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Carbon Risk and the Cost of Capital: Evidence from Indian Listed Firms

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Abstract
As investors get more aware of climate risks and factor them into capital allocation, carbon risk is emerging as a critical factor in corporate financing decisions. This study focuses on the above relationship between carbon risk and Cost of Equity (CoE) in the listed companies of India and explores moderating effect of promoter shareholding. Secondary panel data consisting of 450 firm-year observations were used, with a quantitative research design. Two proxies measuring carbon risk (i.e., relative to net sales and total assets) and the cost of equity (i.e., estimated by the Capital Asset Pricing Model – CAPM) were employed. To test the proposed relationships and deal with potential endogeneity, the data were regressed in panel with year fixed effects as well as instrumental variable estimation. The results show that the carbon risk positively and significantly influences the cost of equity, which means that firms with advanced carbon exposure have a higher cost of equity, because of the higher environmental and transition risk perceived. Results also indicate that the relationship is weaker when promoter shareholding is present, suggesting that promoter concentration may bolster investor confidence and reduce carbon risk impact. The study demonstrates the value of good carbon risk management, open environmental reporting and good corporate governance for better financing conditions and for the sustainable corporate development in emerging economies.

Keywords: Carbon risk, Cost of equity, Promoter shareholding, Sustainable finance, Indian listed firms

1. Introduction

Climate change is now one of the biggest global challenges to the economy, financial markets and corporate decision-making. Governments, regulators and investors have stepped up their efforts to enable sustainable development and carbon neutrality, pushing companies to identify, manage and disclose carbon-related risks. Carbon risk refers to the financial, operational, regulatory and reputational risks correlated with greenhouse gas (GHG) emissions, changing climate policy and the shift to a low carbon economy. Such risks are now more pertinent in corporate finance as they affect the confidence of investors, valuation of the firm, and external financing. Thus, the impact of carbon risk on financing decisions has become a hot topic in the fields of sustainable finance and corporate governance (Wang et al., 2022; Chen et al., 2025).

Increasingly, environmental concerns are becoming a part of the investment decision, thereby changing the way capital markets assess the performance of companies. Investors might expect higher returns from companies more likely to be affected by climate change, due to the uncertainty about regulatory compliance, transition costs, and operational changes (Chandra Sekhar, 2026; Duppati, 2025). Carbon-related risks can also impact on individual companies via supply chain linkages, which can magnify financial vulnerabilities in relation to other companies within the supply chain. In addition, the connection between environmental responsibility and financial performance has been reinforced by the emergence of policy instruments like carbon pricing, leading to the strategic positioning of carbon management for listed companies (Dao et al., 2025; Bandyopadhyay & Ray, 2026).

These issues are especially relevant in the Indian context of the corporate landscape. Rapid industrialization, rising energy demand and commitment to move towards net zero emissions (NZ) in India. At the same time, regulatory efforts, like the Business Responsibility and Sustainability Reporting (BRSR) framework launched by the Securities and Exchange Board of India (SEBI) have propelled environmental disclosure and sustainability reporting in listed companies (Desai et al., 2022). With more investors putting climate-related risks in their investment strategies, companies with larger carbon footprints could face higher financing constraints and higher costs of equity. These findings were also substantiated by recent studies conducted in India, which indicated that carbon emissions and climate transition risks have a substantial impact on firm performance and market valuation, thus emphasizing the need for environmental factors to be included in firm financial strategies (Bhatia & Kaur, 2024; Farhana & Azees, 2026).

Although the consequence of carbon risk has increased in financial markets, empirical studies investigating the direct impact of carbon risk on cost of equity are scant, especially in an emerging economy like India. Prior studies have largely been carried out in developed markets or have studied environmental, social, and governance (ESG) performance in general rather than firm level carbon risk. Furthermore, ownership structure has been relatively under-researched as a determinant of the investors' perception of climate-related financial risk. In certain countries like India, where promoter ownership is concentrated, a higher stake might lead to better corporate monitoring and long-term strategic decision making, and boost investor confidence on the governance of the environment. Thus, an important research gap that has substantial implications for sustainable corporate finance and capital market decision making is whether promoter ownership moderates the relationship between carbon risk and cost of equity.

