# Climate Exposure Drives Firm Political Behavior: Evidence from Earnings Calls and Lobbying Data*

Christian Baehr† Fiona Bare‡ Vincent Heddesheimer§

This Draft: October 12, 2023
First Draft: November 29, 2022

**Abstract**

When do firms engage in climate politics? In the face of multifaceted potential impacts from climate change, some firms expect increased costs from new regulation and should lobby against proclimate policies. Those with physical asset vulnerability or greater green business opportunity should lobby in favor of such regulation. Another matter is relative risk and competitive advantage, as within industry competition should further motivate lobbying. We proxy for exposure to these threats and opportunities by analyzing the discussion of physical, regulatory, and technological opportunity aspects of climate change in quarterly earnings call transcripts for more than 2000 publicly traded firms between 2002 and 2020. We estimate the effect of variation of climate exposure on climate lobbying instances (extensive margin), expenditure (intensive margin), and targets (specific political entities). We find that firms with greater exposure to climate change, especially in terms of opportunities and regulatory risks, are more likely to engage in lobbying activities. Their climate exposure, both absolute and relative to industry peers, dictates whether they lobby, how much they spend on lobbying, and their choice of government entities to target. Taken together, our findings demonstrate the importance of disaggregating firm-level perceptions of climate impacts to understand patterns in political activity.

*We thank Patrick Bayer, Alex Gazmararian, In Song Kim, Helen Milner, Marc Ratkovic, Maria Silfa, Erik Voeten, Hye Young You, and audiences at Princeton, the IPSA 2023 Global Congress, and the APSA 2023 Annual Conference for helpful comments. Christian Baehr and Vincent Heddesheimer are grateful for generous support of this project from the Andlinger Center for Energy and the Environment.

†PhD Candidate, Princeton University, cbaehr@princeton.edu
‡PhD Candidate, Princeton University, fiona.bare@princeton.edu
§PhD Candidate, Princeton University, vincent.heddesheimer@princeton.edu, Web: vincent.heddesheimer@github.io

# 1 Introduction

Extensive private sector lobbying stymies action on climate change as governments face pressure both from firms trying to prevent decarbonization and those that seek special carve-outs. For example, through extensive lobbying, the utilities industry influenced legislation measures to maximize potential rewards for reducing emissions such that the Inflation Reduction Act (IRA) presents a "major long-term growth opportunity" (Lipton, 2022). However, not all see room to profit from climate regulations, with a significant divergence even within industries. Such cleavages are a symptom of how climate change (and related policies) triggers both real and perceived asset revaluation (Colgan et al., 2021). However, there is an open question about the importance of different kinds of climate-related pressure and whether they explain the political behavior of firms.

In this paper, we argue that variation in firm-level experience of climate impacts is necessary to explain political action. Crucially, we observe that exposure to climate change may be a positive or negative state, reflecting potential growth opportunities for some and threats to the business of others. Companies with greater exposure, including both upside and downside, to the impacts of climate change are overall more likely to engage on climate issues but the specifics of their lobbying activity depends on the type of exposure. We focus on three types of exposure: regulatory, opportunity, and physical. Those facing high regulatory costs (e.g., requirements to cut emissions) will push against pro-climate regulation while firms that expect physical risks (e.g., damage to infrastructure) will support policies aiming to limit the impacts of climate change. Those who see greater technological opportunity related to climate change mitigation and adaptation should lobby in favor of pro-climate policies. We argue that firm-level lobbying depends on expectations about whether policy will generate public or private goods, the expected time frame of impacts, and motivation (i.e., secure gains or avert loss). These expectations vary between types of exposure, and thus, they should translate into different levels and types of lobbying. We also emphasize the importance of within industry competition for political activity, especially on climate issues (Kennard, 2020). As such, we expect that if firms have relatively high exposure to climate change as compared to industry competition, they will be more likely to lobby in favor of climate policies, even if this means going against industry-wide interests.

To test our hypotheses, we construct an original panel data set of 2215 publicly traded firms for the period 2002-2020 that connects firms' climate change exposure to their political lobbying behavior. Estimating the impact of climate change on individual firms is difficult because measures like carbon emissions or ESG scores suffer from selection bias and reflect historical business models rather than firm perceptions of how climate change will impact them in the future. We overcome this challenge by using earnings call transcripts of publicly traded companies to identify the amount of attention paid by participants to climate change issues. This is a useful proxy for understanding the extent to which climate change is an important issue for a given company, and how they think about risks relative to opportunities. The transcripts reflect market participants' assessment of the effects of climate change on a given firm, including positive and negative aspects in light of prior performance

and forward-looking strategy. We merge these climate change exposure measures with the universe of climate lobbying reports in the United States (US). Overall, the data set provides crucial information needed for the analyses of companies' climate lobbying, including climate change exposure, lobbying occurrence, intensity (expenditure), content (e.g. specific issues and agencies targeted), industry, and firm characteristics.

We find that as the effects of climate change intensify, firms become more politically active. In particular, differences in exposure to physical risks, regulatory interventions, and market opportunities explain variation of political activity, demonstrating the importance of disaggregating perceptions of climate impacts. Firms are most likely to lobby when they are exposed to climate opportunity, followed by regulatory exposure. Physical exposure also drives lobbying, but appears to have a weaker link for lobbying occurrence (extensive margin) but not for expenditure (intensive margin). We also find differences in lobbying targets (i.e. specific political entities), where firms that are highly exposed to opportunities are more likely to target the Department of Energy (given its oversight of programs such as R&D funding) while those with regulatory concerns focus more on rulemaking by the Environmental Protection Agency (EPA). These findings show that the type of climate exposure a firm faces plays a pivotal role in determining its lobbying strategies and targets.

To ensure that these results are not driven by unobserved confounders, we conduct a range of additional tests. We demonstrate that our findings are robust to the inclusion of important variables that could affect both climate change exposure and lobbying behavior. Our findings remain unchanged when we control for firms' earnings, total assets, and firm productivity, as well as headquarter location and total lobbying expenditure. Moreover, we include increasingly fine-grained fixed effects to demonstrate that unobserved firm-, industry-, or time-specific confounding is not driving our results. We also conduct a sensitivity analysis and show that the existence of an unobserved confounder of the magnitude that would invalidate our findings appears unlikely. Last, we perform placebo tests that assess the effect of climate change exposure on non-climate related lobbying. These tests indicate that climate exposure does not increase lobbying on unrelated issues.

We also include a brief case study focused on the automotive manufacturing sector to provide further evidence on how differential exposure to climate drives lobbying. Drawing on earnings calls, lobby reports, and additional sources, such as Climate Disclosure Project (CDP) reports, we trace how different types and levels of exposure across firms within the same industry translate into variation in lobbying. Companies tend to actively embrace climate mitigation policy, especially through the promotion of incentive programs or infrastructure expansion, when they are relatively well-positioned (i.e., have more opportunities) relative to competitors. Laggards are less individually active on climate policy but do focus some efforts on minimizing regulatory costs. We see this as supporting our argument that the type of exposure, especially relative to competitors, is essential for understanding political behavior given differences in how firms perceive relevant policy payoffs.

This paper contributes to the literature on the climate preferences of firms and the drivers of lobbying activity. We build on recent work focusing on variation in political activity across firms,

responding to calls for the need to explain patterns in both climate resistance and support (Lerner and Osgood, 2022; Liu et al., 2023; Genovese, 2021). However, rather than classifying industries, or even firms, into "winners" and "losers", we take a unique approach by considering that a single company might gain from some aspects of climate change and suffer from others. Examining the type of exposure that firms face is necessary given that company positions on policies are typically highly specific, and these positions drive lobbying activity, including expenditure and target. We bring insights from the literature on firm heterogeneity (Kennard, 2020; Kim, 2017) to consider how the specific factors that determine whether a firm is a relative climate change winner or loser translate to political activity, providing a rigorous empirical exploration of the implications of asset revaluation (Colgan et al., 2021).

Furthermore, we add to the literature on climate lobbying by emphasizing different features of lobbying behavior. In particular, we study the effects of climate exposure on the extensive and intensive margin, and in addition test arguments about targeting specific political entities. In doing so, we emphasize the importance of unraveling the different decisions that firms have to make when deciding to become politically active. Previous research has often treated lobbying as a bundled activity.

Lastly, this paper speaks to recent work emphasizing the importance of earnings calls for understanding firm political activity (Hassan et al., 2019; Mahdavi et al., 2022) by leveraging new data that improve our ability to examine the role of firms in climate policymaking over other empirical approaches. Disaggregation of climate exposure at the firm level is important for our understanding of corporate behavior in climate politics, yielding insight about which companies are likely to be most active and how this might change over time as patterns in exposure evolve.

# 2 Firm Behavior in Response to Climate Change

## 2.1 Effects of Climate Change

Firms are subject to a broad set of threats and opportunities related to climate change, including threats to physical assets, climate-preserving regulatory actions that affect business costs, and technological opportunities arising from regulation and shifts in demand. These dynamics create both winners and losers from climate change, dividing lines across and within industries that help explain whether firms engage with climate policy.

Climate change is linked to increasingly frequent and severe weather that threatens physical assets. S&P Global estimates that over 90% of the world's largest companies will have at least one asset highly exposed to such impacts by 2050 (Portala, 2022). Precipitation and temperature extremes cause crop damage, increase flood risk, and impact tourism while complex events like tropical cyclones or ice storms damage property, decrease land productivity, and increase the possibility of epidemics (Pankratz and Schiller, 2022; Winn et al., 2011). Although physical threats primarily pose risks, they may also create pockets of opportunity for certain sectors and generate demand for adaptation technologies.

Climate-preserving regulatory actions can raise costs for firms and reduce the value of key assets. Regulation aimed at phasing out fossil fuels threatens the existence of firms that hold so-called "climate-forcing" assets such as those in the fossil fuel industry (Colgan et al., 2021). However, not all companies face existential threat from regulation - others may simply worry about costs of compliance.

Government policies also create climate-related opportunities to respond to climate change, such as research & development (R&D) subsidies. Companies with the ability to produce technological innovations that help solve environmental problems have a form of "technological power" (Falkner, 2007). Even those that do not focus on innovation can evolve their investments and production in response to new opportunities. For example, most major oil companies have strategies to shift to renewables (Pickl, 2019). Companies that are changing faster may see more opportunity related to climate change than their competitors. Consumer behavior in light of the physical impacts, regulatory change, and technology development may also impact firms through either boycotts or increased demand for "green" products.

## 2.2 When Firms Take Political Action

In response to the varied impacts of climate change, firms make strategic choices between political and economic action (Green et al., 2022; Meckling, 2011). There are many ways that firms can try to influence climate change policy (Stokes, 2020), including campaign contributions, ex ante lobbying on legislation, ex post lobbying on regulations (You, 2017), and strategic information campaigns (Oreskes, 2010).

In this paper, we focus on lobbying at the federal level in the US. The literature finds that firms are more likely to lobby against climate policy when they face high compliance costs, especially for large greenhouse gas (GHG) emitters (Brulle, 2021; Cory et al., 2021; Cheon and Urpelainen, 2013). Other factors explaining climate lobbying include the type of regulatory pressure (Meckling, 2015), experience of physical shocks (Gazmararian and Milner, 2023), and opportunity for technological change (Kelsey, 2018). Firms lobby also when they expect policy gains, creating a U-shaped relationship between GHG emissions and climate lobbying expenditures (Delmas et al., 2016). For example, companies with more at stake in the American Clean Energy and Security Act lobbied more, regardless of whether it was for potential gain or loss (Meng and Rode, 2019).

Firm heterogeneity is also important to explain political behavior (Kim, 2017). Early adopters of environmental standards have an incentive to export standards, which benefits leaders and harms laggards (Vogel, 1995). Kennard (2020) makes this argument focusing on a globalized economy, arguing that variation in adjustment costs induces a preference for regulation among low-cost firms. Those who are well-positioned to cope with stringent climate policies support regulation, particularly if the gains from their newfound advantage among domestic competitors outweigh any consequent disadvantages to foreign firms. This idea of comparative winners and losers has been explored elsewhere, such as for electric utilities (Kim et al., 2016), transport (Akhundjanov and Muñoz-García, 2016), and in the European context for the EU Emissions Trading Scheme (Genovese and Tvinnereim, 2019).

The existing literature shows that overall and relative exposure across dimensions of climate change should be associated with more lobbying activity - essentially, when firms think climate change is more impactful (positively or negatively) on their business, they should be more likely to lobby. However, this does not tell us whether the *type* of expected benefits or costs matters. Firms have preferences over the specific content of policies within bills (Kang, 2016), which often relate directly to their perceptions of specific aspects of climate change rather than an overall balance of costs and benefits. Therefore, there is still an open question as to whether the type of climate change exposure matters to explain political activities, such as lobbying. Answering this question is important given hypotheses about how climate cleavages may change over time as firm-level exposure changes (Colgan et al., 2021), and the fact that competition between interest groups influences the content of policy (Cheon and Urpelainen, 2013). This implies that policy contestation is likely to grow as the effects of climate change are more widely experienced and that there is a need to better understand how firms are responding to different types of exposure.

