45.076	24.672	2	161
LEV	3000	0.232	0.557	0	16.41

Table 3. Frequency of SRQ and ACE.

SRQ	Freq.	%	ACE	Freq.	%
0	731	24.37	0	184	6.13
1	995	33.17	1	530	17.67
2	692	23.07	2	1240	41.33
3	334	11.13	3	1046	34.87
4	248	8.27	-	-	-
Total	3000	100.00	Total	3000	100.00

To assess multicollinearity, a diagnostic test was conducted using the correlation matrix shown in Table 4. In all cases, the coefficients of correlation were lower than the threshold of 0.8, which indicates an absence of multicollinearity among the predictors of SRQ (Bhat et al., 2024). Likewise, the correlation matrix showed a positive association between ACE and SRQ (0.204). However, the coefficient was smaller than the coefficient of correlation between FS and SRQ (0.570), indicating the greater influence of FS. Further, to confirm that there was no multicollinearity issue, the variance inflation factor (VIF) was calculated, being below the threshold limit of 10 (Mahsina et al., 2025).

Table 4. Matrix of correlations.

Variables	SRQ	ACE	ROA	FS	AGE	LEV	VIF
SRQ	1.000						
ACE	0.204	1.000					1.058
ROA	0.057	0.050	1.000				1.576
FS	0.570	0.206	-0.164	1.000			1.096
AGE	0.174	0.095	0.021	0.124	1.000		1.024
LEV	-0.030	-0.032	-0.586	0.047	-0.057	1.000	1.531

Table 5. Random effects ordered logistic regression: Main.

	Model 1		Model 2		Model 3	
	Coef.	Odds	Coef.	Odds	Coef.	Odds
SRQ						
ACE	0.191***	1.211***	-	-	0.162**	1.176**
ROA	-	-	3.004***	20.163***	2.959***	19.279***
FS	-	-	1.208***	3.348***	1.190***	3.287***
AGE	-	-	0.010	1.010	0.010	1.01
LEV	-	-	0.229	1.258	0.222	1.249
Observations	3000		3000		3000	
Chi2	515.04		653.80		698.31	
Prob > Chi2	0.000		0.000		0.000	

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

Table 5 presents the baseline regression results, where Model 1 indicates a significant influence of ACE on the SRQ (coef. = 0.191, odds = 1.211) at a 1% level of significance. It is also evident from Model 2 that the control variables ROA and FS significantly and positively affect the SRQ at a 1% level of significance. Model 3 shows a significant incremental impact of ACE on SRQ (coef. = 0.162, odds = 1.176) at a 5% level of significance after controlling for the control variables. The odds ratio indicates that the existence of an effective AC has a significant positive association with SRQ. This is further supported by the increase in the Wald chi-squared value from 515.04 in Model 1 to 698.31 in Model 3, indicating a substantial improvement in the model's explanatory power with the inclusion of

ACE. Further, the p-value of the chi-square was lower than 0.05, indicating the model's fitness. This supports hypothesis H1. However, the magnitude of ACE was less than that of the control variables, indicating the economic significance of ROA and FS over ACE.

The literature highlights the importance of marginal effect analysis in understanding the variations in the dependent variable caused by the changes in the independent variables (Erin & Ackers, 2024; Singhania et al., 2024). The marginal effects analysis of ACE on SRQ, given in Table 6, illustrates that as the effectiveness of the AC increases, the probability of a company not publishing sustainability reports and publishing a report without additional governance mechanisms, like sustainability committee oversight and external assurance, decreases at a 5% level of significance (−0.012 and −0.003). On the other hand, the probability of publishing a higher-quality SR increases, as indicated by the positive increase in the marginal effects at levels 3, 4, and 5 (significant at a 5% level of significance).

Table 6. Marginal effect analysis of ACE on various levels of SRQ on all sample firms.