The objective of this study is to examine the relationship between carbon risk and cost of equity of Indian listed companies and understand the moderating effect of promoter shareholding. The study helps to fill the literature on sustainable finance in an emerging economy with unique aspects such as increased concentration of ownership and changing sustainability regulations with empirical evidence, and provides valuable practical guidance for corporate managers, investors, and policymakers aiming to reconcile sustainability and financial results.

2. Review of Literature

As uncertainties about climate change continue to drive investor behaviour and the allocation of capital, carbon risk is emerging as a critical factor in companies' financing decisions. More carbon intensive companies are seen as facing more regulatory, operational and transition risk and are therefore expected to provide higher returns. Carbon risk in corporate finance was comprehensively reviewed, and it was found that the climate-related financial risks are increasingly reflected in firm valuation and are becoming an integral part of sustainable finance (Wang et al., 2022). Likewise, the empirical study of listed companies revealed that carbon risk has an important impact on the stock return, meaning that investors are more considering environmental risk in the capital market.

Environmental disclosure and sustainability reporting have become relevant tools for diminishing information gap between companies and investors. Strong sustainability engagement has been found to lead to a decrease in the cost of equity, as transparent environmental reporting boosts investor confidence in the firm and lowers the perceived risk of investing in the firm (Garzon Jimenez & Zorio-Grima, 2021). Similarly, mandatory GHG disclosure was correlated with cost of equity, indicating that disclosure fosters greater market credibility and financing conditions (Gerged et al., 2021). Further, voluntary corporate disclosure with good corporate governance decreases the cost of equity by lowering the uncertainty and increasing the quality of information for investors (Abu Alia et al., 2022).

There is also an increasing literature connecting the overall sustainability performance with corporate financing outcomes. The ESG performance has been linked to lower financing costs because of improved confidence and lower information asymmetry among stakeholders (Arora & Sharma, 2022). The same conclusion has been found in other BRIC countries, where sustainable corporate practices have been found to lower the cost of capital (Dua & Sharma, 2024). Moreover, companies that perform better in the ESG environment have been shown to have lower systematic risk and better market perception (Nazir et al., 2022), and better ESG performance is also associated with lower capital costs and market risk in emerging economies (Gupta & Aggarwal, 2024).

Recently, financial implications of carbon emissions and climate transition risks have been studied specifically. The Indian companies have been witnessed to experience negative financial impacts with the carbon generation, and therefore, the importance of environmental risk management (Desai et al., 2022). In a similar vein, climate transition risk is also a key issue in the context of firm-level credit risk in India, highlighting the financial impacts of environmental exposures (Bandyopadhyay & Ray, 2026). Carbon risk can also be cascaded along the value chain, heightening firms' cost of equity through financial uncertainty (Dao et al., 2025). Furthermore, carbon pricing has been recognized as a significant determinant of company financial performance and valuation risk, which can promote the incorporation of carbon management into corporate decision-making (Chandra Sekhar, 2026; Duppati, 2025).

It is also noted that corporate governance is an important factor of sustainable financial performance. Intellectual Capital disclosures boost the confidence of investors and help in reducing the cost of equity (Mondal & Ghosh, 2021). Similarly, green innovation helps to build up environmental credibility and enhance financing conditions by showing a higher commitment to sustainable business practices (Alkebsee et al., 2023). Nevertheless, there has been limited research on how the ownership structure affects the financial implications of carbon risk. In emerging markets like India, promoter shareholding can lead to better governance practices, longer-term environmental

policies, and a lower perception of investors of financial uncertainty from climate change.

Though, the relationship between sustainability performance, environmental disclosure, ESG practices and financing costs has been documented in past studies, evidence on the effect of carbon risk at the firm level on the (COE) is scarce in Indian settings. Furthermore, the moderating role of promoter shareholding in the relationship has not been studied much. Given the research gap, the present study attempts to fill the gap by examining the association of carbon risk with cost of equity and role of promoter ownership as a moderator in the relationship between carbon risk and cost of equity for Indian listed firms.

Hypotheses:

H1: Carbon risk has a significant positive effect on the (CoE) among Indian listed firms.