## 2.3 Importance of Relative Risks and Opportunities

We argue that examining the multifaceted impacts of climate change on firms is critical to explaining political action. We focus on variation in the type of exposure to climate change. The expected impacts of physical changes, new regulation, and business opportunities each contribute to expected loss or gains from climate change. However, these types of impact vary in critical ways that affect whether and how firms might seek to influence climate policy through lobbying.

### 2.3.1 Type of Exposure

How does exposure to different aspects of climate change explain lobbying patterns? We focus on three specific types of exposure: opportunity, regulatory, and physical. Opportunity exposure is defined as whether climate change presents options for market expansion or creation. Examples include competitive advantages for low-carbon products or demand for new technologies to support carbon mitigation. Regulatory exposure is defined as whether policies related to climate change are expected to impact business costs. We do not define specific policies, but consider regulatory exposure largely in relation to carbon mitigation efforts that require firm-level compliance with pollution controls and GHG emission reduction. Finally, physical exposure is vulnerability to the physical effects of climate change such as weather extremes or natural disasters. We choose these three aspects because they encompass the main concerns that companies have about climate change, and they have unique mechanisms that are likely to encourage different intensities and types of lobbying.

First, exposure to opportunities related to climate change should be strongly associated with lobbying as firms seek to take advantage of market expansion. Policies such as federal subsidies or incentive programs offer private goods to companies focused on renewable energy or green technologies, especially to those with a competitive advantage over others in their industry (Kim and Milner, 2021).

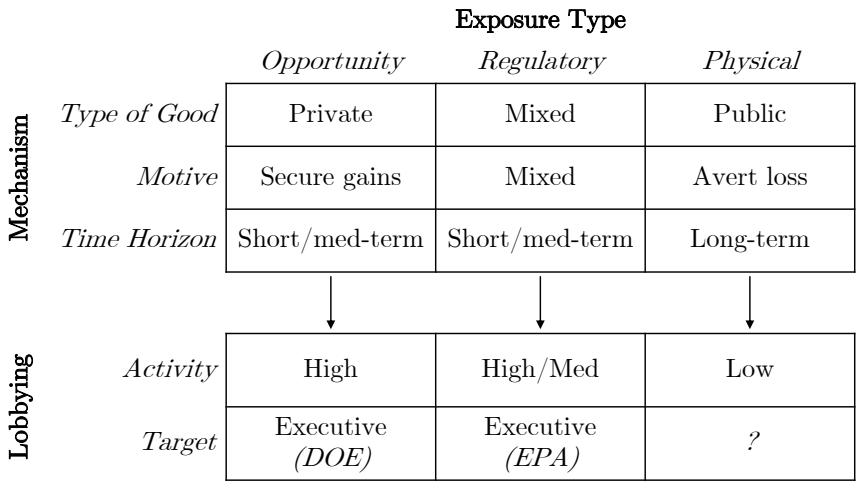
Firms can also lobby for special carve-outs or unique benefits to ensure that they will enjoy policy consequences. Furthermore, firms are likely to experience payoffs in the short term. This means that lobbying to secure opportunity gains from climate change is not subject to the challenge of collective action, and is likely to lead to more individual firm action. Firms that are highly exposed to opportunities are likely to focus their lobbying efforts on the executive branch, specifically on agencies such as the Department of Energy that oversee funding for R&D programs or the Department of Commerce which implements incentive programs. They should also emphasize issues related to technological development and market growth, such as energy efficiency programs or infrastructure development.

Firms are sensitive to regulatory impacts so that exposure to regulation should also help explain lobbying. There is some evidence that companies use political influence to avoid policy risks (including environmental issues) (Hassan et al., 2019). However, blocking the negative impacts of regulation generates both public and private goods that may actually create a collective action problem and reduce lobbying. Certain firms may especially benefit from policy avoidance or alteration, but in general, lobbying on relevant regulations is likely to also generate industry-wide benefits. Still, these firm-level goals to minimize or alter regulatory burden likely involve a combination of interests in securing gains and minimizing losses that should motivate lobbying. And, to achieve such goals, firms may prefer to prevent new regulation to maintain the status quo, and status quo supporters tend to be more active (and successful) at lobbying (Baumgartner et al., 2009). When considering who to target, firms should focus on the agencies most responsible. Departments under the executive branch such as the Environmental Protection Agency (EPA) oversee the implementation of regulation, especially given that the legislature has been relatively inactive on climate policies in recent decades. As such, regulatory-exposed firms should focus lobbying efforts on targets such as the EPA to encourage favorable rule-making and a reduction in regulatory burden. Relatedly, they are also likely to prioritize policy issues related to standards, rules, and carbon mitigation goals in such lobbying.

Finally, physical shocks from climate change present firm-level risks that may motivate lobbying to prevent future loss. However, physical impacts are likely to be experienced over a longer period of time. Additionally, any gains from related federal legislation are diffuse, especially for mitigation policies that may only have a tenuous effect on whether a firm expects to experience detrimental weather extremes. As a result, we expect that physical exposure to climate change will have a more limited relationship with lobbying than other types of exposure. This is consistent with other findings in the literature that experience of weather extremes only has a moderate (and often divisive) impact on attitudes (Bergquist and Warshaw, 2019; Hai and Perlman, 2022; Hilbig and Riaz, 2023), and natural disasters do not predict changes in climate policy (Rowan, 2023). It is less clear what targets and topics physically-exposed firms will prioritize in their lobbying activity based on our expectations of weaker preferences given the longer-time horizon and diffuse, uncertain benefits of related policy. See Figure 1 for the summary of our argument about the relationship between climate change exposure and lobbying.

Considering the mechanisms that motivate lobbying across these types of exposure, we generate

Figure 1: Explaining Climate Exposure → Lobbying




testable hypotheses about the overall lobbying activity and the target of lobbying. While we have expectations about how differential exposure relates to the content of lobbying, i.e. regulatory rules vs. incentive programs, we leave a rigorous empirical test for future work.

**H1 (Activity):** Greater exposure to climate change drives climate lobbying, but the effect varies by type of exposure.

- **H1a:** If firms have high regulatory and opportunity exposure, lobbying activity increases.
- **H1b:** If firms have high physical exposure, lobbying activity increases but is less likely than for regulatory and opportunity.

**H2 (Target):** Firms with high opportunity and regulatory exposure are more likely to lobby departments and agencies in the executive branch than firms with physical exposure.

- **H2a:** If firms have high opportunity exposure, then they are more likely to lobby agencies that oversee R&D and technology funding programs such as the Department of Energy (DOE).
- **H2b:** If firms have a high regulatory exposure, then they are more likely to lobby agencies that oversee the implementation of laws and regulations such as the Environmental Protection Agency (EPA).

### 2.3.2 Industry Competition

While we expect that differential types of exposure are important to firms in absolute terms, we also argue that exposure relative to industry peers is an important mediating factor. One reason is that we focus on explaining individual firm-level lobbying, rather than lobbying through industry associations

or collectives. This means that individual firms must have preferences over policy that are strong enough to motivate them to take individual action. When companies anticipate that they will be uniquely affected by a particular policy compared to other industry peers, they will have to lobby in order to have any chance of influence (Brulle, 2018; Downie, 2017). Such efforts may aim to preserve or create competitive advantage.

There is good reason to believe that there is significant within industry variation in climate change exposure. For example, the insurance industry is highly exposed to the physical impacts of climate change as they provide coverage to households and businesses impacted by natural disasters worsened by climate change. Some insurers made early steps to reshape their business models by incorporating climate-risk considerations into new products and underwriting processes, while others lagged behind. Similarly, some automakers made early investments in electric vehicles, and others have remained slow to roll out alternative powertrains. Such discrepancies in investment create relative leaders and laggards within industries, while other factors such as geographic distribution, differences in supply chain, efforts to retire or repurpose assets, pursuance of new M&A, and even firm mission and leadership can also play a role in explaining the variation of climate exposure across firms.

Given this expected variation, and the likelihood that it matters for explaining lobbying patterns, we further hypothesize that:

> **H3 (Competition):** Firms with greater opportunity, regulatory, and/or physical exposure relative to others in their industry are more likely to lobby on climate policy.

# 3 Data

We construct an original panel data set of public firms for the period 2002-2020 that connects firms' climate change exposure to their political lobbying behavior. The data set includes all publicly traded firms for which we can build a bridge across climate exposure, lobbying, and firm characteristic data sources which are described in more detail below. This yields around 2215 unique firms for which we have annual data on lobbying and exposure. There is a good justification for focusing on publicly traded firms, given that they make up a significant part of the world economy and are responsible for 40 percent of global GHG emissions (Preston and Ward, 2021). In addition, it is interesting to explore the types of political behavior that public firms undertake given the potential role (or lack) of stakeholder capitalism. Public firms are supposed to be transparent, with financial obligations to shareholders and increasingly with environmental, social, and governance (ESG) commitments as well. Understanding trends in exposure to climate change and associated political activity among public firms may yield insights both on current policy direction and on the potential of stakeholder capitalism.

### 3.1 Climate Exposure

To understand the importance of climate change to a firm, we use a measure of "exposure" based on the amount of attention that firm executives and financial analysts dedicate to climate change on quarterly earnings conference calls developed by Sautner et al. (2023) through the European Corporate Governance Institute (ECGI). Exposure should be thought of as "firm-level exposure to a particular impact of climate change" where the impact may be positive or negative (e.g., electric vehicle subsidies, sea-level change) and may also originate from within the firm (e.g., acquisition of a new green business unit). We do not assume that firms are focusing on climate with an inherently negative, or risk-focused, lens. Exposure can be net positive or negative for a specific firm based on the combination of expected costs and benefits.

This measure is useful for gaining insight into the importance of climate for a given company because it is difficult to assess the impacts of climate change, especially since many existing measures are either fully historical, subject to greenwashing, or face selection bias. Publicly traded companies hold regular earnings calls open to financial analysts, journalists, and other interested parties such as institutional or individual investors. The company discusses earnings for a particular period (i.e., related to quarterly 10-Q or annual 10-K reports) and provides a sense of goals, milestones, and expectations.[1] Calls begin with presentations by members of a firm's management team such as the Chief Executive Officer (CEO) and Chief Financial Officer (CFO) who share information they wish to disclose and/or emphasize. These presentations are followed by a question-and-answer (Q&A) session with call participants. Such calls have been shown to improve analysts' ability to forecast earnings accurately (Bowen et al., 2004; Frankel et al., 1999; Hollander et al., 2010). Additionally, as the information shared during calls can be verified ex post,[2] firms have an incentive to be honest (Demers and Vega, 2008), and provide additive information to the earnings report (Matsumoto et al., 2011).

There is evidence that firms talk more about climate in earnings calls when climate matters are more important to a firm (Dzieliński et al., 2022). It is possible that management teams are using calls strategically to send a message to potential investors, but firms can be held accountable in legal proceedings based on information they share in such calls. For example, in the US, the Exchange Act of 1934 holds firms liable to investors for any statement that is "false or misleading"[3] - although many invoke "safe harbor" protection for forward-looking statements. While such regulation makes it likely that firms will be truthful, it also means that legal teams discourage management from providing information that is not already public. Publicly traded firms are required to file quarterly reports although earnings calls are voluntary - still, there are strong norms to hold such calls with the vast majority doing so[4] but it is possible there is some selection into hosting earnings calls. Even with

[1] Earnings calls are typically held within 30 days of the new quarter. However, the median call for the first quarter is usually more delayed (Hassan et al. (2019) estimate the median call to be on the 45th day of the first quarter) because the first-quarter call is typically held after the annual report (i.e., Form 10-K) is made public, which goes with longer statutory due dates and is more labor intensive.

[2] In addition, the SEC's Regulation Fair Disclosure Act forbids companies from sharing "material nonpublic" information with analysts/investors, which is also why most firms make the transcripts public via transcript or audio.

[3] Pub. L. 37-291, sec. 10(b)

[4] According to the National Investors Relations Institute, as of 2016, 97% of publicly traded firms in the US hold

the potential drawbacks, there is strong reason to believe that earnings calls provide meaningful and unique information about the market's perspective on a firm's exposure to climate change given the exchange of information between management and analysts.