SRQ levels	dy/dx
1. Non-existence of sustainability reports	−0.012**
2. Existence of sustainability reports	−0.003**
3. Existence of sustainability reports, as well as a committee on sustainability	0.004**
4. Existence of sustainability reports assured by a non-audit firm	0.005**
5. Existence of sustainability reports assured by one of the Big 4 or other audit firms	0.006**

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

4.2. Subsample analysis

To understand if the ACE and SRQ association varies across environmentally sensitive and less environmentally sensitive firms, hypothesis H1_a was tested using subsample analysis as well as interaction effects. Samples were grouped into environmentally sensitive and less environmentally sensitive firms (Bhat et al., 2024). A panel ordered logistic regression model was run on both groups. The regression results in Table 7 show that the connection between ACE and SRQ is more pronounced among environmentally sensitive firms. In such firms, ACE increases the odds of firms achieving a higher SRQ by 1.187 times (significant at a 5% level of significance). However, for less environmentally sensitive firms, the impact of ACE on SRQ was insignificant. Results for the control variables remained similar to the main findings.

Table 7. Random effects ordered logistic regression: environmentally sensitive and less environmentally sensitive firms.

SRQ	Environmentally sensitive firms		Less environmentally sensitive firms	
	Coef.	Odds	Coef.	Odds
ACE	0.171**	1.187**	0.144	1.154
ROA	2.910**	18.364**	1.797	6.029
FS	1.304***	3.683***	1.139***	3.122***
AGE	0.011	1.011	0.001	1.001
LEV	−2.399**	0.091**	0.221**	1.247**
Observations	1548		1152	
WaldChi2	351.98		436.96	
Prob > Chi2	0.000		0.000	

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

To test hypothesis H1b, samples were divided into two groups based on the size of the firm. A separate panel ordered logistic regression model was run for two groups, namely, large firms and small firms. The results (Table 8) among larger firms support the original findings, highlighting that the ACE encourages a higher SRQ by significantly increasing the odds of publishing quality reports by 1.271 times (at a 1% level of significance). However, the results reveal no statistically significant effect of ACE on SRQ among small firms.

Table 8. Random effects ordered logistic regression: large and small firms.

SRQ	Large firms		Small firms	
	Coef.	Odds	Coef.	Odds
ACE	0.240***	1.271***	0.110	1.116
ROA	0.381	1.464	3.544***	34.602***
FS	1.315***	3.725***	1.327***	3.768***
AGE	0.008	1.008	0.001	1.001
LEV	-2.916***	0.054***	0.199**	1.220**
Observations	1500		1500	
WaldChi2	431.00		540.20	
Prob > Chi2	0.000		0.000	

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

A marginal effect analysis was conducted for all subsamples to determine the impact of ACE on different categories of SRQ. The results in Table 9 indicate that the ACE's marginal effect is significantly negative at lower levels of SRQ and significantly positive at higher levels of SRQ among environmentally sensitive and larger firms. This indicates that having an effective AC in those companies has a positive association with their decision to publish high-quality sustainability reports. However, the marginal effect of ACE on SRQ was found to be statistically non-significant among the less environmentally sensitive and small firms.

Table 9. Marginal effect analysis of ACE on various levels of SRQ: environmentally sensitive firms, environmentally less sensitive firms, large firms, and small firms.

SRQ levels	dy/dx	dy/dx	dy/dx	dy/dx
	Sensitive firms	Less sensitive firms	Large firms	Small firms
1. Non-existence of sustainability reports	-0.013**	-0.010	-0.013***	-0.008
2. Existence of sustainability reports	-0.004**	-0.002	-0.014***	-0.000
3. Existence of sustainability reports, as well as a committee on sustainability	0.004*	0.004	0.001	0.004
4. Existence of sustainability reports assured by a non-audit firm	0.006*	0.004	0.010**	0.002
5. Existence of sustainability reports assured by one of the Big 4 or other audit firms	0.007**	0.005	0.016***	0.001

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

To validate the subsample analysis, statistical tests for the moderating effect of the size of the firm and the environmental sensitivity of the firm on the association between ACE and SRQ were carried out (Hashim & Amrah, 2016). Surprisingly, (Table 10) the results indicate that the association between ACE and SRQ does not vary significantly across firm size (size type) and environmental

sensitivity (sensitivity). This indicates that, although the magnitude of the effects seems to vary in subsample analysis, they do not statistically vary across types of firms. Therefore, hypotheses H1_a and H1_b are not supported.