H2: Promoter shareholding moderates the relationship between carbon risk and the (CoE) among Indian listed firms.

3. Methodology

3.1 Research Design

This research accepted a research design as quantitative research with secondary panel data to investigate the correlation between carbon risk and (CoE) of listed companies in India. The causal and explanatory research approach was used to consider the causal relationship between carbon risk and (CoE) of companies, and the moderating impact of promoter shareholding on the relationship between carbon risk and (CoE). Firm-level financial and environmental data were used for the analysis, allowing for the investigation of the carbon exposure of companies in a context of sustainable finance and corporate governance. To deal with cross sectional and temporal variation in the data, panel regression techniques were used to obtain more reliable and consistent assessments of the relationships between the variables in the study.

3.2 Sample Selection and Data Sources

The study has been done on a sample of Indian listed companies from different nonfinancial industries. Firms were chosen due to the complete financial, governance, and carbon emission data being available for the study period. Observations for the firms with missing information for any of the variables of interest were omitted to maintain consistency and comparability of the data. Finally, a balanced panel was constructed containing 450 firm-year observations, which contained enough variation for econometric analysis. The necessary data was extracted from corporate annual reports, sustainability disclosures, BRSR (Business Responsibility and Sustainability Reports) and trusted financial databases with firm-specific financial and governance data. Data on carbon emissions were gathered from companies' environmental reporting, while data on financial and governance variables were gathered from published companies' environmental reporting and financial statements.

3.3 Variable Measurement

The dependent variable in the study was the (CoE) which was computed by the Capital Asset Pricing Model (CAPM). Two alternative measures of carbon risk, as independent variables, were used as a way of improving the robustness of the empirical analysis. The two measures were calculated as follows: CR1: Total carbon emissions (scope 1 and scope 2) / Net sales; and CR2: Total carbon emissions (scope 1 and scope 2) / Total assets. The latter two of these alternative measures measured the carbon exposure of the operating activities and asset base of the firms. The moderating variable used was promoter shareholding (PS) which is the percentage shareholding of promoters. This variable was added to determine whether concentrated ownership has an effect on the relationship between carbon risk and the (CoE). To minimise omitted variable bias, several firm-specific control variables were added. Cash holdings (CH) were defined as cash and cash equivalents (CCCE) / net assets excluding cash (NAEC). The ratio of capital expenditure (CP) was calculated as capital expenditure/ total assets. The financial leverage (FL) was defined as the ratio of long-term debt to total assets. The number of women directors (WD) and independent directors (ID) was introduced as control variables for the boards' characteristics, which may affect sustainability practices and financing decisions.

3.4 Econometric Model Specification

To examine the proposed hypotheses, panel regression models with year-fixed effects were estimated. The baseline model evaluated the direct effect of carbon risk on the (CoE) while controlling for firm-specific characteristics. The empirical model is expressed as:

$$COE_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 CH_{it} + \beta_3 CP_{it} + \beta_4 FL_{it} + \beta_5 WD_{it} + \beta_6 ID_{it} + \varepsilon_{it}$$

where COE denotes the (CoE), CR represents carbon risk, CH is cash holdings, CP is the capital expenditure ratio, FL is financial leverage, WD is the number of women directors, ID is the number of independent directors, and ε is the error term.

To examine the moderating role of promoter shareholding, an interaction term between carbon risk and promoter ownership was incorporated into the regression model:

$$COE_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 PS_{it} + \beta_3 (CR \times PS)_{it} + \beta_4 CH_{it} + \beta_5 CP_{it} + \beta_6 FL_{it} + \beta_7 WD_{it} + \beta_8 ID_{it} + \varepsilon_{it}$$

A statistically significant negative coefficient for the interaction term would indicate that promoter shareholding weakens the positive connection between carbon risk and the (CoE).