Table 1: Top-10 Bigrams Captured by Overall Climate Change Exposure

| **Bigram** | **Frequency** |
|---|---|
| renewable energy | 15605 |
| electric vehicle | 9508 |
| clean energy | 6430 |
| climate change | 4374 |
| wind power | 4253 |
| wind energy | 4035 |
| energy efficient | 3899 |
| greenhouse gas | 3416 |
| solar energy | 2511 |
| air quality | 2409 |

***Notes:*** Based on Table 2 in Sautner et al. (2023).

We retrieve climate change exposure data based on earnings calls of publicly listed firms from Sautner et al. (2023), who use the complete database of English-language transcripts from 2002 to 2021 from the Refinitiv Eikon database. They adapt the keyword discovery algorithm proposed in King et al. (2017) to produce bigrams related to climate change. These "bigrams" are associated with different sub-components of corporate attention to climate change: physical shocks, regulation, and technological opportunity. See Table 1 for examples of the types of bigrams associated with overall climate change attention. There are many additional bigrams associated with the attention to physical change (e.g., "global warm", "coastal area"), regulation (e.g., "carbon price", "environmental standard") and opportunity (e.g., "plug hybrid", "opportunity clean"). We have included the top 100 bigrams for each of the measures in appendix A. The overall climate change exposure measures include both general bigrams and those pertaining to each of these subcomponents. The physical, opportunity, and regulatory measures are distinct subsets of the overall measure.

Each exposure variable is the relative frequency with which bigrams related to climate change occur in earnings call transcripts, constructed by counting the number of such bigrams and dividing it by the total number of bigrams (Sautner et al., 2023). The frequency with which these bigrams occur within the transcript of a given quarter provides measures of the attention paid to climate change on these calls. Quarterly data as well as annual data (created by averaging the quarterly measures) are available. Appendix Table 7 summarizes exposure to climate change throughout the sample. Firms' climate change exposure has increased over time, meaning that firms are increasingly discussing issues related to climate on their quarterly earnings calls. Furthermore, earnings calls focus the discussion more on climate change-related opportunities than physical impacts and regulation.

While they do not directly measure fundamental risk or opportunity to a company, we believe these

earnings calls.

measures are effective proxies for firm's perception of the climate change risk and opportunity they face given the extensive validation conducted by Sautner et al. (2023). Exposure has relationships as expected with covariates such as carbon emissions, investments in renewable R&D, and an index of public attention to climate change.[5] We also build on a growing literature linking these exposure measures to outcomes such as green patenting (von Shickfus, 2021), physical risk disclosure in 8k filings (Gostlow, 2020), carbon risk management (Duong et al., 2023), and bank lending after the Paris Agreement (Ginglinger and Moreau, 2019).

#### 3.1.1 Variation Within Industries

By Hypothesis 3, we expect that some companies lobby in favor of more stringent climate policies because they are better positioned to adapt to these policies than their competitors. We take several exploratory steps to verify that exposure to climate change varies at the industry level. First, Figure 2 plots the distribution of firm climate exposure within the fifteen industries with highest variance in exposure.[6] The figure shows that there exists meaningful variation of these measures within industries. In particular, segments of the energy industry (Utilities) show high levels of variation, along with major manufacturers (Transport; Industrial, Electric, and Electronic Machinery). This seems to capture perceptions about how firms embrace renewable energy to varying degrees in their business models. Strikingly, firms vary in particular with regard to their opportunities, while within-industry variation in physical or regulatory risk is relatively lower. These descriptive results motivate our analysis of within-industry variation in exposure and the effects on climate lobbying.

To provide a brief illustration of how earnings call transcripts are mapped to exposure measures, Table 2 compares the 2020 exposure scores of three sample automobile producers: BMW, General Motors (GM), and Toyota. All companies have relatively high overall exposure, but BMW is almost double both GM and Toyota - including for opportunity. This reflects the different ways that companies perceive the impacts of climate change, given that by 2020, BMW was already an EV leader while GM was playing catch-up and Toyota continued to push for hybrids over EVs.

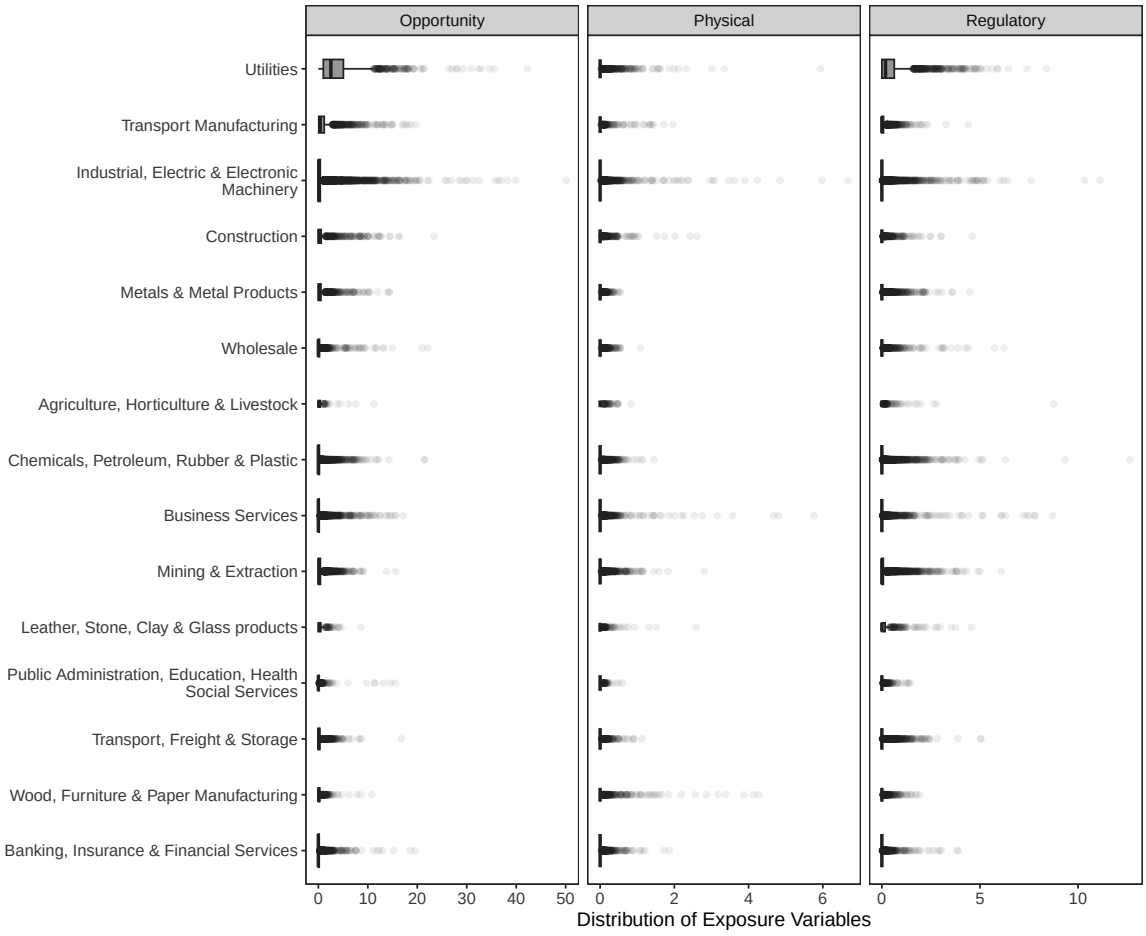
### 3.2 Lobbying Activity

The lobbying data comes from the LobbyView dataset (Kim, 2018). This is a firm-level lobbying dataset based on the universe of lobbying reports that became available under the LDA of 1995 and for which systematic data are available from 1999. The purpose of the LDA is to document the federal lobbying

[5] In addition, the authors validated their measure using several strategies. First, the bigrams pass a simple face validity test. Second, a team of graduate students performed a structured human audit to manually code a 2000+ transcript excerpts. The findings confirmed that the algorithm reliably captured bigrams in climate change discussions. Thirdly, the measures are robust to excluding one keyword at a time from the initial. Fourth, the keyword search-based algorithm performed much better than an alternative approach that uses only the initial keywords. Fifth, industry patterns among the measures are plausible. The opportunity subcategories performed as expected. Sautner et al. (2023) also ensure that variance within the firm-year captures meaningful economic heterogeneity rather than idiosyncratic error.

[6] We calculate the averages of the climate change exposure variables for each firm in our dataset across all firm-year observations. Then we map each firm to its Bureau van Dijk (BvD) industry code. Finally, we calculate the variance of these averages for each BvD industry and select the 15 industries with the highest average variance. In Figure 2, the industries are sorted by average industry with "Utilities" having the highest average variance in the three exposure measures.

Figure 2: Within Industry Variation of Climate Change Exposure




***Note:*** The figure visualizes within-industry variation in firms' climate change exposure across industries. The boxplots summarize the distribution of firms' average climate change exposure scores across all of their earnings calls for each industry. Points represent outlier values of these scores. Boxplot widths are proportional to the square roots of the number of observations in the industries. The figure includes the 15 industries with the highest variance in exposure.

Table 2: 2020 Auto Industry Climate Exposure Scores & Call Excerpts

| **Firm** | **Overall** | **Opp** | **Reg** | **Phys** | **Excerpt from CEO Presentation** |
|---|---|---|---|---|---|
| BMW | 11.8 | 8.72 | 0.75 | 0 | "Our electro-offensive encompasses all model ranges with much more to come. By 2023, we will offer 25 models with an electrified drivetrain. Our plug-in hybrids are also doing very well. This is a great opportunity to introduce people to electric drivetrains. We want our customers to choose e-mobility for themselves, because they recognize and appreciate the benefits." |
| General Motors | 5.44 | 2.93 | 0.1 | 0 | "We have committed to increasing our EV and AV investments to $27 billion from 2020 through 2025, including more than $7 billion this year alone. With this investment, we will launch 30 EVs globally and achieve EV market leadership in North America. In addition, by mid-decade, we plan to sell at least 1 million EVs per year in our 2 largest markets in North America and with our joint venture partners in China" |
| Toyota | 5.58 | 2.34 | 0.13 | 0 | "In Europe, our long-term effort has borne fruit. Future tightening of environmental regulation was expected, and we decided to anticipate customer needs by taking advantage of our hybrid technology. However, it was an extremely demanding choice because in the European market, diesel technology was dominant and hybrid technology was quite unknown to customers." |

activities of entities such as businesses, nonprofit organizations, and paid lobbyists. Registrants must file reports that disclose approximately how much was spent on lobbying activities and describe the issues that were the subjects of the lobbying activities. To illustrate the nature of the data, Table 3 summarizes the information included in a lobbying report for General Motors in 2020. Each report is filed by a specific registrant for a given quarter-year. Reports indicate the registrant's lobbying expenditure in the quarter as well as detailed information about the specific lobbying issues, including bill numbers, and government entities that are lobbied. For example, in the Report #301179589 filed by General Motors Company, the general issue code was "ENV" for Environment, and they lobbied the DOE, Department of Transportation, and EPA (among other entities) on bills related to higher octane fuels, electric vehicles, and greener air standards.

Table 3: Lobbying Report by General Motors, 2020 First Quarter

| | 301179589 |
|---|---|
| Registrant Name | General Motors Company |
| Client Name | General Motors |
| Year | 2020 |
| Quarter | 1 |
| Expense | $ 3,240,000.00 |
| General issue area code | ENV |
| Specific lobbying issues | - H.R.4690, The 21st Century Transportation Fuels Act, higher octane fuels;<br>- H.R.2256/S.1094, Driving America Forward Act, EV tax credit, EV infrastructure;<br>- H.R.431, CAFE Standards Repeal Act of 2019, fuel economy;<br>- H.R.978, Clean and Efficient Cars Act of 2019, CAFE;<br>- S.1022, Greener Air Standards Mean Our National Security, Environment and Youth Saved Act, CAFE;<br>- H.R. 5545, No Exhaust Act of 2020, EV infrastructure;<br>General sustainability and climate change related issues; harmonization; ongoing engagement on fuel economy regulation and EV deployment; Tailpipe emissions proposed Tier 3 rule; EV policy development; Consumer and Fuel Retailer Choice Act; fuel economy harmonization; and, RFS Reform/future fuels. |
| Government entities | Department Of Energy, Department Of Transportation, Environmental Protection Agency, House Of Representatives, National Economic Council, National Highway Traffic Safety Administration, Senate, White House |

Reports can be associated with multiple general issue codes. Unique report identifiers enable us to link each issue to the textual description of the lobbying activity for each lobbied issue. Furthermore, each issue is assigned to its three character lobbying issue code.[7] The database provides unique reporter identifiers that allow us to merge each reported issue with information about the reporter as well as firm databases such as ORBIS. As Sautner et al. also include these identifiers, we merge the above outlined climate change exposure variables with the LobbyView data in order to analyze exposure and

[7] See Lobbying Issue Codes for details.

lobby activity (including a binary variable and total expenditure) at the firm-year and firm-quarter level.[8]

As there is no overarching "climate" category under the LDA, we investigate issues that reasonably relate to climate change mitigation and adaptation, along with those that involve environmental quality and conservation. We create a series of binary variables indicating whether a report is coded as being related to a) CAW: Clean Air & Water (Quality); b) ENG: Energy/Nuclear; c) ENV: Environmental/Superfund; and d) FUE: Fuel/Gas/Oil. The issue areas of energy, environment, and fuel are immediately relevant to climate policies. We also include clean air & water given that the Clean Air Act is used to provide a basis for federal regulation of GHG emissions and a summary review of lobbying reports submitted for this issue area provide additional support for this choice. In addition, we construct a summary variable, "climate", as to whether a report is tagged to any of these issue areas. In Appendix B.2 we show that climate lobbying represents a substantial part of overall lobbying in the US Congress.

