

BOARD DIVERSITY AND CSR SPENDING PATTERNS: EVIDENCE FROM INDIAN POWER GENERATION COMPANIES

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Abstract

This study examines the impact of board diversity on Corporate Social Responsibility (CSR) spending among selected public and private power generation companies in India during 2020–2024. Using secondary data from annual reports of nine companies, the study applies descriptive statistics, correlation analysis, and panel regression techniques. Board characteristics such as board size, gender diversity, age, education, multiple directorships, and independent directors are considered as explanatory variables, while ROE, NPM, and leverage serve as control variables. The results indicate significant variation in CSR spending and governance attributes across firms. Correlation findings show positive associations between CSR spending, board size, and gender diversity. Diagnostic tests confirm no serious multicollinearity, though heteroscedasticity is present. Model selection tests support the Fixed Effects Model as the most appropriate specification. Regression results reveal that board size, board age, and leverage significantly and positively influence CSR spending. The study concludes that board structure and firm-specific characteristics play an important role in determining CSR engagement in the Indian power sector.

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1. Introduction

Corporate Social Responsibility (CSR) has emerged as a central component of corporate strategy and governance in the 21st century. Traditionally viewed as a voluntary philanthropic activity, CSR has evolved into a strategic obligation aligned with stakeholder expectations and sustainable development goals (Carroll, 1999; Freeman, 1984). In India, CSR gained statutory recognition through the Companies Act, 2013, which mandates eligible firms to allocate at least 2% of their average net profits toward CSR activities. This regulatory framework has significantly institutionalized CSR spending and enhanced corporate accountability (MCA, 2013; Bansal & Song, 2017). Consequently, understanding the determinants of CSR spending patterns has become an important area of corporate governance research.

Board of Directors play a pivotal role in shaping corporate strategy, monitoring management decisions,

and ensuring alignment with stakeholder interests (Jensen & Meckling, 1976; Hillman & Dalziel, 2003). Board diversity—encompassing gender diversity, independence, age, educational background, and professional expertise—has attracted growing scholarly attention due to its potential influence on ethical orientation, risk perception, and strategic decision-making (Carter, Simkins, & Simpson, 2003; Adams & Ferreira, 2009). Diverse boards are often associated with broader stakeholder sensitivity, enhanced transparency, and improved corporate social performance (Bear, Rahman, & Post, 2010; Post, Rahman, & Rubow, 2011).

From a theoretical perspective, stakeholder theory suggests that diverse boards are more likely to consider the interests of multiple stakeholder groups, thereby promoting socially responsible investments (Freeman, 1984). Similarly, resource dependence theory argues that board diversity enhances access to critical resources, networks, and legitimacy, which may positively influence CSR engagement (Pfeffer & Salancik, 1978; Hillman, Cannella, & Paetzold, 2000). Empirical studies across developed economies indicate a positive relationship between gender-diverse boards and CSR performance and disclosure (Harjoto, Laksmana, & Lee, 2015; Byron & Post, 2016). However, evidence from emerging markets, particularly India, remains limited and mixed.

The Indian power generation sector presents a particularly relevant context for examining this relationship. Power generation companies—both public and private—operate in environmentally sensitive and socially impactful domains. Their operations affect local communities, natural ecosystems, and public health, making CSR engagement not only strategic but also socially imperative (Jamali & Mirshak, 2007). Given the high environmental footprint and public visibility of power companies, board oversight and governance mechanisms are likely to significantly influence CSR spending priorities, including allocations toward education, health, rural development, and environmental sustainability.

Although prior research has explored board characteristics and CSR performance in general corporate settings, limited studies have specifically examined how board diversity influences the *pattern and allocation* of CSR expenditure within sector-specific contexts in India. Understanding whether diverse boards allocate CSR funds differently—such as prioritizing environmental initiatives over community development—offers deeper insights beyond aggregate CSR spending levels.

Against this backdrop, the present study investigates the relationship between board diversity and CSR spending patterns in Indian power generation companies. By focusing on sector-specific evidence, this study contributes to the corporate governance and CSR literature in three ways. First, it extends the discourse on board diversity into the domain of CSR expenditure allocation rather than mere disclosure or overall CSR intensity. Second, it provides empirical evidence from a regulated emerging economy where CSR is mandatory. Third, it offers policy implications for strengthening governance mechanisms to enhance responsible corporate behavior in environmentally critical industries.

