

Research on Corporate Lobbying Behavior from a Carbon Accounting Perspective: The Correlation Between Lobbying Expenditures and Carbon Footprints

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ABSTRACT

Given the escalating climate risks and policy uncertainties globally, the relationship between corporate carbon footprints and lobbying expenditures has become an urgent research topic. This study employs empirical analysis to examine this correlation from a carbon accounting perspective, utilizing data on lobbying expenditures and carbon emissions from selected U.S. publicly listed companies between 2011 and 2023. The findings reveal that: (1) A significant positive correlation exists between corporate carbon emission intensity and political lobbying investments. As corporate carbon footprints expand, their lobbying expenditures correspondingly increase. (2) For U. S. companies, the growth in carbon emissions exacerbates financing constraints, which in turn drives additional lobbying expenditures. (3) Against the backdrop of increasingly stringent environmental regulations, high-carbon-emitting firms tend to influence policy-making processes through lobbying to secure favorable treatment or delay the implementation of unfavorable environmental regulations. In contrast, low-carbon-emitting firms, facing relatively lower compliance costs and regulatory pressures, do not exhibit a significant increase in lobbying expenditures. This divergence highlights strategic differences among firms with varying carbon emission levels in responding to environmental policies.

KEYWORDS

Corporate lobbying expenditures; Corporate carbon footprint; Climate policy

1 Introduction

As global climate risks intensify, climate policies play a pivotal role in addressing issues such as global warming, while corporate lobbying is regarded as a critical factor in the success or failure of climate change legislation ^[1]. The carbon footprint serves as a metric for measuring carbon dioxide emissions, encompassing the entire lifecycle emissions of products or services, from production and transportation to final use and disposal. To mitigate climate risks, many non-profit organizations and national governments have implemented carbon footprint management measures, particularly imposing stricter carbon taxes or cap-and-trade policies on high-carbon-emitting firms ^[2].

However, corporate strategic responses to climate policies may either drive the transition to a low-carbon economy or attempt to delay regulatory measures to safeguard commercial interests.

Against the backdrop of mandatory ESG reporting requirements for relevant firms in an increasing number of countries and corporate disclosures of lobbying expenditures, a pertinent question arises: What is the relationship between corporate lobbying behavior and carbon footprints? Specifically, from a carbon accounting perspective, do firms use lobbying expenditures to influence climate policies and circumvent carbon-related costs? In other words, is there an inherent link between corporate carbon footprints and lobbying expenditures? To elucidate this relationship, this study employs empirical analysis. First, a theoretical framework integrating carbon accounting and lobbying behavior is constructed to analyze the role of carbon emission data in corporate strategy. It explores how firms leverage lobbying to maintain market positions and whether such behavior is particularly pronounced among high-carbon-emitting firms.

2 Literature Review

Existing research on the relationship between corporate lobbying expenditures and carbon footprints remains limited. Current studies primarily focus on the motivations and pathways of corporate lobbying behavior or the quantification, accounting, and disclosure of carbon emissions, with a significant emphasis on specific sectors such as energy, automotive, and finance ^[3]. Lobbying-related research often centers on the financial returns of corporate lobbying, paying less attention to emerging motivations such as environmental internalization. Prior studies indicate that high-carbon-emitting industries, such as fossil fuels, allocate more resources to lobbying than to other political expenditures like campaign donations, as these industries lobby to protect their economic dominance ^[4]. Fiercer market competition may weaken the influence of pollution lobbying groups and incentivize firms to adopt greener practices rather than relying on lobbying ^[5]. In sectors such as energy, transportation, and metals, lobbying efforts often promote "negative lobbying." For EU countries, budgetary disparities in lobbying activities underscore the complex interplay between financial resources

and strategic interests^[6].

Some studies suggest a negative correlation between lobbying activities by fossil fuel companies and shareholder value. In the context of supporting clean energy development, industry lobbyists have inadvertently amplified divestment campaigns, which may not yield long-term shareholder benefits^[7]. While corporate lobbying research is extensive, most studies focus on the impact of lobbying on policies, lacking reverse analyses of carbon performance. The intersection of corporate lobbying expenditures and carbon footprints from a carbon accounting perspective remains underexplored.

3 Research Hypotheses

Based on resource dependence theory, firms with larger carbon footprints face higher compliance risks^[8]. To mitigate potential climate-related regulatory risks, such firms increase lobbying expenditures to influence environmental policy-making. Thus, the first hypothesis is proposed:

H1: A positive correlation exists between corporate carbon footprint intensity and lobbying expenditure intensity.