# 4 Empirical Strategy

We are interested in the effect of different types of climate change exposure on both the extensive and intensive margin of lobbying on climate issues. Thus, we analyze lobbying occurrence using a binary variable indicating whether a firm lobbied on a climate change issue in a given year, as well as lobbying expenditure measured as the dollars spent on climate lobbying in a given year.

We estimate a set of models that can be described as follows:

$$Y_{ict} = \alpha + \beta_1 Opportunity_{it} + \beta_2 Regulatory_{it} + \beta_3 Physical_{it} + \delta_t + \delta_c + \delta_{tc} + \gamma \mathbf{X}_{ict} + \epsilon_{ict}$$

where *Opportunity*, *Regulatory*, and *Physical*, represent the individual climate exposure measures, $\delta_t$, $\delta_c$, and $\delta_{tc}$ represent fixed year, industry, and year-by-industry effects, respectively, and $\mathbf{X}_{ict}$ represents a vector of firm-year-level covariates that might affect both climate change exposure and lobbying behavior. We use a z-score transformation of our three exposure variables in all models that allows us to compare the relative importance of each variable in our models. The regression coefficients represent the change in the dependent variable for a one standard deviation change in the respective independent variable. We estimate the probability of lobbying occurrence using logit models given the binary nature of the dependent variable. We use Type I Tobit models when investigating lobbying expenditures to account for the fact that a majority of observations of the dependent variable take the value of zero.

Identification of $\beta_1 - \beta_3$ depends on a number of statistical assumptions. First, we assume conditional exogeneity between climate lobbying and opportunity, regulatory, and physical exposure, respectively. That is, we rely on the assumption that climate exposure is independent of the lobby-

[8] We use ISIN to merge the Sautner et al. (2023) with Bureau van Dijk ORBIS for financial characteristics and the Bureau van Dijk IDs to merge with the LobbyView data. This approach resulted in the least missingness.

ing behavior, conditional on company covariates and fixed effects. There are a number of potential threats to this assumption. The strongest threat to identification is omitted variable bias, that is, that unobserved factors drive our findings. We take several steps to address this. First, we include additional important variables related to the exposure to climate change at the firm level and its impact on political activity. We control for key financial variables that are commonly used in the literature on finance and economics related to firm size and productivity. These include earnings before interest and taxes (EBIT), total assets, and the EBIT to asset ratio, which is a measure of firm productivity. Data on firm financial variables are from the ORBIS global company database. We also assume that certain characteristics of a firm may make them more likely to lobby in general, regardless of the issue area. Thus, we control for total lobbying in terms of the dollar amount spent on lobbying in a given year of any type, by firm. This is a proxy measure for the general propensity of a firm to lobby, which may impact whether or not it lobbies on climate issues. Finally, we also include a dummy variable indicating whether a firm's headquarters (HQ) is located in the US as it is likely that US-based firms are more likely to lobby the US government.

Next, we further account for the possibility of excluded relevant variables by including industry, year-by-industry, and firm-specific fixed effects, depending on the specific model. These unit-specific intercepts will absorb any fixed characteristics that might be driving both the core independent variables and outcome at the unit level. Examples of such unit-specific traits are company culture or the role of the board of directors. A second threat is the possibility of unobserved temporal variables that cause co-movement over time in both the independent and dependent variables. We account for this threat by including year or year-by-industry fixed effects, depending on the specification. The year effects will absorb any unobserved variation that affects a large number of units similarly at a given point in time, such as the amount of climate legislation being discussed or implemented in a given year or government turnover. In Appendix C, we also report results from models with firm-specific fixed effects. However, we believe that within-*industry* competition is a theoretically more realistic explanation of climate lobbying (Kennard, 2020; Kim, 2017; Downie, 2017).

Finally, we address confounding through a sensitivity analysis. We demonstrate, even if there was an unobserved confounder with a partial correlation that is multiple order of magnitude times stronger than other meaningful covariates and their lobbying efforts, its inclusion would not change our main findings. Given that we control for many relevant explanatory factors, the existence of an unobserved confounder of this magnitude appears very unlikely. We elaborate on this in Section 6. The results of the sensitivity analysis make us confident that our results are not driven by unobserved confounding.

The remaining threats to identification include reverse causality between the dependent and exposure variables, omitted variable bias from unobserved and both time- and unit-varying factors that affect both the dependent and exposure variables, and non-random missingness in the modeled variables that might introduce sample selection bias if missing data are listwise deleted. We assume that the climate exposure measure based on quarterly earnings calls is independent from past climate lobbying and is instead driven by exogenous climatic, political, and business factors. We further assume

that no unaccounted factors are driving both the exposure of a firm to climate change and the decision to lobby on climate-related issues. This is of course a strong assumption – there might be innumerable factors that vary over time and by firm that factor into the decision to lobby that we have not accounted for. However, we do not need to account for all these factors to identify our model. Instead, we just require confidence that the conditional distribution of the dependent variable with respect to the exposure variables does not depend on these unobserved factors. There is no affirmative test for the presence or absence of omitted relevant variables, but we conduct a number of placebo tests to ensure the conditional relationships between our exposure variables and the dependent variable are not spurious. Finally, we also implement a multiple imputation approach to deal with missing data. This relaxes the assumption that data are missing "completely at random", instead imposing a less stringent assumption that missingness is random conditional on the observed data. The results are in Appendix 16.

# 5 Results

Figure 3 plots the development of lobbying expenditure over time and across different levels of climate exposure within industries.[9] Lobbying expenditure on climate has increased steadily in the 2000s, spiked around 2010 which was likely due to ACES, and has since decreased, although with some fluctuation. The major share of lobbying expenditure on climate issues comes from firms within the top exposure quartile. This indicates that the firms that are most exposed to climate change relative to other firms within the same industry become particularly politically active. This is especially evident for exposure to physical and regulatory risk, while these differences between quartiles are more attenuated for climate opportunity measures.

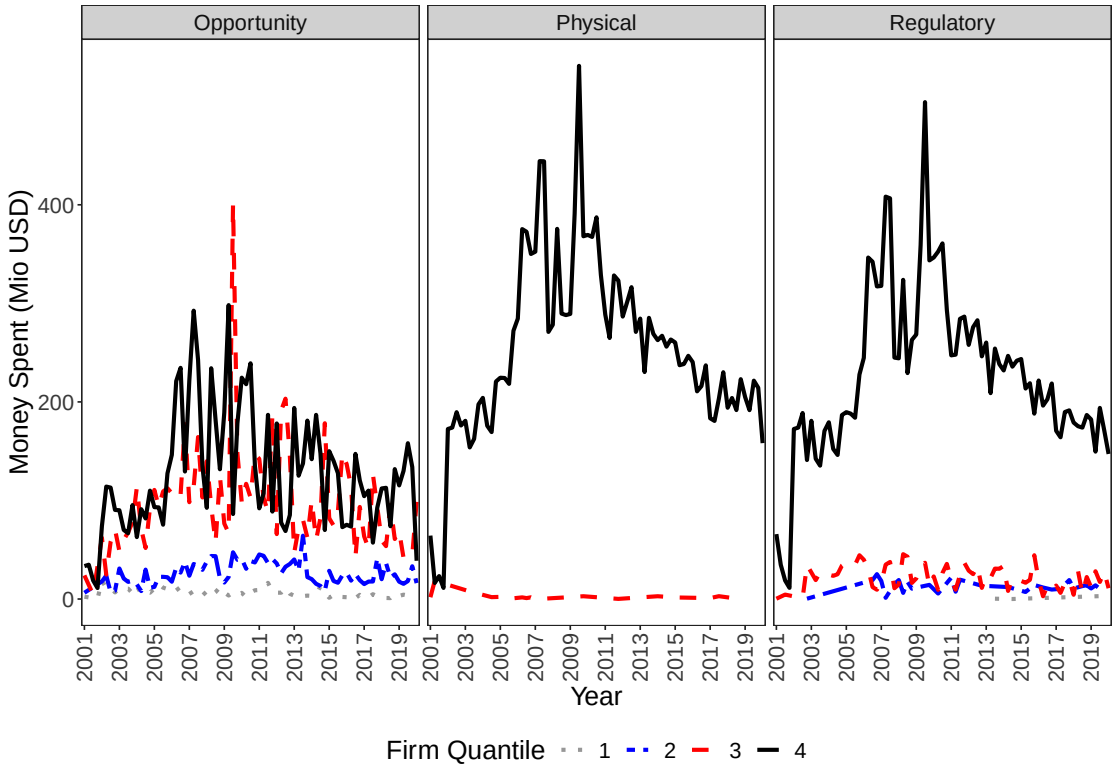
## 5.1 Extensive Margin: Lobbying Occurrence

Next, we substantiate these descriptive results more rigorously, and estimate the effect of different types of climate change exposure on the probability of lobbying on any climate issues. We begin by assessing the effects of the various measures of climate change exposure on whether a firm lobbies on related issues in a given year. The results of these models are summarized in Table 4. Throughout our empirical analyses we account for potential correlation of our modeling residuals by clustering our standard errors at the firm and year level. The results are consistent across specifications - all three exposure measures exert a positive and statistically significant impact on the decision of a firm to lobby on climate change, although the physical exposure measure is statistically insignificant at the 90% level prior to the inclusion of firm-level covariates.

The relatively larger coefficients for opportunity and regulatory exposure relative to physical exposure suggest that physical vulnerabilities are a weaker driver of climate lobbying, which aligns with our

[9] We categorize firms into quartiles (1 to 4) based on their climate change exposure relative to other firms in the same industry (Bureau van Dijk sectors) and quarter of a year.

Figure 3: Lobbying Expenditure by Climate Exposure Over Time




***Notes:*** The figure visualizes lobbying expenditures across exposure quartiles within an industry for each exposure measure.

expectations. This result is sensible considering that physical vulnerabilities, stemming from increased risk of events such as sea level rise or severe weather, can often be dealt with only through policies that have long horizons and produce diffuse benefits. It is more difficult for a firm to justify private lobbying costs in return for such slow-developing and diffuse policy outcomes. The consistent results in Table 4 suggest that the more exposed a firm is to climate change, the more likely that firm is to lobby on climate-related topics, but that the type of exposure matters, providing support for Hypothesis 1.

The interpretation of column 6 changes as we incorporate the year-by-industry fixed effect such that the exposure variables can now be interpreted as the degree of exposure to climate change *relative to the exposure of other members of the same industry in a given year*. This most rigorous specification allows us to evaluate how within-industry heterogeneity in climate exposure affects the decision to engage in climate lobbying. It reflects the importance of a firm's relative position to industry competitors for explaining political activity, despite how policy might impact a firm in absolute terms. Evidently, firm-specific exposure relative to industry rivals is driving the positive relationship, as the magnitude of the coefficient actually increases once year-by-industry fixed effects are included. This supports Hypothesis 3.

Finally, in column 7, we assess whether the composite effect of the various measures of climate change exposure on whether a firm lobbies on related issues in a given year. Unsurprisingly given the

Table 4: Effect of exposure on lobbying occurrence

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Opportunity Exposure | 0.827** | 0.828** | 0.801** | 0.809** | 0.469*** | 0.479*** | |
| | (0.348) | (0.344) | (0.328) | (0.329) | (0.143) | (0.151) | |
| Regulatory Exposure | 0.807*** | 0.830*** | 0.869*** | 0.889*** | 0.469*** | 0.471*** | |
| | (0.063) | (0.060) | (0.063) | (0.055) | (0.109) | (0.113) | |
| Physical Exposure | 0.186 | 0.185 | 0.269** | 0.285** | 0.161** | 0.181** | |
| | (0.129) | (0.126) | (0.104) | (0.106) | (0.072) | (0.079) | |
| Overall Exposure | | | | | | | 0.896*** |
| | | | | | | | (0.235) |
| EBIT | | | 0.066 | −0.073* | 0.013 | −0.005 | −0.004 |
| | | | (0.052) | (0.038) | (0.037) | (0.043) | (0.044) |
| EBIT/Assets | | | −0.001*** | −0.001*** | −0.001*** | −0.001*** | −0.001*** |
| | | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| US HQ | | | | −0.140 | −0.032 | −0.040 | −0.034 |
| | | | | (0.207) | (0.262) | (0.266) | (0.247) |
| Total Lobbying ($) | | | | 2.073*** | 2.298*** | 2.380*** | 2.426*** |
| | | | | (0.400) | (0.392) | (0.422) | (0.429) |
| Num.Obs. | 59 531 | 59 531 | 47 433 | 47 433 | 47 156 | 43 976 | 43 976 |
| R2 | 0.113 | 0.116 | 0.118 | 0.165 | 0.301 | 0.288 | 0.291 |
| R2 Adj. | 0.113 | 0.116 | 0.117 | 0.164 | 0.299 | 0.271 | 0.273 |
| R2 Within | | 0.114 | 0.116 | 0.163 | 0.100 | 0.102 | 0.105 |
| R2 Within Adj. | | 0.114 | 0.116 | 0.163 | 0.100 | 0.102 | 0.105 |
| FE: year | | X | X | X | X | X | X |
| FE: industry | | | | | X | X | X |
| FE: industry*year | | | | | | X | X |

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

***Notes:*** Standard errors are clustered at the firm-year level.

results in models 1 - 6, we confirm that firms with greater overall climate exposure are more likely to lobby on climate issues.