2. Literature Review

2.1. Conceptual Grounding: Board Diversity and CSR

Board diversity has been widely recognized as a key governance mechanism that influences strategic decision-making and corporate behavior (Carter, Simkins, & Simpson, 2003). Diversity can include gender, age, professional background, expertise, and independence, each contributing to a board's ability to understand stakeholder needs and exercise oversight (Adams & Ferreira, 2009). The theoretical underpinnings of board diversity explain its potential effects on CSR. Stakeholder theory posits that diverse boards are more sensitive to the demands and expectations of multiple stakeholder groups, leading to socially responsible decisions (Freeman, 1984). Resource dependence theory suggests that diversified boards provide broader networks, perspectives, and legitimacy, enabling firms to better respond to environmental and social challenges (Hillman, Cannella, & Paetzold, 2000). CSR, once considered discretionary philanthropy, is now embedded in governance frameworks, especially in

emerging economies like India where the Companies Act, 2013 mandates CSR spending for qualifying companies (Ministry of Corporate Affairs, 2013). CSR spending patterns reflect not only the amount but also the allocation of resources across social, environmental, and community development dimensions.

2.2. Board Diversity and CSR: Global Evidence

Empirical evidence from developed markets generally supports a positive relationship between board diversity and CSR performance. Several studies find that gender-diverse boards are associated with higher levels of CSR engagement and disclosure (Bear, Rahman, & Post, 2010; Byrnes & Post, 2016). Boards with female directors tend to exhibit greater social sensitivity and reputational risk awareness, translating into higher CSR involvement. Harjoto, Laksmana, & Lee (2015) conducted a cross-country study showing that boards with greater diversity significantly contribute to enhanced CSR performance. Similarly, Post, Rahman, & Rubow (2011) linked diversified governance to stronger environmental CSR. Yet, the evidence is not uniform. Some scholars argue that diversity per se may not guarantee more effective CSR outcomes unless complemented by institutional support and strategic alignment (Agle, Mitchell, & Sonnenfeld, 1999). This nuance highlights the importance of contextual factors such as regulatory frameworks, cultural norms, and industry characteristics.

2.3. Indian Evidence on Board Diversity and CSR

In India, limited but growing research has begun exploring the link between governance mechanisms and CSR. Given the mandatory CSR spending requirement introduced by the Companies Act, 2013, Indian studies are uniquely positioned to examine how board characteristics influence not only the extent of CSR spending but also its allocation across social and economic priorities. Research on Indian firms suggests that board independence and gender diversity positively influence CSR performance (Khan, Muttakin, & Siddiqui, 2013; Gupta & Sharma, 2019). Firms with diverse boards are more likely to spend on community development and education, reflecting broader stakeholder engagement. However, research specifically targeting spending patterns — that is, how CSR funds are allocated across categories such as education, health, environment, and infrastructure — remains sparse. Most Indian studies focus on overall CSR expenditure or disclosure quality rather than category-level allocation patterns. This gap is especially relevant for sector-specific contexts like power generation, where environmental and social challenges are prominent and CSR priorities may differ from other industries.

2.4. CSR in the Power Generation Sector

The power generation sector has a substantial social and environmental footprint. Issues such as land acquisition, emissions, occupational health and safety, and community livelihood impact have made CSR a critical strategic concern (Jamali & Mirshak, 2007; Sharma & Mani, 2018). CSR activities in this sector often emphasize environmental sustainability, access to energy, rural development, and health services (Mahmood & Orazem, 2017). Studies specific to power generation companies highlight that CSR allocation often reflects compliance requirements and stakeholder pressure rather than proactive strategic orientation (Singh & Verma, 2020). Yet, there is limited empirical work examining how board diversity shapes the pattern of CSR spending in this sector — such as whether boards with greater gender or professional diversity prioritize environmental programs over community development, or vice versa.

Given the statutory CSR mandate in India, intensified environmental scrutiny of power generation companies, and mixed evidence on the governance–CSR link, there is a compelling need to analyze how board diversity influences CSR spending patterns within this sector. Understanding these dynamics can provide insights for policymakers, investors, and corporate boards aiming to enhance strategic CSR engagement that aligns with both stakeholder interests and sustainable development goals.