On the one hand, firms with stronger reputations are more inclined to manage stakeholder perceptions through actions rather than lobbying^[9]. On the other hand, policy uncertainty exacerbates instability in strategic regulation^[10]. In other words, these factors contribute to changes in corporate financing constraints, which serve as a critical channel through which carbon footprints influence lobbying expenditures. Specifically, an increase in carbon footprint intensity worsens financing constraints, which in turn drives higher lobbying expenditures. Therefore, the second hypothesis is proposed:

H2: Financing constraints mediate the relationship between corporate carbon footprints and lobbying expenditures.

Given the current transfer of stock benefits between traditional and new energy industries^[11], the study must account for the moderating effect of corporate pollution attributes on the relationship between carbon footprints and lobbying. For high-carbon-emitting firms, increased carbon emissions significantly elevate lobbying expenditures. In contrast, for low-carbon-emitting firms, the impact of carbon emissions on lobbying behavior is insignificant. Furthermore, prior research demonstrates that ex-ante disclosure of regulatory information enhances corporate governance capabilities, such as improving internal control quality and encouraging investors to exercise their rights actively^[12]. Thus, this study further hypothesizes that the transmission mechanism of environmental regulatory pressure is particularly salient for high-carbon-emitting firms, such as those facing higher environmental compliance costs.

H3: Corporate pollution attributes moderate the relationship between carbon footprints and lobbying expenditures.

4 Sample and Data Sources

Given that traditional high-energy-consuming industries, such as fossil fuels, are major contributors to carbon emissions, and the financial sector's growing involvement in climate change^[13], this study selects a sample of U.S. firms from 2011 to 2023. The sample includes energy and materials firms such as Chevron and Sherwin-Williams, as well as financial institutions such as JPMorgan Chase and Citigroup. Carbon emission data comprise annual carbon emissions for 29 firms, while lobbying expenditure data cover annual lobbying expenditures by sector.

The sample data were screened and compiled from the Wind and Bloomberg databases. Firms with incomplete disclosures or missing annual data were excluded, as were those lacking variables required for this study. Ultimately, 29 firms across various industries were randomly selected, with partial financial indicators included (see Table 1).

Table 1 Summary of Key Variables

Category	Variable Name	Variable Code	Definition/Measurement
Dependent Variable	Annual Corporate Lobbying Expenditure Intensity	lobbying_exp	Corporate lobbying expenditure / total assets (or log-transformed)
Core Independent Variable	Annual Corporate Carbon Emissions	carbon_footprint	Total CO2e emissions (Scope 1 + 2), in 10,000 tons
Control Variables	Carbon Intensity	carbon_intensity	CO2e emissions (tons) / revenue (in \$ million)
	Firm Size	Employ	Number of employees
	Debt-to-Asset Ratio	Leverage	Total liabilities / total assets
	Cash Flow	Cashflow	Operating cash flow
	Shareholders' Equity	Total_equity	Total equity capital
	Equity Ratio	Equity_ratio	Total equity / total assets
Mediating Variable	Return on Assets (ROA)	ROA	Net income / total assets

5 Empirical Analysis

5.1 Descriptive Statistics

Table 2 presents the descriptive statistics for key variables. The results show that the mean value of corporate annual lobbying expenditure intensity (lobbying_exp) is 2.038, with a minimum of 0.046, a maximum of 16.032, and a standard deviation of 2.212. Meanwhile, the mean value of annual carbon emissions (carbon_footprint) is 15.386, with a minimum of 10.049 and a maximum of 19.067. The relatively high mean indicates substantial carbon emissions. Control variables such as employee count (employ), cash flow (cashflow), total equity (total_equity), and equity ratio (equity_ratio) exhibit distributions consistent with their medians, suggesting approximate normality. However, the wide range of equity ratios indicates significant disparities in capital structures among these firms, though this does not interfere with the study's conclusions.

Table 2 Descriptive Statistics of Key Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
lobbying_exp	377	2.038	2.212	0.046	16.032
carbon_footprint	377	15.386	1.987	10.049	19.067
Employ	377	10.483	1.369	7.000	12.644
Cashflow	377	24.555	1.175	21.017	27.472
Total_equity	377	23.913	1.496	18.450	26.516
Equity_ratio	377	3.746	3.705	0.561	39.223

5.2 Baseline Regression Results

To examine the relationship between corporate lobbying expenditures and carbon footprints, a static panel fixed-effects model was established. Lobbying intensity served as the dependent variable, while carbon footprint was the core explanatory variable.