Concerning the sample size in Table 4, approximately 12,000 observations (∼20% of the total sample) are listwise deleted due to missingness when financial covariates at the firm level are incorporated into the model.Additional observations are omitted when including industry- and year-by-industry fixed effects because a few of these fixed effect groups express no variation in the dependent variable. Inclusion of these groups contributes no information to model estimation and would simply serve to artificially deflate standard errors.

## 5.2 Intensive Margin: Lobbying Expenditure

We estimate the relationship between climate exposure and the intensive lobbying margin. The outcome of interest is firm expenditure, in dollars, towards lobbying on climate issues in a given year. We use as our measure the sum of a firm's expenditures in a given year in the four climate-related lobbying issue codes. This composite measure of climate lobbying disbursement is heavily skewed – a few large corporations expend very large sums towards climate lobbying. We account for the skewed dependent variable by adding one to the composite measure and then using the log transformation.

There are a large number of zeros in the dependent variable, as many firms in the sample do not lobby on climate issues in a given year. This focal point in the outcome distribution might bias the

OLS estimates of our coefficients downward. We use the Tobit Model to account for this non-normality in our dependent variable. As stated previously, we have no theoretical basis to think that any of our factors are affecting the extensive margin, but not the intensive margin of lobbying. Without such an exclusion restriction or the necessity for a two-part model, we use the Type I Tobit Model.

The results of the model are presented in Table 5. Column 1 reports a positive partial correlation between our variables and lobbying expenditures. Furthermore, the magnitude of the opportunity and regulatory exposure measures exceed that of physical exposure. With the industry and year-by-industry fixed effects in columns 4 and 5, respectively, the relationship between each exposure measure and lobbying expenditures remains positive. This aligns with our core expectation of Hypothesis 1. However, the coefficient of opportunity exposure is smaller in magnitude than that of physical exposure. This result is unexpected, as Hypothesis 1 predicts that opportunity and regulatory exposure would prove to be a stronger stimulus for climate lobbying action than physical exposure. The magnitude of the exposure coefficients are nonetheless closely grouped, all sharing the first significant digit. However, these results suggest that physical and regulatory risks are more effective drivers of the intensive margin of climate lobbying than opportunities for gain. One interpretation of these results is loss aversion motive induces firms to bear greater costs to obtain favorable policy outcomes. Collectively, the results reinforce the findings of Section 5.1 that a number of factors drive firm behavior toward climate change, and focus exclusively on any single dimension of exposure would be to ignore other important determinants of climate-related firm behavior.

Table 5: Effect of exposure on lobbying dollar expenditures (Tobit)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Opportunity Exposure | 0.125*** | 0.110*** | 0.111*** | 0.0350* | 0.0401*** |
| | (0.0261) | (0.0265) | (0.0271) | (0.0174) | (0.00374) |
| Regulatory Exposure | 0.110*** | 0.0984*** | 0.0982*** | 0.0445*** | 0.0475*** |
| | (0.0172) | (0.0163) | (0.0171) | (0.0114) | (0.00309) |
| Physical Exposure | 0.0477** | 0.0644*** | 0.0649*** | 0.0433*** | 0.0472*** |
| | (0.0224) | (0.0146) | (0.0152) | (0.0118) | (0.00113) |
| EBIT | | 0.0219 | 0.0195 | 0.0550*** | 0.0549*** |
| | | (0.0174) | (0.0208) | (0.0180) | (0.00620) |
| EBIT/Assets | | -0.000190*** | -0.000133** | -0.000108*** | -7.67e-05*** |
| | | (4.87e-05) | (5.11e-05) | (3.44e-05) | (1.50e-05) |
| US HQ | | 0.0237 | 0.0225 | 0.103 | 0.104*** |
| | | (0.0713) | (0.0712) | (0.0708) | (0.0156) |
| Total Lobbying ($) | | 0.230*** | 0.229*** | 0.227*** | 0.227*** |
| | | (0.0752) | (0.0794) | (0.0724) | (0.00250) |
| Num. Obs. | 59531 | 47433 | 47433 | 47433 | 47433 |
| Year FE | | | X | X | X |
| Industry FE | | | | X | X |
| Year*Industry FE | | | | | X |

* p<0.1, ** p<0.05, *** p<0.01. Standard errors clustered by year and firm. Dependent variable is $\log(1 + \text{expenditure } (\$)_{it})$.

### 5.3 Lobbying Targets

Next, we investigate whether differential exposure to climate change has an effect on firms' choice to target lobbying towards a specific government entity. We expect firms with high opportunity exposure to lobby agencies that oversee R&D and technology funding programs, such as the DOE, while firms with high regulatory exposure should lobby agencies that oversee the implementation of laws and regulations, such as the EPA. We focus on these entities given that the majority of climate-related policymaking has occurred through the executive branch given legislative gridlock and that they each oversee different types of policies. To test our expectations, we use a variable from the LobbyView data set that indicates which government entity registrants lobbied on. We create two dichotomous variables that take the value one, if a firm lobbied on climate *and* targeted the EPA or DOE, respectively. To estimate the effect of our exposure variables on the likelihood of targeting one of the two agencies, we run logistic regression models of similar forms as outlined in Section 4.

Table 6: Effect of exposure on targeting the EPA or DOE

| | (EPA) | (DOE) |
|---|---|---|
| Opportunity Exposure | 0.010 | 0.152** |
| | (0.049) | (0.062) |
| Regulatory Exposure | 0.157*** | 0.121** |
| | (0.043) | (0.044) |
| Physical Exposure | 0.113** | 0.078 |
| | (0.049) | (0.048) |
| EBIT | −0.033 | 0.124 |
| | (0.128) | (0.108) |
| EBIT/Assets | 0.004* | 0.000 |
| | (0.002) | (0.001) |
| US HQ | 0.234 | −0.204 |
| | (0.215) | (0.234) |
| Total Lobbying ($) | 1.585*** | 0.281 |
| | (0.435) | (0.637) |
| Num.Obs. | 40 074 | 37 128 |
| R2 | 0.184 | 0.115 |
| R2 Adj. | 0.159 | 0.091 |
| R2 Within | 0.086 | 0.031 |
| R2 Within Adj. | 0.085 | 0.031 |
| FE: year | X | X |
| FE: industry | X | X |
| FE: industry*year | X | X |

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

***Notes:*** Standard errors are clustered at the firm-year level.

Table 6 presents the results. Higher opportunity is positively and significantly related to lobbying the DOE. Regulatory risk is significantly associated with both lobbying the EPA and DOE. Yet, the coefficient is of larger magnitude for the EPA and significant at the 95% level. Physical risk is only significantly related to lobbying the EPA. These results support Hypothesis 2 that differential climate exposure influences the decision of firms not only *whether* to lobby but also *which entity* to target.

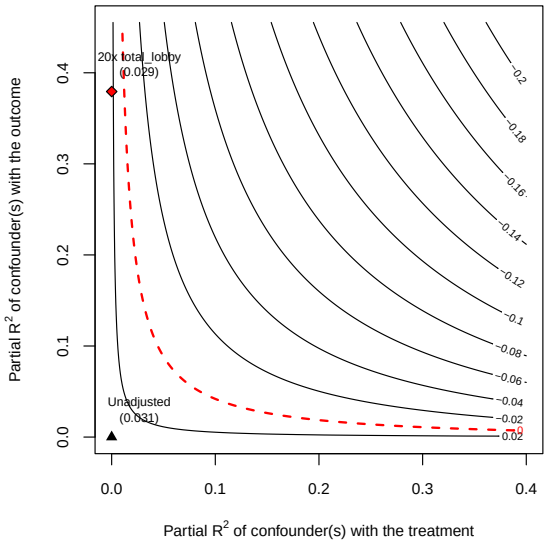
# 6 Robustness

## 6.1 Sensitivity Analysis

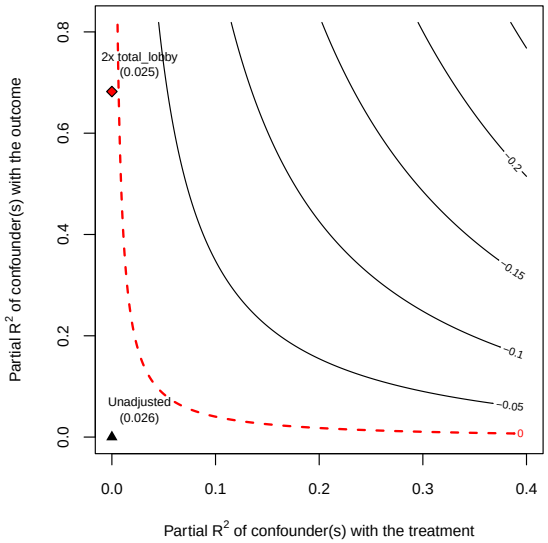
We address the threat of omitted variable bias by implementing a sensitivity analysis (Imbens, 2003). Through this method we can gauge how strong an unobserved confounder would have to be to invalidate our findings. We implement the analysis using a method and package developed by Cinelli and Hazlett (2020). We use models 6 in tables 4 and 5 for this analysis.[10]

Figure 4: Sensitivity analysis: Regulatory

(a) Occurrence




(b) Expenditure




***Notes:*** Results from the sensitivity analysis proposed by Cinelli and Hazlett (2020). The plots indicate how strongly confounders would have to be correlated with the treatment and the outcome to reduce the estimated effect size to zero (dashed red line). The original effect sizes without unmeasured confounding are shown in the bottom left corners of each plot. The red diamond shapes indicate partial correlations for total lobbying and a hypothetical confounder that is multiple orders of magnitude stronger than the total lobbying covariate.

Figure 4 summarizes the results of this exercise for the *Regulatory* variable. A point in the plot represents a hypothetical unobserved confounder. The x-coordinate represents the partial $R^2$ of the confounder with respect to the treatment (dialectal distance) and its y-coordinate represents the partial $R^2$ with respect to the outcome (lobbying occurrence or expenditure). For reference, we have included partial $R^2$ values for the total lobbying covariate measuring how much a firm lobbies overall (in addition to climate issues) in a given year, as well as a hypothetical confounder that is multiple orders of magnitude as strong as the total lobbying measure. Next to the variable names, we also indicate the effect size of the independent variable if an unobserved confounder with the respective strength were included in the model. For example, the left graph shows that it would take a confounder 20 times stronger than the total lobbying measure to bring the lower bound of the confidence interval of

[10] We use linear models for both dependent variables because of computation requirements.

the *Regulatory* exposure variable to intersect with 0 at the 5% significance level when investigating lobbying occurrence. Similarly, it would take a confounder more than two times as strong as the total lobbying variable to bias the results when analyzing the lobbying expenditure, as shown by the right plot of the figure. Similar results hold for the *Opportunity* and *Physical* exposure measures (see Appendix D). Based on this analysis, we are confident that even if there was an unmeasured confounder multiple orders of magnitude stronger than the total lobbying measure, adding it would not change the substantive conclusions of our paper.