Table 10. Moderating effect of the size and the environmental sensitivity of the firm on the association between ACE and SRQ.

	Model 1		Model 2	
	Coef.	Odds	Coef.	Odds
SRQ				
ACE	0.081	1.084	0.132	1.141
ROA	2.986***	19.812***	2.962***	19.323***
FS	1.206***	3.340***	1.189***	3.284***
AGE	0.010	1.010	0.01	1.010
LEV	0.222	1.249	0.223	1.250
Size type	−0.384	0.681	-	
ACE × size type	0.161	1.175	-	
Sensitivity		-	0.395	1.484
ACE × sensitivity		-	0.05	1.052
Observations	3000		3000	
Chi2	709.10		692.41	
Prob > Chi2	0.000		0.000	

4.3. Robustness or sensitivity tests

The ordered logit model is based on the proportional odds assumption, where coefficients remain the same among the different categories of the dependent variable. To ensure the robustness of the main findings to violations of the assumption of proportional odds, the generalised ordered logit model was used. This model is the superior alternative to deal with variations in coefficients among the different levels of the categorical dependent variable. In case of partial violation, the coefficients of only those variables that violate the assumption of proportional odds vary between the categories (Singhania et al., 2024; Williams, 2016). The significant and positive coefficients in each category in Table 11 indicate that ACE increases the likelihood of a higher level of SRQ. Further, the consistency in the coefficients of ACE in all categories indicates that the proportional odds assumption is not violated for the variable ACE. This confirms the reliability of the main findings.

Table 11. Generalized ordered logit model.

SRQ	Model 1	Model 2	Model 3	Model 4
	0 vs. 1,2,3,4	0,1 vs. 2,3,4	0,1,2 vs. 3,4	0,1,2,3 vs. 4
ACE	0.186***	0.186***	0.186***	0.186***
ROA	4.954***	4.954***	4.954***	4.954***
FS	1.008***	0.806***	0.948***	0.730***
AGE	0.010***	0.010***	0.010***	0.010***
LEV	0.201	0.201	0.201	0.201
Observations	3000			
Pseudo R2	0.156			
Chi2	394.52			
Prob > Chi2	0.000			

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

Additional analysis was carried out by considering an alternate proxy for the dependent variable. Sustainability assurance (SA), a dummy variable, was used, indicating the external assurance of sustainability reports. A binary logit model was run with SA as the outcome variable. The results in Table 12 illustrate a significant positive link between ACE and SA (coef. = 0.192, odds = 1.212). This supports the original findings by showing that the effectiveness of AC increases the probability of companies opting for external assurance of the sustainability reports, thereby increasing the quality of sustainability reports.

Table 12. Robustness analysis with SA as the dependent variable.

SA	Coef.	Odds
ACE	0.192**	1.212**
ROA	3.861***	47.505***
FS	1.189***	3.283***
AGE	0.006**	1.006**
LEV	0.253	1.288
Observations	3000	
Chi2	586.81	
Prob > Chi2	0.000	

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

Additionally, the association between each individual AC characteristic and SRQ was tested to enhance the robustness of the original findings. The regression results in Table 13 indicated that individual AC size, AC meetings, and AC independence fail to significantly influence SRQ in comparison to composite scores. This further supports the claim that AC traits are jointly associated with SRQ.

Table 13. Robustness analysis with individual AC characteristics.

SRQ	Coef.	Odds
AC size	0.040	1.040
AC meeting	0.013	1.013
AC independence	-0.005	0.995
ROA	2.985***	19.789***
FS	1.202***	3.326***
AGE	0.001	1.010
LEV	0.227	1.255
Observations	3000	
Chi2	688.61	
Prob > Chi2	0.000	

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

In addition, considering the potential issue of endogeneity due to reverse causality, the lagged values of the predictor variables were used to examine their relationship with SRQ (Shaheen et al., 2023; Sial et al., 2018). The results in Table 14, indicating a significant positive link between lagged values of ACE and SRQ (coef. = 0.122, odds = 1.129) remain consistent with original findings.

Table 14. Robustness analysis for reverse causality using lagged predictor values.