Control variables included firm size (employ), leverage ratio (leverage), cash flow (cashflow), total equity (total_equity), and equity ratio (equity_ratio). The model is expressed as:

$$lobbying_{exp_{it}} = \alpha + \beta_1 * carbon_{footprint_{it}} + \gamma * Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Based on the GHG Protocol, corporate carbon emissions are categorized into three scopes: Scope 1 (direct emissions, e. g., fuel combustion), Scope 2 (indirect emissions from purchased electricity or heat), and Scope 3 (value chain emissions, e. g., raw material procurement or waste disposal)^[14]. Data were sourced from ESG reports, the EPA database, and the CDP database. Carbon footprint intensity is quantified as:

Carbon footprint intensity = (Scope 1 + 2 emissions (tons CO₂e)) / Revenue (million USD)

A two-way fixed-effects model with clustered robust standard errors was employed. Column (1) excludes control variables, while Column (2) includes them (see Table 3). The results show that the coefficients for lobbying_exp in both columns are positive and statistically significant at the 1% level, indicating that higher carbon footprint intensity leads to greater lobbying expenditures. Thus, Hypothesis 1 is validated.

Table 3 Baseline Regression Results

	(1)	(2)
	Lobbying Intensity	Lobbying Intensity
carbon_footprint	0.618*** (4.097)	3.043*** (6.732)
Employ		-0.584 (-1.096)
Cashflow		-0.292** (-2.253)
Total_equity		-1.792*** (-3.876)
Equity_ratio		-0.118*** (-2.746)
Constant	-7.476*** (-3.233)	11.537** (1.994)
Firm FE	YES	YES
Year FE	YES	YES
Observations	377	360
R-squared	0.694	0.747

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively; t-statistics are reported in parentheses.

5.3 Endogeneity Tests

It is noteworthy that the model may suffer from endogeneity issues, as a potential bidirectional causal relationship could exist between corporate carbon footprints and lobbying expenditures. For instance, while one might hypothesize that high-carbon-emitting firms increase lobbying expenditures, successful lobbying efforts could subsequently reduce their actual carbon emission pressures. To address this endogeneity concern, this study conducts a two-stage analysis as follows:

The first stage:

$$\text{carbon_footprint}_{it} = \pi_0 + \pi_1 \text{IV}_{it} + \pi_2 \text{Controls}_{it} + \mu_i + \lambda_t + u_{it}$$

The second stage:

$$\text{lobbying_expet}_{it} = \alpha + \beta_1 \text{carbon}_{\text{footprint}_{t_{lag}}} + \gamma \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

This paper uses the one-period lagged value of total carbon emissions as the new instrumental variable (IV). On one hand, corporate carbon emissions typically exhibit a certain degree of continuity and inertia. That is, a firm's carbon emission level in a given period is often closely related to its emission level in the previous period, satisfying the relevance condition. On the other hand, the one-period lagged carbon emissions should not be affected by unobserved factors in the current period, which might influence the outcome variable in the current period, thereby satisfying the exogeneity condition.

The regression results are presented in Table 4. In the first-stage results, total corporate carbon emissions show a significantly positive correlation with the instrumental variable at the 1% level, meeting the prerequisite assumption. In the second stage, total corporate carbon emissions are significantly positive at the 1% level, increasing firms' lobbying expenditures, which is consistent with the hypothesis of this paper.

Table 4 Endogeneity Test

	(1)	(2)
	Carbon Footprint	Lobbying Expenditure
IV	0.446*** (7.87)	
Carbon Footprint		3.296*** (4.678)
Controls	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	332	332
R ²	0.995	0.740

*Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. t-values are in parentheses.

5.4 Robustness Test

Excluding Policy Effects: To ensure robustness, this study excludes samples from periods when major policies were enacted. In 2017, the U.S. first announced its withdrawal from the Paris Agreement, and in 2020, it rejoined and set more ambitious targets.