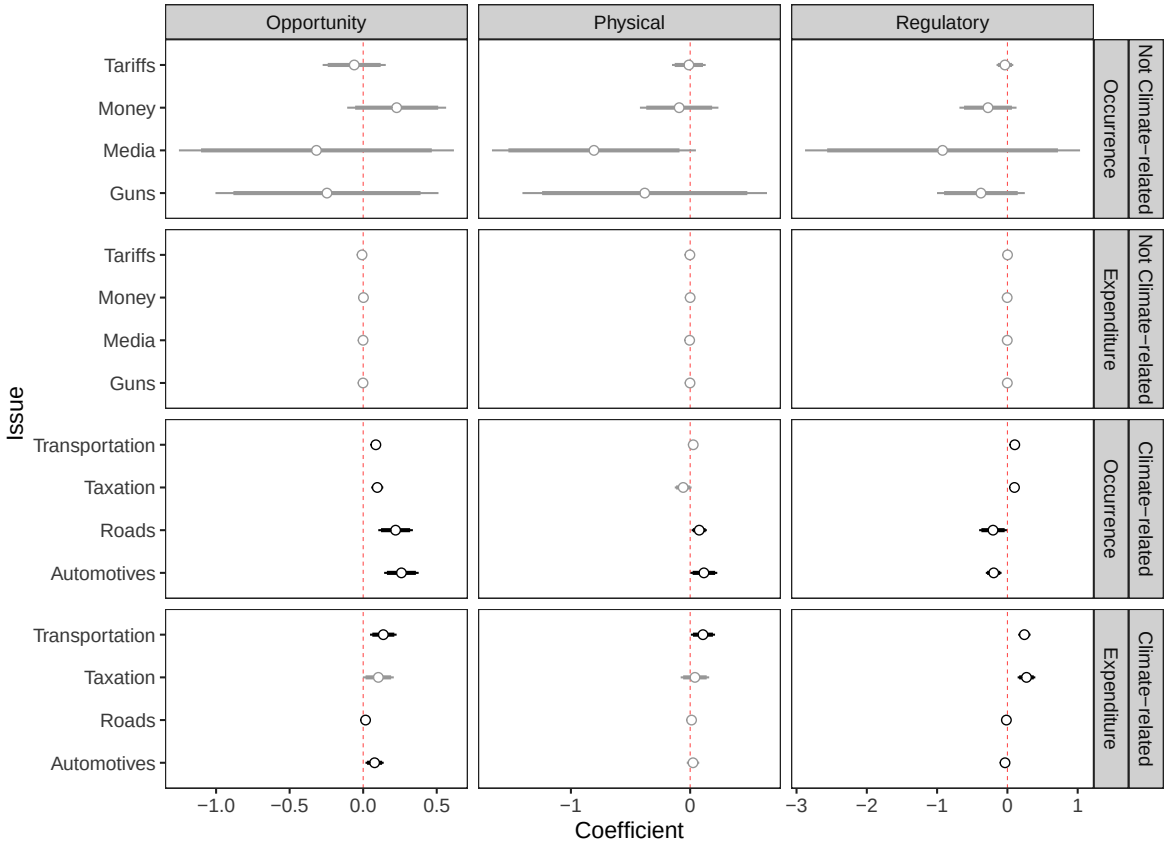
## 6.2 Placebo Tests

We further test the theory that climate change exposure affects climate policy lobbying by conducting placebo tests. If lobbying also rises in areas that are unrelated to climate change as a result of climate change exposure, this would indicate a different cause for political activity than indicated by our theory. However, if the rise is only seen in lobbying related to climate exposure, it supports our theory that relative climate exposure drives firms' political activities. To be as transparent as possible, we estimate our most rigorous model specifications with industry, year, and industry-year fixed effects and all controls for all other issue areas and for both lobbying occurrence (logit) and expenditure (ols). The full results of the placebo tests are presented in Appendix E. Overall, we do not find any systematic relationship between our climate exposure variables and lobbying on non-climate issues that raise concern for our results.

In the two upper grids in Figure 5, we display the analysis for a selection of issue areas where we would expect no relationship between opportunity, regulatory, or physical climate exposure and lobbying. The relationship between climate exposure and issues like Miscellaneous Tariffs (TAR), Minting/Money/Gold Standard (MON), Media (MIA), and Firearms/Guns/Ammunition (FIR) are all near-zero and insignificant for lobbying at both the extensive and intensive margin. We have no reason to expect that firms with greater exposure to climate change across the exposure dimensions would be more likely to lobby for changes to tariffs broadly defined, or on policies related to media, minting, or firearms. This is consistent with our interpretation of our findings that greater exposure to climate change leads to political engagement only for related policy areas.

We do find a relationship between climate exposure and issue areas that are plausibly related, as shown for a subset of issue areas in the two lower grids of Figure 5. Climate change exposure has a statistically significant relationship with lobbying at the extensive (occurrence) and intensive margin (expenditure) for issues like transportation (TRA), taxes (TAX), roads/highways (ROD), and the Automotive Industry (AUT). This is not surprising, given that policies such as favorable tax programs for "green" companies or efforts to expand electric vehicle charging infrastructure are likely to be tagged to these issue areas. Thus, such findings are consistent with our theory that climate exposure drives lobbying on climate issues and may even indicate that we could expand the universe of climate lobbying that we consider.

Figure 5: Placebo Tests




***Notes:*** Estimates from regression of non-climate lobbying instances (placebos) on climate exposure variables. Horizontal bars denote 90% (thick lines) and 95% (thin lines) confidence intervals. Black (grey) points and bars denote estimates that are (not) significant at the 95% confidence level. Full issue code descriptions as well as regressions for all issue codes are in Appendix E.

# 7 Examining the Mechanisms: Auto Industry Case Study

To provide further evidence for our hypotheses about how differential climate exposure translates into political activity, we offer an illustrative example from the automobile industry. Road transport accounts for approximately 15% of global $CO_2$ emissions, including passenger and freight, according to the International Energy Agency (IEA), and rapid decarbonization of the sector is necessary to achieve global emissions targets. This means that the auto industry is highly exposed to the impacts of climate change and that they are also active lobbyists, for example, spending over 65 million USD on federal lobbying in 2020. There is also significant variation in the types of exposure that auto companies have given that electric vehicles (EVs) have emerged as the most important technology to achieve climate goals (Stevenson, 2021). Hybrid emissions are high compared to EVs, making it difficult to align with increasingly stringent regulations, while fuel cell technology has been slow and expensive to develop. Auto manufacturers that invested heavily and early in EV technology have an advantage over manufacturers that invested in alternate technologies such as hybrids and fuel cells, particularly as government support for the EV transition grows.

Pure EV makers such as Tesla have a clear advantage, but legacy carmakers like BMW made significant early investments as well with the launch of the BMW i3 in 2014. General Motors (GM) also positioned itself for the electrification transition with the release of the Chevy Bolt. For example, on a quarterly earnings call in 2016, a GM representative emphasized the importance of their "lead with the Bolt EV", commenting that "it's not just a great electric vehicle, it's a great vehicle, and that's the feedback we're getting from customers. That gives us the foundation to really push forward in electrification, and be very successful from an electrification perspective, leveraging our global scale. So that is something that I think is huge opportunity." Other companies made more recent shifts to rapidly speed up their ability to bring new EVs to the market, such as collaboration between Ford and Volkswagen (VW), and the merger between Peugeot and Fiat-Chrsyler (Stevenson, 2021). Meanwhile, companies such as Toyota, Honda, and Suzuki have shown relatively little commitment to full electrification by continuing with an emphasis on hybrids. Toyota has been a longstanding leader in hybrid vehicles, and expressed doubt about the future of electric vehicles - even discontinuing an electric Rav4 project in 2014 and selling off shares in Tesla in 2017. On a quarterly earnings call in 2019, a Toyota executive expressed that "We believe in an alternative fuel portfolio in the U.S. that has its backbone in hybrids, in plug-in hybrids and we're moving into fuel cells" encapsulating the company's climate strategy.

According to our argument, high overall exposure across the industry to climate change impacts, especially through regulatory compliance and new market opportunities, should translate into political engagement by auto manufacturers through lobbying. Furthermore, differences in the decarbonization strategy mean that individual automakers now face a different profile of exposure than their peers. Relative leaders such as BMW see opportunity from stricter emissions regulations and EV subsidies, while laggards like Toyota fear higher cost burden and loss of market share. This variation in exposure helps explain the lobbying behavior and related political activity of car manufacturers.

Companies tend to embrace more aggressive climate policy in direct proportion to their EV strategy with firms like Tesla, BMW, VW, GM, and Ford leading in both EV production and support of more ambitious climate regulation such as internal combustion engine (ICE) phase-out dates (InfluenceMap, 2023). GM's CEO provided a succinct summary of this idea on a 2020 earnings call, commenting: "we are well positioned from a policy standpoint...We look forward to working with the administration on policies that support safer transportation with zero emissions...[and] will seize every opportunity to drive growth, expand our markets and enter new ones." Others, such as Nissan, Honda, and Toyota fall at the bottom in terms of forecasted zero-emission vehicle production and climate policy engagement. With emissions regulations tightening in the EU and pressure for new subsidies for EVs mounting in the US, Toyota increased its political activity in the US (Tabuchi, 2021). Toyota has opposed stricter car emissions and EV mandates, including siding with the Trump administration in California over implementation of the Clean Air Act. Recently, Toyota shareholders have even pushed for a resolution requiring more transparency in lobbying disclosures given concerns that Toyota is attempting to slow EV policies and may be missing out on potential profit (Dolan and Leussink, 2023). Details in the

LobbyView reports for the auto industries also follow our expectations about the targets and topics. For example, in 2020, GM lobbies for "EV tax credits and electric charging" infrastructure development while Toyota lobbies "to increase the availability of full cell infrastructure" - reflecting their diverse strategies towards decarbonization.

To understand whether these differences in opportunity and regulatory exposure are translating into differences in lobbying patterns based on the mechanisms of type of policy good, motive, and time horizon, we conduct a qualitative review of Carbon Disclosure Project (CDP) reports from 2010-2022.[11] CDP surveys firms about emission reduction activities, including specific questions about their perceptions and responses to risks and opportunities, and makes this data available to investors, corporations, and regulators.[12] In these reports, identified opportunities are more likely to be categorized as having a short-term time horizon, high likelihood, and medium-high magnitude of impact as opposed to risks that tend to longer time horizons and mixed likelihood. This provides support to our argument that firms think about market opportunity and regulatory burden differently. Still, most automakers mention concern about increasing regulations, such as zero-emissions vehicle (ZEV) requirements over the medium-term although the discussion varies based on a firm's industry position. Continuing with the comparison of Toyota and GM, Toyota mentions concerns about stranded ICE and HV assets as a result of regulation while GM primarily discusses the need to increase consumer demand and improve the availability of supporting infrastructure. This difference in orientation translates into the policy actions described by each company. The only direct lobbying action that Toyota describes is "promotion of hydrogen/fuel cell strategy," (where they have greater competitive advantage), otherwise they mention general affiliation with business associations/interests. In contrast, GM provides specifics about their support for specific climate change provisions such as EV charging infrastructure, and investments in supply chains, and alternative fuel vehicle tax exemption. This seems to indicate that firms are focusing direct lobbying efforts on areas where they have competitive advantage, given expectations about private benefits in the short-term.

Generalizing from this example indicates that the type and level of climate change exposure should dictate lobbying activity. As in the case of the auto industry, exposed firms should lobby on climate issues, especially when they face greater exposure than industry competitors. Firms that face high levels of potential regulatory burden (e.g., Toyota) and those that see new market opportunity (e.g., GM) should lobby on climate change issues at higher levels than those facing physical risks (a more limited factor in the auto industry). Further, as demonstrated by the differences in how firms are prioritizing action on regulatory costs versus market opportunity, the type of exposure is critical for explaining differences in lobbying patterns.

[11] The full sample of CDP reports that we review includes BMW, Daimler, Fiat-Chrysler, Ford, GM, PSA, Honda, Hyundai, Nissan-Renault, Suzuki, Toyota, and VW.

[12] While there is some selection into which firm submit detailed information, it is largely considered one of the best platforms for corporate environmental reporting and is increasingly used in firm-level analyses.

# 8 Conclusion

When do firms become politically active on topics related to climate change? In this paper, we contend that understanding the various types of climate impact expected by companies is essential for understanding their political action. Importantly, we note that climate change exposure can have positive or negative implications, presenting growth opportunities for some and posing threats to others. Previous studies have failed to account for the complete picture of climate change from firms' perspectives. A major challenge for previous research studying firms' climate change preferences has been to measure company perceptions over the expected costs and benefits from more ambitious climate change policies. To overcome these challenges we use novel firm-level earnings call data from 2002-2020 to understand the level of climate change exposure and relative risk-opportunity exposure for over 2215 public firms. We map these measures to firms' federal lobbying activity, as reported under the LDA. This allows us to analyze the relationship between both positive and negative types of exposure to the effects of climate change with related political activity.

We provide evidence that greater general exposure to climate change increases the likelihood that firms engage in lobbying on climate issues. Furthermore, differences in physical risk, regulatory risk, and market opportunities explain the variation in the extensive and intensive margins of lobbying, along with the target of policy influence. Our findings contribute to a growing literature that stresses the importance of firms and interest groups for policymaking on climate (Cory et al., 2021; Kennard, 2020; Lechner, 2016) and other areas of global engagement (Kim, 2017; Kim and Osgood, 2019; Osgood, 2018). We emphasize the importance of variation within industries, while also acknowledging that a single firm can be exposed to climate change in multiple ways and that this balance is critical for explaining lobbying activity.