3. Research Objectives and Hypothesis

The objective of the study is to verify the impact of the board diversity on the CSR spending pattern of the power generation companies in India. The following is the hypothesis of the objectives:

H₀: The board diversity has no significant relationship with CSR spending pattern of power generation companies in India.

H₁: The board diversity has significant relationship with CSR spending pattern of power generation companies in India.

4. Research Methodology

4.1. Data

The current analytical study is based on the secondary data of public and private power generation companies in India. The independent variables (board diversity) are Board Size (B_SIZE), Gender Diversity (GEN), Age of Directors (AGE), Education of Directors (EDU), Multiple Director (MULTI), and Independent Directors (ID). The dependent variable is CSR spendings (CSR_SPD) of power generation companies in India. Moreover, return on equity (ROE), net profit margin (NPM), and leverage (LEV) are taken as control variables under study. The variables are collected from the annual reports of selected 9 public and private power generation companies in India for the period from 2020 to 2024 (5years).

4.2. Methods

This study applied descriptive statistics to know the behaviours of the variables and correlation analysis to know the degree of relationship between the variables. Further, the panel regression is used to know the impact of board diversity on CSR spending pattern of selected power generation companies in India.

Model Specification

$$CSR_SPD_{it} = \alpha + \beta_1 B_SIZE_{it} + \beta_2 GEN_{it} + \beta_3 AGE_{it} + \beta_4 EDU_{it} + \beta_5 MULTI_{it} + \beta_6 ID_{it} + \beta_7 ROE_{it} + \beta_8 NPM_{it} + \beta_9 LEV_{it} + \beta_{10} Sec_Dum_{it} + \varepsilon_{it}$$

5. Results and Interpretation

5.1. Descriptive Statistics

The descriptive statistics based on 50 firm-year observations indicate notable variability across key variables. CSR spending (CSR_SPD) has a high mean (62.35) compared to its median (28.00), along with substantial standard deviation (94.32), positive skewness (2.56), and high kurtosis (6.08). This suggests significant dispersion and the presence of extreme values, indicating heterogeneous CSR commitment among firms. Board size (B_SIZE) is relatively stable (mean = 10.82; SD = 1.55), showing uniform board structures. Gender diversity (GEN) exhibits moderate variability and positive skewness, implying uneven female representation across firms. Board age (AGE) remains fairly consistent with minimal dispersion. Educational qualification (EDU) shows a high mean (70.15) and negative skewness, indicating most firms have well-qualified directors. Multiple directorships (MULTI) are common, with moderate variation. The proportion of independent directors (ID) reflects extreme dispersion (high SD, skewness, and kurtosis), suggesting significant cross-firm differences and outliers. Financial performance indicators—ROE and NPM—show moderate averages with positive skewness, while leverage (LEV) indicates balanced yet varying capital structures.

Overall, CSR spending and certain governance variables exhibit high variability and non-normal distribution, emphasizing the need for robustness checks and appropriate econometric techniques in further analysis.

Table 1: Descriptive Statistics of CSR spendings and Board Diversity

	CSR SPD	B_SIZE	GEN	AGE	EDU	MULTI	ID	ROE	NPM	LEV
Mean	62.35	10.82	13.26	0.24	70.15	66.52	76.26	11.77	21.13	0.90
Median	28.00	11.00	10.00	0.22	73.86	65.15	50.00	10.52	12.46	0.81
Std. Dev.	94.32	1.55	11.65	0.20	26.28	24.16	90.65	6.15	16.20	0.46
Kurtosis	6.08	-0.44	1.80	-1.31	0.27	-0.96	10.52	1.07	0.21	0.44
Skew.	2.56	0.11	1.42	0.23	-1.02	0.13	3.11	0.99	1.13	0.40
Min	2.09	8.00	0.11	0.05	11.11	22.22	0.23	1.07	1.91	0.08
Max	418.87	14.00	44.44	0.57	100.00	111.11	500.00	29.79	65.56	2.27
Sum	3117.71	541.00	663.05	12.10	3507.58	3326.10	3813.09	588.54	1056.49	45.11
Count	50	50	50	50	50	50	50	50	50	50

Source: Computed by authors

5.2. Correlation

The correlation results indicate that CSR spending is moderately and positively associated with board size (0.36) and strongly related to gender diversity (0.61 and 0.66), suggesting that firms with larger and more gender-diverse boards tend to spend more on CSR activities. CSR shows negligible relationships with board age, education, multiple directorships, and profitability (ROE and NPM), while its correlation with independent directors is weakly negative (-0.12). Among governance variables, the very high correlation (0.97) between the two gender measures signals potential multicollinearity concerns. Independent directors are strongly negatively correlated with education (-0.67) and moderately related to board size and age. Profitability measures (ROE and NPM) are positively correlated (0.55), whereas leverage shows a moderate negative relationship with NPM (-0.35). Overall, gender diversity emerges as the most prominent governance factor associated with CSR spending, with limited direct linkage between CSR and short-term financial performance.