3.5 Endogeneity Analysis

The study used instrumental variable (IV) estimation with two-stage least squares (2SLS) to overcome potential endogeneity issues due to reverse causation or failed variable bias. Industry-average carbon emissions were adopted as the instrumental variable for firm-level carbon risk, as the emission intensity of an industry can be expected to affect the carbon risk of a firm, but it is exogenous once firm characteristics are controlled. The validity of the instrument was checked using the F test which is the first stage test to check instrument relevance, under-identification test (LM test) to check if the instrument was identified or not and Hansen J statistic to check instrument validity. These diagnostic tests provided assurance that the expected relationship between carbon risk and the (CoE) was solid and not resulting from an endogenous relationship.

3.6 Diagnostic Tests

Descriptive statistics was used to explain the descriptions of the variables in the study before regression estimation. Pearson correlation analysis was performed to analyse the bivariate relationship of the variables. The Variance Inflation Factor (VIF) was used to check multicollinearity, and all the VIF values were well below the commonly used threshold value, which showed there is no problem with multicollinearity. To take account of macroeconomic and regulatory changes that occurred for all firms during the study period, all regression models included year fixed effects. All the analyses have been conducted by using suitable econometric software for panel data estimation, with the results being considered statistically important at 10%, 5% and 1% consequence levels.

4. Results

4.1 Descriptive Statistics

Table 1 indicates the descriptive data of the study variables. The final sample consisted of 450 firm-year observations of Indian listed firms. The average (CoE) was 11.2362 and the standard deviation was 2.6026 which means that the financing costs of the firms were moderately varying. Carbon risk (CR) (Scope 1 and Scope 2) had a mean of 1.4814 with a relatively high standard deviation of 3.3952 demonstrating high level of variability in the carbon exposure of the firms. The minimum and maximum values also show significant inter-firm differences in environmental performance. The mean for cash holdings (CH) came at 0.0503 and the mean for capital expenditure ratio (CP) was 4.0935 among the control variables. The average value for financial leverage (LV) was 22.1892, showing that there were noticeable differences in the capital structures of the companies. On average, a firm had about 5.22 independent directors (ID) whereas women directors (WD) had an average of 1.8377, which implies that Indian listed companies are complying with the corporate governance requirements. Descriptive statistics overall suggest that there is enough variability on all variables to be used for the further regression analysis. Figure 1 shows the distribution of the average values of all the variables studied.

Table 1: Descriptive statistics

Variables	N	Mean	Median	Std. Dev.	Min	Max
COE	450	11.2362	10.43	2.6026	8.35	20.43
CR	450	1.4814	0.1268	3.3952	0.0041	19.141
CH	450	0.0503	0.0284	0.0661	-0.0032	0.3801
CP	450	4.0935	2.48	5.5072	-7.11	30.34
LV	450	22.1892	16.9	19.5627	0.02	80.23
WD	450	1.8377	2.0000	0.9799	0.0000	5.0000
ID	450	5.2155	5.0000	1.5394	2.0000	9.0000