In addition, these findings deepen our understanding of the distributive politics of climate change. The relative expected costs and benefits, and the evolution of these over time, help explain the political activity of firms to influence climate policy. If firms are more likely to lobby based on opportunity generation, rather than physical impacts, policies are likely to support technological advancement. This provides reason for cautious optimism about the speed of decarbonization, but may also indicate that policies to support active adaptation to the increasingly felt physical impacts of climate change may be slow to develop. As physical impacts, regulatory effects, and business opportunities related to climate change become increasingly realized, it is likely that firms' policy preferences and related lobbying activity will continue to evolve with important implications for future contestation over climate policies.

# References


Akhundjanov, Sherzod B. and Félix Muñoz-García (2016). Firm Preferences for Environmental Policy: Industry Uniform or Firm Specific? *Strategic Behavior and the Environment 6*(1-2), 135–180.

Baumgartner, Frank R. , Jeffrey M. Berry, Marie Hojnacki, Beth L. Leech, and David C. Kimball (2009). *Lobbying and Policy Change: Who Wins, Who Loses, and Why.* Chicago, US: University of Chicago Press.

Bergquist, Parrish and Christopher Warshaw (2019). Does Global Warming Increase Public Concern about Climate Change? *The Journal of Politics 81*(2), 686–691. Publisher: The University of Chicago Press.

Bowen, Robert M. , Angela K. Davis, and Dawn A. Matsumoto (2004). Do Conference Calls Affect Analysts' Forecasts? *The Accounting Review 77*(2), 285–316.

Brulle, Robert J. (2018). The climate lobby: a sectoral analysis of lobbying spending on climate change in the USA, 2000 to 2016. *Climatic Change 149*(3), 289–303.

Brulle, Robert J. (2021). Networks of Opposition: A Structural Analysis of U.S. Climate Change Countermovement Coalitions 1989–2015. *Sociological Inquiry 91*(3), 603–624.

Cheon, Andrew and Johannes Urpelainen (2013). How do Competing Interest Groups Influence Environmental Policy? The Case of Renewable Electricity in Industrialized Democracies, 1989–2007. *Political Studies 61*(4), 874–897.

Cinelli, Carlos and Chad Hazlett (2020). Making sense of sensitivity: Extending omitted variable bias. *Journal of the Royal Statistical Society Series B: Statistical Methodology 82*, 39–67.

Colgan, Jeff D. , Jessica F. Green, and Thomas N. Hale (2021). Asset Revaluation and the Existential Politics of Climate Change. *International Organization 75*(2), 586–610.

Cory, Jared , Michael Lerner, and Iain Osgood (2021). Supply Chain Linkages and the Extended Carbon Coalition. *American Journal of Political Science 65*(1), 69–87.

Delmas, Magali , Jinghui Lim, and Nicholas Nairn-Birch (2016). Corporate Environmental Performance and Lobbying. *Academy of Management Discoveries 2*(2), 175–197.

Demers, Elizabeth and Clara Vega (2008). Soft Information in Earnings Announcements: News or Noise? *The Federal Reserve Board of Governors in Washington DC. Discussion Paper*.

Dolan, David and Daniel Leussink (2023). Toyota shareholders submit proposal on climate disclosure, in test for new CEO. *Reuters*.

Downie, Christian (2017). Business actors, political resistance, and strategies for policymakers. *Energy Policy 108*, 583–592.

Duong, Huu Nhan , Petko S. Kalev, Madhu Kalimipalli, and Saurabh Trivedi (2023). Do Firms Benefit from Carbon Risk Management? Evidence from the Credit Default Swaps Market. *Unpublished*.

Dzieliński, Michał , Florian Eugster, Emma Sjöström, and Alexander F. Wagner (2022). Do Firms Walk the Climate Talk? *Swiss Finance Institute Research Paper Series*.

Falkner, Robert (2007). *Business power and conflict in international environmental politics*. New York: Palgrave Macmillan.

Frankel, Richard , Marilyn Johnson, and Douglas J. Skinner (1999). An Empirical Examination of Conference Calls as a Voluntary Disclosure Medium. *Journal of Accounting Research 37*(1), 133–150.

Gazmararian, Alexander F. and Helen V. Milner (2023). Firm Responses to Climate Change: Exit and Voice. *Unpublished manuscript*.

Genovese, Federica (2021). Market responses to global governance: International climate cooperation and Europe's carbon trading. *Business and Politics 23*(1), 91–123.

Genovese, Federica and Endre Tvinnereim (2019). Who opposes climate regulation? Business preferences for the European emission trading scheme. *The Review of International Organizations 14*(3), 511–542.

Ginglinger, Edith and Quentin Moreau (2019). Climate Risk and Capital Structure. *Unpublished manuscript*.

Gostlow, Glen (2020). The Materiality and Measurement of Physical Climate Risk: Evidence from Form 8-K. *Unpublished manuscript*.

Green, Jessica , Jennifer Hadden, Thomas Hale, and Paasha Mahdavi (2022). Transition, hedge, or resist? Understanding political and economic behavior toward decarbonization in the oil and gas industry. *Review of International Political Economy 29*(6), 2036–2063.

Hai, Zuhad and Rebecca L. Perlman (2022). Extreme weather events and the politics of climate change attribution. *Science Advances 8*(36).

Hassan, Tarek A , Stephan Hollander, Laurence van Lent, and Ahmed Tahoun (2019). Firm-Level Political Risk: Measurement and Effects. *The Quarterly Journal of Economics 134*(4), 2135–2202.

Hilbig, Hanno and Sascha Riaz (2023). Natural disasters and green party support. *The Journal of Politics*.

Hollander, Stephan , Maarten Pronk, and Erik Roelofsen (2010). Does Silence Speak? An Empirical Analysis of Disclosure Choices During Conference Calls. *Journal of Accounting Research 48*(3), 531–563.

Imbens, Guido W (2003). Sensitivity to exogeneity assumptions in program evaluation. *American Economic Review 93*, 126–132.

InfluenceMap (2023). Analyzing the Automotive Sector on Climate Change. Technical report.

Kang, Karam (2016). Policy Influence and Private Returns from Lobbying in the Energy Sector. *The Review of Economic Studies 83*(1), 269–305.

Kelsey, Nina (2018). Industry type and environmental policy: Industry characteristics shape the potential for policymaking success in energy and the environment. *Business and Politics 20*(4), 615–642.

Kennard, Amanda (2020). The Enemy of My Enemy: When Firms Support Climate Change Regulation. *International Organization 74*(2), 187–221.

Kim, In Song (2017). Political Cleavages within Industry: Firm-level Lobbying for Trade Liberalization. *American Political Science Review 111*(1), 1–20.

Kim, In Song (2018). Lobbyview: Firm-level lobbying & congressional bills database.

Kim, In Song and Helen Milner (2021). Multinational Corporations and their Influence Through Lobbying on Foreign Policy. In *Global Goliaths: Multinational Corporations in a Changing Global Economy*. Washington, DC: The Brookings Institution.

Kim, In Song and Iain Osgood (2019). Firms in trade and trade politics. *Annual Review of Political Science 22*, 399–417.

Kim, Sung Eun , Johannes Urpelainen, and Joonseok Yang (2016). Electric utilities and American climate policy: lobbying by expected winners and losers. *Journal of Public Policy 36*(2), 251–275. Publisher: Cambridge University Press.

King, Gary , Patrick Lam, and Margaret E. Roberts (2017). Computer-Assisted Keyword and Document Set Discovery from Unstructured Text. *American Journal of Political Science 61*(4), 971–988.

Lechner, Lisa (2016). The domestic battle over the design of non-trade issues in preferential trade agreements. *Review of International Political Economy 23*(5), 840–871.

Lerner, Michael and Iain Osgood (2022). Across the Boards: Explaining Firm Support for Climate Policy. *British Journal of Political Science*, 1–24. Publisher: Cambridge University Press.

Lipton, Eric (2022). With Federal Aid on the Table, Utilities Shift to Embrace Climate Goals. *The New York Times*.

Liu, Huchen , Sijing Wei, and Jiarui Zhang (2023). Corporate Lobbying and ESG Reports: Patterns among US Companies, 1999–2017. *Business and Politics*, 1–22.

Mahdavi, Paasha , Jessica Green, Jennifer Hadden, and Thomas Hale (2022). Using Earnings Calls to Understand the Political Behavior of Major Polluters. *Global Environmental Politics 22*(1), 159–174.

Matsumoto, Dawn , Maarten Pronk, and Erik Roelofsen (2011). What Makes Conference Calls Useful? The Information Content of Managers' Presentations and Analysts' Discussion Sessions. *The Accounting Review 86*(4), 1383–1414.

Meckling, Jonas (2011). *Carbon Coalitions: Business, Climate Politics, and the Rise of Emissions Trading*. MIT Press.

Meckling, Jonas (2015). Oppose, Support, or Hedge?: Distributional Effects, Regulatory Pressure, and Business Strategy in Environmental Politics. *Global Environmental Politics 15*(2), 19–37. Publisher: The MIT Press.

Meng, Kyle C. and Ashwin Rode (2019). The social cost of lobbying over climate policy. *Nature Climate Change 9*(6), 472–476.

Oreskes, Naomi (2010). *Merchants of doubt : how a handful of scientists obscured the truth on issues from tobacco smoke to global warming* (1st U.S. ed. ed.). New York: Bloomsbury Press.

Osgood, Iain (2018). Globalizing the supply chain: Firm and industrial support for us trade agreements. *International Organization 72*, 455–484.

Pankratz, Nora M. C. and Christoph M. Schiller (2022). Climate Change and Adaptation in Global Supply-Chain Networks. *Finance and Economics Discussion Series 2022-056*.

Pickl, Matthias J. (2019). The renewable energy strategies of oil majors – From oil to energy? *Energy Strategy Reviews 26*, 100370.

Portala, Juliette (2022). Large companies' assets at growing risk of climate impact - S&P Global. *Reuters*.

Preston, Felix and John Ward (2021). Listed Companies and Climate-Warming Emissions.

Rowan, Sam (2023). Extreme weather and climate policy. *Environmental Politics 32*(4), 684–707.

Sautner, Zacharias , Laurence Van Lent, Grigory Vilkov, and Ruishen Zhang (2023). Firm-Level Climate Change Exposure. *The Journal of Finance 78*(3), 1449–1498.

Stevenson, Emma (2021). Chasing Tesla: how traditional carmakers are revving up their electric vehicle production.

Stokes, Leah Cardamore (2020). *Short Circuiting Policy: Interest Groups and the Battle Over Clean Energy and Climate Policy in the American States*. Oxford Scholarship.

Tabuchi, Hiroko (2021). Toyota Led on Clean Cars. Now Critics Say It Works to Delay Them. *The New York Times*.

Vogel, David (1995). *Trading up : consumer and environmental regulation in a global economy.* Cambridge, Mass: Harvard University Press.

von Shickfus, Marie-Theres (2021). Institutional Investors, Climate Policy Risk, and Directed Innovation. *IFO Working Papers.*

Winn, Monika , Manfred Kirchgeorg, Andrew Griffiths, Martina K. Linnenluecke, and Elmar Günther (2011). Impacts from climate change on organizations: a conceptual foundation. *Business Strategy and the Environment 20*(3), 157–173.

You, Hye Young (2017). Ex Post Lobbying. *The Journal of Politics 79*(4), 1162–1176. Publisher: The University of Chicago Press.

# Appendix

## A Climate Change Bigrams

Sautner et al. (2023) adapt the keyword discovery algorithm proposed by King et al. (2017) which requires a small set of "bigrams" that are unambiguously related to climate change. Then, using those bigrams, the algorithm searches for new bigrams that also likely indicate climate change conversation in the transcripts. Using a combination of the initial bigrams and the new bigrams, the algorithm constructs a model predicting whether or not a sentence is related to climate change. By reversing back the machine learning process to trace back the bigrams that best discriminate climate change-related sentences from those that are not, allows Sautner et al. (2023) to develop a new list of climate change bigrams that includes the initial ones and the additionally identified. This has the advantage of extending the broad initial list into more specialized word combinations, some of which may be more relevant to a particular firm. See below for a list of top bigrams across each of the categories.