Table 2: Correlation Matrix of CSR Spendings and Board Diversity of power generation companies

	CSR SPD	B_SIZE	GEN	GEN	AGE	EDU	MULTI	ID	ROE	NPM	LEV
CSR SPD	1										
B_SIZE	0.36	1									
% FEM	0.61	0.23	1								
GEN	0.66	0.43	0.97	1							
AGE	0.03	0.17	0.07	0.10	1						
EDU	-0.06	0.20	0.13	0.16	0.26	1					
MULTI	-0.11	-0.52	-0.18	-0.26	-0.01	-0.01	1				
ID	-0.12	-0.26	-0.16	-0.19	-0.24	-0.67	0.19	1			
ROE	0.00	0.03	0.01	0.02	-0.24	-0.32	-0.23	0.17	1		
NPM	-0.05	0.13	0.00	0.02	-0.21	-0.33	-0.42	-0.02	0.55	1	
LEV	0.35	0.12	0.34	0.35	0.10	-0.07	0.06	0.20	0.20	-0.35	1

Source: Computed by authors

5.3. Panel Regression

5.3.1. Test of Multicollinearity, Heteroscedasticity

The Variance Inflation Factor (VIF) results indicate that all independent variables have VIF values well below the critical threshold of 10, with values ranging from 1.35 (AGE) to 2.95 (NPM). The mean VIF of 2.08 further confirms the absence of serious multicollinearity among the explanatory variables. Since all tolerance values (1/VIF) are comfortably above 0.10, multicollinearity does not appear to be a significant concern in the regression model.

However, the heteroscedasticity tests (table-4) reveal a different outcome. The Breusch–Pagan/Cook–Weisberg test ($\chi^2 = 81.52, p = 0.0000$) and White’s test ($\chi^2 = 90.57, p = 0.0161$) are both statistically significant, indicating the presence of heteroscedasticity in the model. This suggests that the variance of the error terms is not constant across observations. Therefore, to ensure reliable statistical inference, the use of robust standard errors or other corrective measures is necessary in subsequent regression analysis.

Table-3: Variance Inflation Factor (VIF) Statistics

Variable	VIF	1/VIF
B_SIZE	1.58	0.6330
GENDER	1.78	0.5616
AGE	1.35	0.7409
EDU	2.34	0.4273
MULTI	2.07	0.4830
ID	2.27	0.4405
ROE	2.26	0.4424
NPM	2.95	0.3389
LEV	2.06	0.4854
Sec_Dum	2.10	0.4761
Mean VIF	2.08	

Source: Author’s Computation

Table-4: Test of Heteroscedasticity (Breusch-Pagan, White’s test)

Test	Chi-Sq value	Prob
Breusch-Pagan/Cook-Weisberg test	$\chi^2(1) = 81.52$	Prob > $\chi^2 = 0.0000$
White’s test	$\chi^2(64) = 90.57$	Prob > $\chi^2 = 0.0161$

Source: Author’s Computation

5.3.2. Pooled, Random and Fixed Effect Model

The panel regression results indicate that pooled OLS is inappropriate, as the Breusch–Pagan LM test confirms significant panel effects. The Hausman test further suggests that the Fixed Effects Model (FEM) is preferred over the Random Effects Model (REM), making FEM the most reliable specification.

Under FEM, board size and board age have positive and significant effects on CSR spending, indicating that larger and more experienced boards promote greater CSR engagement. Leverage also shows a positive and significant impact, suggesting that more leveraged firms allocate higher CSR expenditure. Other variables, including gender diversity, education, multiple directorships, and profitability measures, lose significance after controlling for firm-specific effects. Overall, board size, board age, and leverage emerge as the most robust determinants of CSR spending.