Source: Authors' Estimation

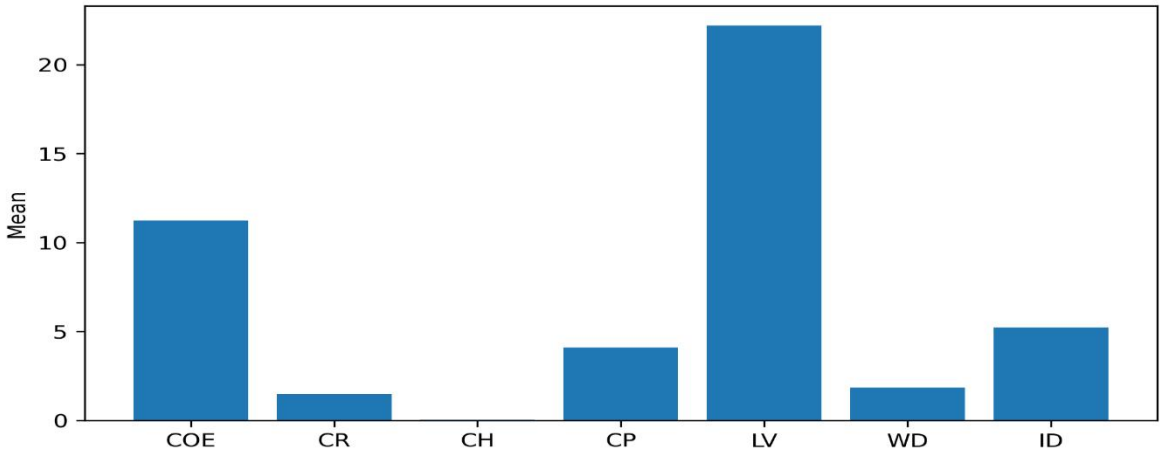


Figure 1. Mean Values of the Study Variables

4.2 Correlation Analysis and Multicollinearity

The Pearson correlation coefficients and VIF values are stated in Table 2. The results indicated that Carbon risk was positively and statistically significant correlated with (CoE) (r = 0.1204), hence the preliminary results suggested that firms with higher carbon exposure had higher equity financing cost. The (CoE) was also found to be positively correlated with financial leverage while capital expenditure and number of female directors was negatively correlated. The correlation between the descriptive variables were relatively low, suggesting that there was little linear relationship between the variables and alleviating concerns about multicollinearity. This result was supported by the VIF statistics that vary from 1.02 to 1.18 well below the recommended limit of 10. Therefore, multicollinearity was not a problem in the regression analyses. Figure 2 visually summarizes the correlation between the (CoE) and the explanatory variables.

Table 2: Correlation Matrix and Multicollinearity Test

Var	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(VIF)
COE	1.0000							
CR	0.1204*	1.0000						1.06
CH	-0.0215	-0.0164	1.0000					1.02
CP	-0.1860*	-0.1100*	-0.0374	1.0000				1.13
LV	0.1854*	0.2189*	0.1170*	-0.2999*	1.0000			1.18
WD	-0.1399*	-0.0136	-0.0225	0.1779*	-0.1675*	1.0000		1.07
ID	0.0376	-0.1042*	-0.0754	0.1373*	-0.1136*	9.0000	1.0000	1.05

Source: Authors' Estimation

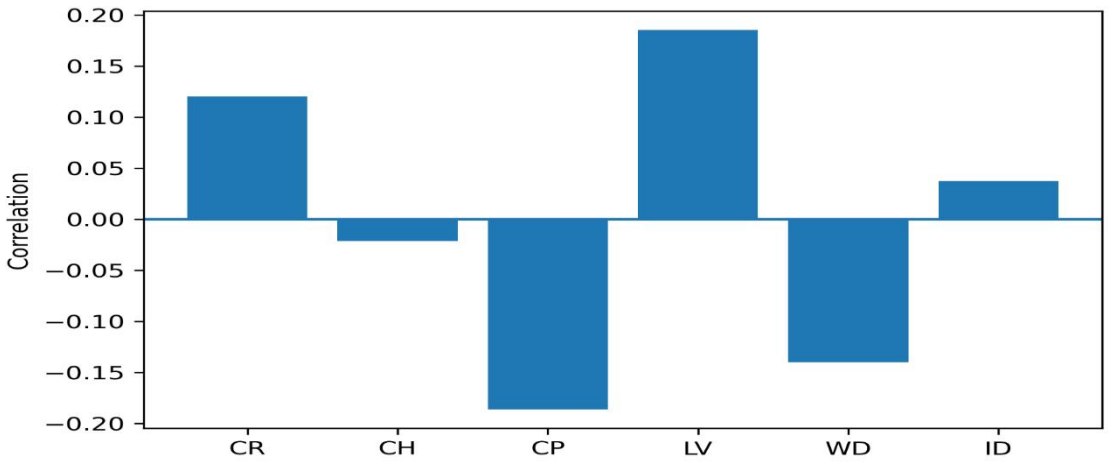


Figure 2. Correlation of Carbon Risk with the Cost of Equity

4.3 Baseline Regression Results

Table 3 indicates the baseline regression estimates. The results show that for all the specifications, the carbon risk is found to be positively seen with the (CoE), and the relationship is statistically important. The estimated coefficients were again positive and significant using the first proxy of carbon risk (CR1), which suggests that the higher the carbon intensity with respect to net sales, the higher the firm's required equity returns. The second proxy (CR2) had similar positive and statistically significant coefficients when measured relative to total assets, thereby strengthening the results. The control variables revealed that cash holdings showed a negative relationship with (CoE) indicating that firms with higher cash holding have lower financing cost. The (CoE) was also negatively and statistically significant associated with capital expenditure. Financial leverage, on the other hand, showed a positive relationship with equity financing costs, which means that the more an issuer leverages, the greater the perceived financial risk of the investors. Across the estimated models, the number of women directors had a negative relationship with the (CoE), while the number of independent directors had a positive relationship. All F-statistics showed overall model significance, with the models capturing 2.42% - 19.46% of the difference in the (CoE).