Therefore, the sample period is restricted to 2017–2020 to eliminate potential policy effects from the withdrawal and re-entry into the Paris Agreement. The results, shown in Column (1) of Table 4, indicate that the regression coefficient for carbon emissions remains statistically significant at the 1% level. This suggests that the aforementioned policies did not affect the regression model, and the policy changes did not distort the core findings. Thus, the baseline regression results remain robust.

$$\text{lobbying_expet}_{it} = \alpha + \beta_1 \text{carbon_footprint}_{it} + \gamma \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Table 5 Robustness Test

	(1)
	Lobbying Expenditure
Carbon Footprint	2.233*** (2.837)
Controls	YES
Firm FE	YES
Year FE	YES
N	109
R ²	0.848

*Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are reported in parentheses.

5.5 Mechanism Test

Financing Constraints as a Mediating Mechanism. Generally, commercial banks enhance the accuracy of corporate credit assessments by integrating multi-channel data resources, thereby providing more suitable financial products and services to enterprises. This enables firms to secure additional funding for production and development activities.

In this study, we use Return on Assets (ROA) to measure corporate financing constraints. The regression results are presented in columns (1) and (2) of Table 6. The analysis reveals that the coefficient of carbon footprint on ROA is significantly positive, as is the coefficient of carbon footprint on lobbying expenditure. The findings indicate that increased carbon emissions exacerbate corporate financing constraints, which in turn leads to higher lobbying expenditures. Thus, Research Hypothesis 2 is empirically validated.

$$ROA_{it} = \alpha + \beta_1 * carbon_footprint_{it} + \gamma * Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

$$lobbying_expet_{it} = \alpha + \beta_1 * carbon_footprint_{it} + \beta_2 * ROA_{it} + \gamma * Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Table 6 Mediation Mechanism Test

	(1)	(2)
	ROA	Lobbying Expenditure
Carbon Footprint	0.077*** (3.240)	3.043*** (6.732)
Controls	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	360	360
R ²	0.924	0.747

*Notes: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively; t-statistics are in parentheses.

5.6 Heterogeneity Test: Firm Characteristics

Based on the Global Industry Classification Standard (GICS), this study categorizes sample firms into high-emission and low-emission groups according to their industry sectors. A dummy variable *pulo* is constructed, where *pulo* = 1 denotes heavily polluting (high-carbon) firms and *pulo* = 0 indicates lightly polluting (low-carbon) firms. The regression results are presented in columns (1) and (2) of Table 7. Key findings reveal: For high-carbon firms, the coefficient of carbon emissions is significantly positive. For low-carbon firms, the coefficient of carbon emissions is statistically insignificant. This demonstrates that high-carbon firms typically face stricter environmental regulations and higher compliance costs. As carbon emissions increase, these firms may require additional resources to address regulatory scrutiny, potential fines, or other penalties. Lobbying activities serve as a strategic tool to alleviate compliance pressures – by influencing policymakers, firms seek to obtain favorable policy terms or delay unfavorable regulations. In contrast, low-carbon firms face substantially lower direct compliance costs and regulatory pressures due to their minimal emission levels. Consequently, they lack strong incentives to increase lobbying expenditures in response to environmental policies. These results empirically validate Research Hypothesis 3.

High carbon enterprises (*pulo*=1)

$$lobbying_expet_{it} = \alpha + \beta_1 * carbon_footprint_{it} + \gamma * Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Low carbon enterprise (*pulo*=0)

$$lobbying_expet_{it} = \alpha + \beta_1 * carbon_footprint_{it} + \gamma * Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Table 7 Heterogeneity Analysis

	(1)	(2)
	Lobbying Expenditure (High-carbon)	Lobbying Expenditure (Low-carbon)
Carbon Footprint	3.920*** (5.622)	0.257 (0.62)
Controls	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	220	140
R ²	0.710	0.885

*Notes: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively; t-statistics are shown in parentheses.

6 Conclusion

This study examines the relationship between carbon emissions and lobbying expenditures among a sample of U.S.

firms. Empirical analysis demonstrates that increased carbon footprint intensity leads firms to allocate significantly more resources to lobbying activities—likely to mitigate the negative financial and regulatory impacts associated with high emissions. Furthermore, rising carbon emissions exacerbate corporate financing constraints, which in turn drives additional lobbying spending.

Facing increasingly stringent environmental regulations, high-carbon firms actively engage policymakers to secure favorable policy terms or delay unfavorable measures. In contrast, low-carbon firms face minimal compliance costs and regulatory pressures, resulting in no statistically significant increase in lobbying expenditures.

These findings highlight the strategic role of corporate lobbying in climate policy while revealing a critical risk: high-carbon firms may prioritize lobbying over transitioning to sustainable practices. Policymakers and investors should account for these dynamics when formulating regulations or making investment decisions.

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