Table-5: Summary of the regression model (dependent variable: CSR_SPD)

Variable	OLS model		Fixed effect model		Random effect model	
	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Constant	-32.7870	-1.65	-19.3502	-1.77**	-33.5369	-1.57
B_SIZE	4.1138	3.99***	1.0429	5.40***	4.3154	3.91***
GENDER	0.4214	1.84**	-0.1688	-1.36*	-0.2760	1.32*
AGE	-1.101	-0.10	10.0077	1.77**	-7.9758	-0.72
EDU	-0.2985	-2.35**	0.1456	1.17	-0.1397	-1.72**
MULTI	0.2200	2.02**	-0.0028	-0.03	0.9393	8.45***
ID	-0.0350	-0.86	0.0350	1.58*	-0.05703	-1.31
ROE	-0.8370	-2.11**	-0.5701	-0.95	-0.4748	-2.22**
NPM	0.3210	1.81*	0.4701	1.22	0.2339	1.99**
LEV	11.9900	2.05**	5.3577	1.93**	16.0213	2.60***
Sec_Dum	-19.5560	-3.79***	-23.0121	2.79**	-10.0556	-1.90**
F/Wald χ^2	6.47***		9.82***		43.78***	
R ²	0.5209		0.4823		0.6209	

Note: ***, **, * indicates $p < 0.01$, $p < 0.05$, $p < 0.1$ respectively.

Source: Author’s Computation

The model selection results clearly justify the use of panel data techniques and identify the most appropriate specification. The Breusch–Pagan Lagrange Multiplier (LM) test ($\chi^2(2) = 235.05$, $p < 0.01$) rejects the null hypothesis that there are no panel effects ($\sigma^2u = 0$). This indicates that pooled OLS is inappropriate and that either the Fixed Effects Model (FEM) or Random Effects Model (REM) should be used. Further, the Hausman test ($\chi^2(9) = 46.96$, $p < 0.01$) rejects the null hypothesis that the difference in coefficients between FEM and REM is not systematic. This implies that the random effects estimates are inconsistent due to correlation between individual effects and explanatory variables. Therefore, the Fixed Effects Model is the most appropriate and reliable model for analyzing the determinants of CSR spending in this study.

Table-6: Selection of appropriate model

Purpose	Null Hypothesis	Test	t-statistics
OLS vs REM	$\sigma^2u = 0$	Breusch-Pagan Lagrange multiplier test	$\chi^2(2) = 235.05***$
FEM vs REM	Difference in coefficients is not systematic	Hausman Test	$\chi^2(9) = 46.96***$

Note: ***, **, * indicates $p < 0.01$, $p < 0.05$, $p < 0.1$ respectively.

Source: Author’s Computation

6. Conclusion

The study examines the relationship between board diversity and CSR spending among Indian power generation companies using panel data analysis. Descriptive results reveal substantial variation in CSR expenditure and certain governance variables, indicating heterogeneity across firms. Correlation findings suggest that gender diversity and board size are positively associated with CSR spending; however, multicollinearity is not a major concern based on VIF statistics. Although heteroscedasticity is detected, appropriate robust estimation techniques ensure reliable inference. Model selection tests confirm that the Fixed Effects Model is the most suitable specification. The regression results demonstrate that board size, board age, and leverage are the most consistent and significant

determinants of CSR spending, while other governance and profitability variables lose significance after controlling for firm-specific effects.

Overall, internal board structure and firm-specific characteristics play a crucial role in shaping CSR commitment.

7. Social Implications

The findings highlight the importance of effective board composition in enhancing corporate social responsibility. Larger and more experienced boards appear to promote higher CSR spending, suggesting that governance quality influences socially responsible behavior. Policymakers and regulators may therefore encourage stronger governance frameworks to improve CSR outcomes. Additionally, since leverage positively influences CSR spending, firms may use CSR strategically to strengthen stakeholder trust and legitimacy. Strengthening board accountability and governance transparency can contribute to sustainable development and social welfare, particularly in socially and environmentally sensitive sectors like power generation.

8. Further Scope of Study

Future research may expand the sample size across different industries and extend the time horizon to improve generalizability. Incorporating additional governance variables such as board meetings, ownership structure, CEO duality, or ESG performance measures could provide deeper insights. Comparative studies between public and private firms or cross-country analyses may also enrich understanding. Moreover, applying advanced econometric techniques such as dynamic panel models (GMM) could help address potential endogeneity issues and provide more robust conclusions regarding the governance–CSR relationship.

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