The regression results specify evidence that under both carbon risk measures, carbon risk positively and significantly impacts the (CoE). Thus, Hypothesis 1 (H1) is accepted that there is a positive correlation between carbon risk and (CoE). The (CoE) effects of carbon risk is plotted in Figure 3.

Table 3: Baseline regression results

	COE					
	(1)	(2)	(3)	(4)	(5)	(6)
CR1	0.8905***	0.7633***	1.8027***			
	(0.1596)	(0.1301)	(0.5482)			
CR2				72.2569**	69.5174**	670.0033***
				(33.9721)	(35.1607)	(209.4621)
CH		-8.6501**	-9.6729**		-7.4828*	-8.9135**
		(4.1636)	(3.9764)		(3.9543)	(3.8521)
CP		-0.1177***	-0.1125***		-0.1112***	-0.1068***
		(0.0293)	(0.0302)		(0.0301)	(0.0305)
LV		0.0866***	0.0825***		0.1079***	0.1011***
		(0.0294)	(0.0284)		(0.0312)	(0.0311)
WD		-0.6519***	-0.6625***		-0.6711***	-0.6788***
		(0.1898)	(0.1912)		(0.1902)	(0.1915)
ID		0.3152**	0.3341**		0.3251**	0.3379**
		(0.1361)	(0.1385)		(0.1356)	(0.1326)
PS			0.0646*			0.0614*
			(0.0378)			(0.0365)
CR * PS			-0.0181**			-8.4531***
			(0.0083)			(2.8383)
Constant	9.9171***	8.6489***	5.2845***	10.9118***	8.8952***	5.5339***
	(0.2364)	(1.0814)	(2.0146)	(0.1524)	(1.1245)	(2.0733)
Year FE	YES	YES	YES	YES	YES	YES
N	450	450	450	450	450	450
R-Square	0.0608	0.179	0.1946	0.0242	0.1579	0.1881

F-Statistics	31.14	14.73	12.42	4.52	8.64	9.72

Source: Authors' own work

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively, with standard error in parentheses.