SRQ	Coef.	Odds
L.ACE	0.122*	1.129*
L.ROA	3.009***	20.259***
L.FS	1.091***	2.978***
LAGE	0.010	1.010
L.LEV	0.206	1.228
Observations	2750	
Chi2	745.30	
Prob > Chi2	0.000	

5. Discussion

Stronger governance mechanisms, accompanied by disclosure of non-financial information, ensure accountability in management and thereby prevent corporate failures. Recognising this, regulatory bodies around the world have updated CG and sustainability disclosure regulations. This attracted researchers' interest in understanding the role of CG in SR practices, finding that effective governance in the form of ACs encourages companies to engage in sustainable business practices and disseminate reliable sustainability disclosures (Al-Shaer & Zaman, 2018; Shaker et al., 2023). Notably, agency theory, stakeholder theory, and legitimacy theory collectively underscore the importance of the AC in reducing information asymmetry, meeting stakeholder expectations, and upholding organisational legitimacy through high-quality SR. Considering this, the present study aimed to evaluate the association between effective AC and SR practices in India, where SR regulations are progressing.

The descriptive statistics and frequency table reveal that, despite the evolving mandatory regulations on sustainability disclosures in India, overall SRQ among firms is low, with only 8.27% of the companies publishing top-quality sustainability reports. However, Indian companies have moderately effective ACs, with 34.87% of the sample firms attaining higher effectiveness scores. A random effects ordered logistic regression was applied to determine if an effective AC encourages companies to adopt a high level of SR practices. By recognising the benefits of composite measurement over separate measurement of individual attributes, this study investigated the relationship between the composite measure of ACE and the quality of SR (AlQadasi & Abidin, 2018; Elmashtawy et al., 2024). Findings supported the hypothesis, indicating that effective AC on the corporate board has a significant positive association with the odds of publishing high-quality sustainability reports. The results corroborate the findings of previous studies in developing countries like Indonesia and Malaysia, which found that members in the AC bring diverse knowledge and expertise into the company, thereby improving its SR practice (Meutia et al., 2023; Razali et al., 2025). It was evident from a study on Iraqi firms that frequent AC meetings enable members to regularly review non-financial reports, ensuring quality reporting practices (Shaker et al., 2023). Further, independence in the AC enables impartial governance and, in turn, leads to better ESG disclosure (Buallay & Al-Ajmi, 2020; Ruziwa et al., 2025). Subsequently, marginal effect analysis indicated that ACE does not encourage the basic reporting choices of the firms; instead, it motivates them to publish high-quality reports that are internally governed by the sustainability committee and externally assured. This confirms that, though the causal effect of ACE on SRQ is lower than that of the control variables, the role of ACE in contributing to the

reliability and credibility of the report cannot be ignored. In accordance with the agency theory, the findings illustrated the monitoring role played by AC in SR decisions. Further, it is understood that AC tries to align the reporting practices of the company with the stakeholder expectations and societal norms, as explained through stakeholder and legitimacy theory. This supports the findings of previous research demonstrating the AC's contribution in enhancing the credibility of the disclosures on sustainability (Al-Shaer & Zaman, 2018). Particularly in the evolving regulatory context of India, the implications of these regulations are evident in the form of improved ACE and SRQ association. The results remained consistent across various robustness analyses, indicating the positive association between ACE and SRQ. Additionally, the subsample analysis reflected that the nexus between ACE and SRQ is more pronounced among environmentally sensitive and larger firms compared to environmentally less sensitive and smaller firms. However, moderation analysis revealed that the association does not statistically vary among firm types.