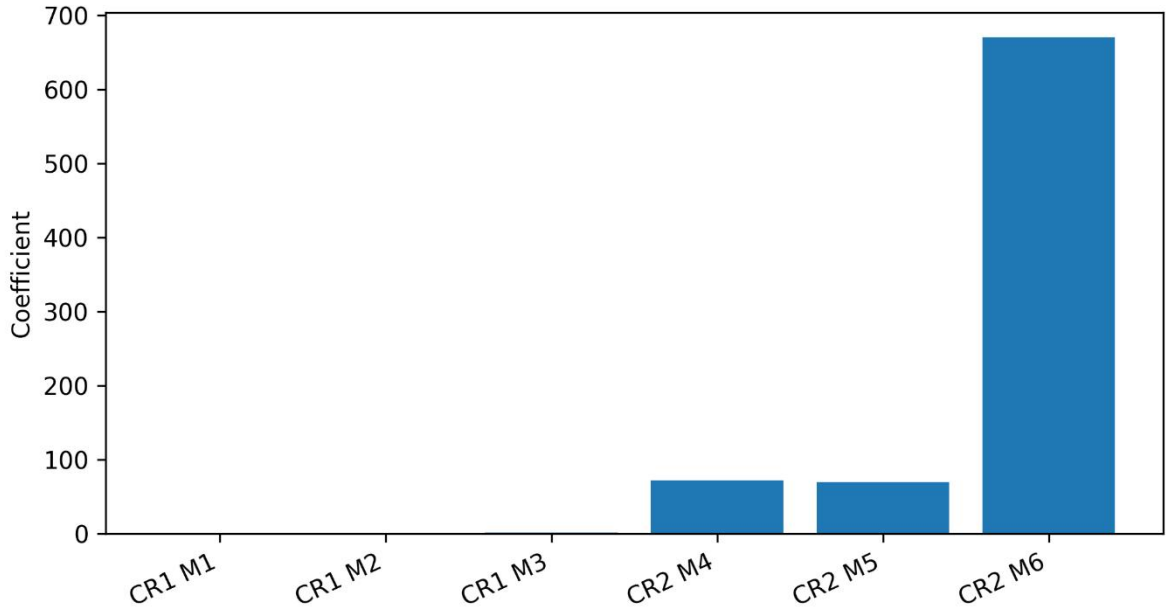


Figure 3. Regression Coefficients for Carbon Risk

4.4 Moderating Effect of Promoter Shareholding

Table 3 also indicates results of the moderation analysis which includes promoter shareholding and the interface term between promoter shareholding and carbon risk variable. Promoter shareholding had a positive coefficient whereas the interface variables of carbon risk and promoter shareholding had a negative and statistically substantial impact under both carbon risk specifications. This result indicates that the relationship between carbon risk and (CoE) is negatively affected by an increase in promoter ownership. This implies that investors believe concentrated ownership minimizes carbon-related financial risks and thus helps to curb the harmful effects of carbon emissions on equity financing costs. The findings offer empirical evidence for the suggested moderating hypothesis. The carbon risk x promoter shareholding interaction term is negative and statistically pointed for the estimated models. This result suggests a negative relationship between promoter shareholdings and carbon risk on the (CoE), which supports the result of promoter's ownership strengthening the impact of carbon risk on (CoE). Thus, Hypothesis 2 (H2) is accepted.

4.5 Endogeneity Analysis

An instrumental variable (IV) regression analysis was conducted with industry-average emissions as an instrument for carbon risk to check the strength of the empirical results. The results are showed in Table 4. The authenticity of the instrument was confirmed from the first-stage regression which showed that the industry-average emissions were positively and statistically significantly correlated with the firm-level carbon risk. The F-statistic in the initial stage was above the critical value used in the literature, which meant that the instrument was in general sufficiently strong. After the addition of the possibility of endogeneity, the second-stage regression still showed a positive and statistically significant connection between carbon risk and the (CoE). In addition, the results of the under-identification (LM) test and Hansen J statistic endorsed the validity of the instrumental variable approach, making the estimated carbon risk–equity financing cost relationship reliable.

Table 4: Endogeneity problem: Instrumental Regression

	(1)	(2)
	First -Stage	Second-Stage
	CR	COE
Industry Average Emission	0.9342*** (0.1675)	

CR		3.0742*** (0.6916)
First-Stage F-stat	31.10***	
LM statistic (Underid. Test)	22.990 (0.0000)	22.990 (0.0000)
Hansen J statistic (p-value)		0.000
Controls	Yes	Yes
Year fixed effect	Yes	Yes

Source: Authors' own work
Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively, with standard error in parentheses.

5. Discussion

The current study focused on the correlation between carbon risk and (CoE) of Indian listed firms and explored the moderating effect of promoter shareholding. The empirical results support that carbon risk has a positive effect on the (CoE) which suggests that firms with advanced carbon exposure have a higher financing cost in the equity market. This correlation implies that carbon-intensive companies are seen as having more regulatory, market, and transition risk and therefore investors require higher expected returns to offset these risks. This solid link, which is supported by instrumental variable estimation, also further suggests that carbon risk is not only an environmental issue, but an important financial consideration. The results demonstrate how climate considerations are becoming more mainstream in investment decisions and the relevance of sustainable practices in new capital markets.

The results confirm earlier studies that found environmental risk/disclosure practices have a substantial impact on the financing costs of firms. Ding and Shahzad (2022) present similar findings that environmental penalties raise the (CoE), and environmental disclosures reduce investors' perceived risk. It is worth noting that, Abu Alia et al. (2022) illustrated that voluntary corporate disclosure, backed up with good governance structure, help in decreasing the (CoE) financing due to transparency and the reduction of information asymmetry. The results are also constant with the findings of the effect of environmental performance and sustainability practices on the capital costs for the firms. Research indicates that the positive impact of ESG on financing costs is undermined by ESG controversies, highlighting the need for consistent environmental management (Hampl & Vágnerová Linnentová, 2024; Rohara, 2025). Additionally, Tanjung (2023) revealed that companies with higher ESG scores tend to have better financing conditions and overall market performance, which aligns with the current study's findings that environmental risk has been integrated into investor assessment.

The findings also wink that the positive connection between carbon risk and (CoE) is greatly mitigated by the promoter shareholding. The result suggests that high concentration of ownership increases investor confidence through more effective monitoring of management and more willingness to make long-term decisions about carbon related risks, which reduces the financial impact of carbon related risks. Promoters who have significant equity interest might have stronger incentives to undertake and have more effective sustainability projects, better environmental governance and less uncertainty related to climate-related risks. Thus, investors might view the companies with higher promoter stakes as more effective in dealing with environmental issues and hence as less risky in terms of equity financing costs, even though the carbon exposure is higher in those companies.

The findings in this study indicate moderating role which is like earlier studies which highlighted the importance of governance and sustainability strategies in reducing the financial risk. Pizzutilo et al. (2020) found that good carbon risk management helps to reduce financing costs, as it boosts firms' environmental credibility in financial markets. Likewise, Garzón-Jiménez et al. (2025) found that better environmental profiles and sustainability reporting lower the overall cost of capital for companies, while Desai et al. (2025) showed that internal carbon pricing could improve the value of the firm by improving environmental decision-making. Similarly, Veeravel et al. (2025) have identified that internal carbon pricing has a positive impact on firm performance in Indian listed firms, suggesting that internal carbon pricing has an environmental and financial impact.

From a practical point of view, the results indicate that listed companies in India should include carbon risk management as part of their corporate financial planning process and not just as a compliance issue. Enhancing environmental governance, the quality of carbon disclosure, and the credibility of emission reduction initiatives may help investors mitigate their risk perceptions and, in the end, lower the equity financing cost for companies. Furthermore, ownership arrangements that include committed promoters can help to reinforce market confidence through the promoters' monitoring and long-term sustainability planning. Comparable findings have

been reported in the literature on the relationship between energy efficiency, carbon footprint, and governance quality and financial performance (Roy, 2026; Ghose et al., 2026). Further, high corporate transparency on sustainability related information is crucial to diminish the information asymmetry and improve investor confidence, as suggested by Mahajan and Singh (2024) for commercial banks in India.

The present study has several limitations. The study has been based on secondary data at the firm level, and hence the results are applicable only for listed firms in India and not for a privately held firm or other developing economy. Future research could expand the study by adding additional ESG metrics, different carbon transition risk measurements, sector-specific carbon exposure and a cross-country analysis to increase a deeper understanding of carbon risk and sustainable corporate finance.

6. Conclusion

This study focused on the relationship between carbon risk and (CoE) for Indian listed companies and moderated the relationship by promoter shareholding. The results show that the higher the carbon risk the higher the (CoE), which means investors think of carbon-intensive companies as being at greater financial risk and transition risk. The results also show that promoter shareholding has a weakening effect on this relationship, which highlights that concentrated ownership is likely to enhance investor confidence as it ensures better governance and long-term strategies on environmental risks. This study adds to the body of work on supportable finance with empirical findings from the Indian context where climate related financial risks and sustainable reporting is gaining significant traction. The results highlight the consequence of good carbon risk management, not just as a green responsibility, but as a sound financial practice, which can lower equity funding costs and make companies more resilient. The findings are significant for managers, showing the need to enhance the disclosure of carbon emissions, ensure environmental governance and engage in proactive approaches to reduce emissions. Policymakers can also work to facilitate sustainable investment through the promotion of more comprehensive climate change reporting requirements. Further studies should build on this research to use other climate risk indicators, more ESG dimensions, industry variations, and cross-country comparisons to gain a more comprehensive sight of the link between carbon risk and corporate financing decisions in emerging economies.

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