This study found contradictory evidence when individual AC traits were examined. Similar observations were found in past studies, where individual AC attributes had no significant impact on sustainability-related disclosures (Madi et al., 2014; Rustiarini et al., 2024; Ruziwa et al., 2025). However, this confirms that there is a significant positive connection between the combined measure of individual AC traits and SRQ among companies. This is contrary to a study conducted in Indonesia using a similar composite measure, which found that ACs do not prioritise sustainability issues and thus do not have a direct positive influence on such disclosures (Mahsina et al., 2025). However, smaller coefficients of ACE in the main results and marginal effects analysis indicated the limited influence of ACE in significantly contributing to a higher SRQ. This can be attributed to the lack of a legitimacy requirement for AC members to encourage SR and limited awareness among them on sustainability issues. As a result, the motivation for firms to translate ACs' oversight into quality reporting is reduced. It posits that the AC may perceive publishing credible SR as a compliance requirement rather than as a strategic priority, leading ACs to concentrate more on financial disclosures than on sustainability oversight. Moreover, the evolving governance and SR regulations in India make investors perceive these strategies as merely symbolic for a few firms, reducing the incentive for the AC to adopt high-quality disclosures.

6. Conclusions

The growing importance of corporate sustainability has led researchers to explore the intricate link between CG and SR of corporate entities. AC is an effective governance mechanism in overseeing non-financial disclosures. Given the evolving regulatory environment for both CG and SR, this study intended to evaluate the nexus between ACE and the extent of SR in India. Taking agency theory, legitimacy theory, and stakeholder theory as the base, this study employed a panel ordered logistic regression using a unique measure of ACE and SRQ for 250 entities listed on the Nifty 500 index over a time frame of 12 years.

Results highlight the presence of strong ACs and a lower level of SRQ among selected Indian companies. Regression results reveal that an effective AC decreases the chances of companies adopting a basic level of reporting and increases the probability of adopting the highest degree of SR practices, involving internal scrutiny by a sustainability committee and external assurance by the Big Four or

other audit firms. It indicates that an AC with an effective number of members who meet regularly will bring cognitive diversity and enable continuous monitoring. Furthermore, independent members of the committee promote unbiased and quality disclosures. The non-significant results of individual attributes and significant results of combined measures advance the existing studies on individual AC attributes by illustrating how the joint presence of those characteristics shapes the extent of non-financial disclosure among top-listed entities from a developing country context.

The study is consistent with the expectations of multiple theoretical frameworks. It supports the agency theory by highlighting that ACE reduces the information asymmetry by improving the SRQ. Simultaneously, the findings on the AC's role in meeting the stakeholders' need for sustainability information align with the stakeholder theory. Furthermore, the results are in line with the legitimacy theory, which underscores that ACE helps a company to maintain legitimacy by overseeing the dissemination of credible information. The findings provide significant suggestions for policymakers and regulatory bodies to strengthen the existing norms on AC structure, as it plays a crucial role in enhancing the quality of sustainability disclosures. The lower coefficients indicate that ACE alone is insufficient to drive meaningful improvements in SR among these firms. Further, it is also clear that the economic significance of ROA and FS are more evident than that of ACE. Therefore, policies should be developed to increase awareness among AC members on monitoring sustainability activities and their reporting to ensure that SR goes beyond compliance among the firms. Further, firms may consider sustainability-linked incentives for AC members to further enhance the AC role in improving SRQ.

Despite the inclusion of robust analysis to address the potential concerns of endogeneity due to reverse causality or omitted variable bias, the study acknowledges its limitations in completely removing endogeneity, as well as the subjectivity in the manual measurement of variables. At the same time, the study considers only three characteristics in measuring AC effectiveness, leaving other potential effectiveness traits unaccounted for. Future researchers may enhance the findings of this study by considering alternative measures of SR, like ESG scores, or by including additional AC attributes like expertise and experience of AC members to gauge the strength of ACs. Examination of contextual factors like regulatory pressure, incentive structure, or firm resources that affect the ACE and SRQ would provide deeper insights. This study is confined to Indian firms, which reduces its generalizability to other economies. Therefore, comparative evidence from diverse economies or cross-country analysis would be a fruitful avenue for future researchers. Furthermore, studies can also investigate the impact of AC effectiveness on other emerging forms of reporting, such as integrated reporting, which combines the disclosure of both financial and non-financial aspects.

Author contributions

Deepa C Bhat: Conceptualization, Data Curation, Methodology, Formal Analysis, Writing – original draft. Sandeep S Shenoy: Project administration, Investigation, Supervision, Writing- review & editing, Software. Dasharathraj K Shetty: Supervision, Methodology, Writing- review & editing, Validation

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

The authors declare no conflict of interest.

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