Figure 6: Opportunity Bigrams

**Panel A: Top-100 Opportunity Climate Change Bigrams ($CCExposure^{Opp}$)**

| Bigrams | Frequency | Bigrams | Frequency | Bigrams | Frequency |
|---|---|---|---|---|---|
| renewable energy | 15605 | clean efficient | 348 | solar storage | 272 |
| electric vehicle | 9508 | hybrid technology | 339 | opportunity clean | 272 |
| clean energy | 6430 | energy vehicle | 338 | solar program | 272 |
| new energy | 4544 | vehicle lot | 337 | safe clean | 272 |
| wind power | 4253 | gigawatt install | 337 | geothermal power | 270 |
| wind energy | 4035 | gas clean | 332 | vehicle good | 269 |
| solar energy | 2511 | focus renewable | 331 | supply industrial | 268 |
| plug hybrid | 1130 | vehicle type | 327 | cost renewable | 267 |
| battery electric | 1121 | renewable electricity | 326 | grid technology | 265 |
| solar farm | 971 | meet energy | 326 | solar battery | 263 |
| heat power | 941 | bus truck | 326 | ton carbon | 262 |
| renewable resource | 933 | energy commitment | 325 | subsidy receive | 261 |
| carbon neutral | 690 | battery charge | 324 | vehicle electric | 260 |
| electric hybrid | 585 | vehicle place | 319 | vehicle small | 260 |
| carbon free | 558 | clean supply | 310 | vehicle hybrid | 259 |
| sustainable energy | 523 | vehicle space | 309 | demand wind | 259 |
| rooftop solar | 498 | expand energy | 308 | power world | 258 |
| grid power | 493 | vehicle future | 308 | term electric | 257 |
| solar generation | 491 | pure electric | 305 | incremental content | 256 |
| vehicle charge | 476 | fully electric | 303 | carbon energy | 254 |
| issue rfp | 475 | energy research | 302 | energy target | 252 |
| reinvestment act | 474 | invest renewable | 298 | target gigawatt | 252 |
| charge infrastructure | 469 | cell electric | 297 | energy landscape | 249 |
| construction megawatt | 468 | electronic consumer | 291 | customer clean | 248 |
| guangdong province | 431 | install solar | 290 | conventional energy | 247 |
| recovery reinvestment | 407 | community solar | 288 | mild hybrid | 245 |
| energy standard | 406 | ton waste | 287 | vehicle talk | 243 |
| ev charge | 403 | power solar | 284 | charge network | 243 |
| hybrid car | 403 | type energy | 282 | medical electronic | 242 |
| generation renewable | 381 | energy goal | 281 | vehicle offer | 238 |
| grid connect | 376 | vehicle development | 280 | free energy | 237 |
| vehicle battery | 374 | energy important | 279 | plus storage | 237 |
| micro grid | 370 | energy bring | 277 | vehicle opportunity | 237 |
| energy wind | 352 | | | | |

***Notes:*** Based on table 2 in Sautner et al. (2023).

Figure 7: Regulatory Bigrams

**Panel B: Top-100 Regulatory Climate Change Bigrams ($CCExposure^{Reg}$)**

| Bigrams | Frequency | Bigrams | Frequency | Bigrams | Frequency |
|---|---|---|---|---|---|
| greenhouse gas | 3416 | reduce nox | 194 | emission issue | 133 |
| reduce emission | 2354 | emission year | 192 | emission monitor | 133 |
| carbon emission | 2088 | target energy | 191 | china air | 132 |
| gas emission | 1910 | air resource | 186 | capture carbon | 131 |
| reduce carbon | 1715 | implement energy | 183 | quality permit | 126 |
| carbon dioxide | 1583 | control regulation | 180 | available control | 123 |
| air pollution | 1127 | global climate | 179 | efficient combine | 122 |
| carbon price | 999 | think carbon | 173 | environmental goal | 122 |
| energy regulatory | 967 | efficient natural | 170 | comply environmental | 121 |
| carbon tax | 928 | promote energy | 169 | nox sox | 121 |
| environmental standard | 593 | source electricity | 167 | oxide emission | 119 |
| carbon reduction | 558 | gas regulation | 162 | way comply | 118 |
| emission trade | 480 | issue air | 162 | install low | 118 |
| dioxide emission | 478 | florida department | 161 | relate climate | 116 |
| nox emission | 475 | nitrous oxide | 160 | clean electricity | 115 |
| energy independence | 399 | produce carbon | 156 | hill wind | 112 |
| epa regulation | 381 | reduce sulfur | 156 | glacier hill | 111 |
| development renewable | 344 | effective energy | 154 | tax australia | 111 |
| deliver clean | 322 | product carbon | 152 | high hydrocarbon | 108 |
| know clean | 309 | impact clean | 152 | emission ton | 107 |
| standard requirement | 309 | regulation low | 151 | reduce methane | 106 |
| carbon market | 298 | emission rate | 150 | wait commission | 105 |
| trade scheme | 283 | commission license | 150 | gas carbon | 104 |
| emission intensity | 268 | recovery pollution | 150 | stability reserve | 103 |
| impact climate | 265 | appeal district | 148 | eu ets | 102 |
| reduce air | 254 | emission compare | 147 | weight fuel | 101 |
| emission free | 223 | emission increase | 147 | commission public | 101 |
| save technology | 222 | achieve carbon | 144 | talk climate | 100 |
| mercury emission | 221 | capture sequestration | 139 | expect carbon | 100 |
| place energy | 219 | clean job | 137 | castle peak | 98 |
| carbon economy | 217 | emission improve | 137 | emission carbon | 97 |
| talk clean | 216 | emission come | 135 | additive process | 97 |
| energy alternative | 214 | nation energy | 135 | request public | 96 |
| change climate | 207 | | | | |

Figure 8: Physical Bigrams

**Panel C: Top-50 Physical Climate Change Bigrams ($CCExposure^{Phy}$)**

| Bigrams | Frequency | Bigrams | Frequency | Bigrams | Frequency |
|---|---|---|---|---|---|
| global warm | 837 | sea water | 232 | especially coastal | 68 |
| coastal area | 816 | ice product | 202 | golf ground | 67 |
| snow ice | 538 | management district | 193 | plant algeria | 67 |
| friendly product | 527 | water act | 187 | area coastal | 63 |
| forest land | 512 | management water | 172 | large desalination | 61 |
| provide water | 429 | weather snow | 165 | solution act | 57 |
| sea level | 421 | service reliable | 161 | combine sewer | 54 |
| area florida | 402 | ability party | 147 | sewer overflow | 53 |
| nickel metal | 375 | ice control | 142 | sell forest | 52 |
| supply water | 352 | inland area | 134 | fluorine product | 52 |
| natural hazard | 295 | value forest | 130 | warm product | 52 |
| storm water | 292 | non coastal | 117 | area inland | 48 |
| air water | 290 | sale forest | 110 | exposure coastal | 41 |
| heavy snow | 260 | storm january | 109 | city coastal | 39 |
| warm climate | 245 | fight global | 86 | marina east | 37 |
| security energy | 238 | land forest | 84 | keppel marina | 28 |
| water discharge | 233 | particularly coastal | 70 | | |

# B Data Descriptives

## B.1 Summary Statistics

Table 7: Summary Statistics

| | Mean | SD | Min | P25 | P75 | Max | N |
|---|---|---|---|---|---|---|---|
| Overall Exposure | 0.131 | 0.307 | 0.000 | 0.015 | 0.095 | 4.868 | 59531 |
| Opportunity Exposure | 0.051 | 0.155 | 0.000 | 0.000 | 0.028 | 3.236 | 59531 |
| Regulatory Exposure | 0.008 | 0.030 | 0.000 | 0.000 | 0.000 | 0.876 | 59531 |
| Physical Exposure | 0.001 | 0.009 | 0.000 | 0.000 | 0.000 | 0.424 | 59531 |
| Earnings Before Interest and Taxes (EBIT) ($M) | 20 827.504 | 143 228.770 | −19 858.000 | 196.000 | 6675.000 | 3 418 318.000 | 48809 |
| EBIT/Total Assets (Productivity) | 0.867 | 16.814 | −1638.500 | 0.736 | 1.034 | 849.600 | 47433 |
| Total Lobbying Per Year($M) | 13.798 | 107.827 | 0.000 | 0.120 | 5.360 | 5188.885 | 59531 |

***Note:*** the climate exposure measures are transformed by $10^2$ to ease comparison.

## B.2 Climate Lobbying

Using total reported lobbying expenditures by issue, we first compare climate issues to all other issue areas. Figure 9 shows that total lobbying expenditure increased from 2000 to 2020 whereas climate lobbying spiked around 2010 due to the American Clean Energy and Security (ACES) Act and has since decreased overall. This is somewhat surprising, as the distributive implications of climate change have grown in recent years, but can be rationalized given the failure of ACES and limited opportunity for federal climate policy progress under the Trump administration. Figure 10 divides spending into the four subcomponent issue areas. Energy and nuclear topics receive the most, followed by environment, then clean air & water, and finally, fuel/gas/oil. Most of these issues spiked around 2010, but there is also fluctuation throughout the 2010s to be explained.

Figure 9: Lobbying Expenditure on Climate Lobbying vs Other Issues Over Time

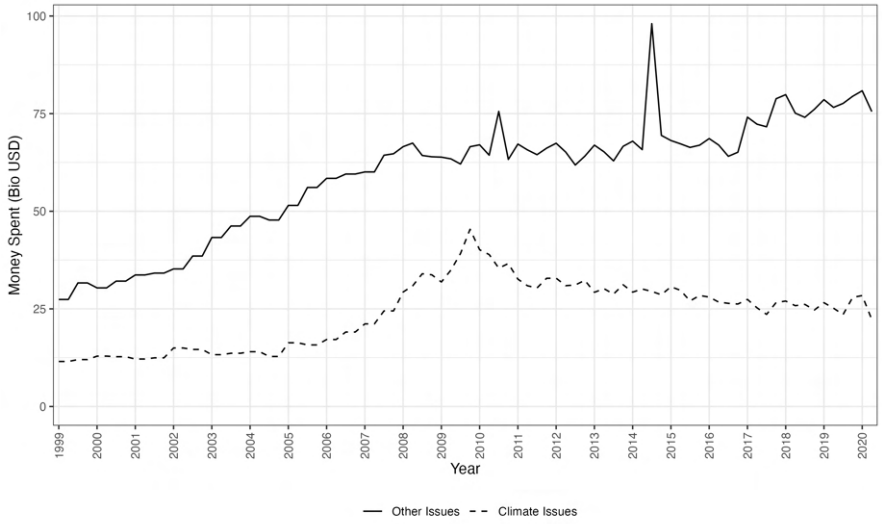
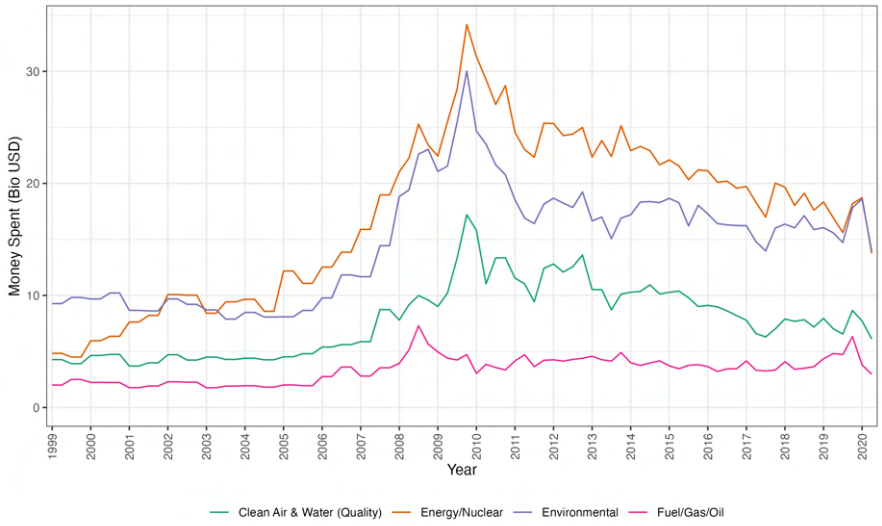



Figure 10: Lobbying Expenditure by Climate Issue Over Time



## B.3 Climate Change Exposure Scores by Sub-Category

We calculate summary statistics for each of the annual exposure measures by industry. Tables 8 - 11 show the results for the top 10 industries, using the Bureau van Dijk industry classifications.

Table 8: Overall Exposure

| Industry | Mean | SD | Min | P25 | P75 | Max | N |
|---|---|---|---|---|---|---|---|
| Agriculture, Horticulture & Livestock | 0.151 | 0.341 | 0.000 | 0.014 | 0.103 | 1.965 | 347 |
| Construction | 0.198 | 0.298 | 0.000 | 0.031 | 0.220 | 1.583 | 627 |
| Industrial, Electric & Electronic Machinery | 0.159 | 0.357 | 0.000 | 0.017 | 0.123 | 4.868 | 8969 |
| Leather, Stone, Clay & Glass products | 0.109 | 0.112 | 0.000 | 0.035 | 0.137 | 0.614 | 533 |
| Metals & Metal Products | 0.147 | 0.140 | 0.000 | 0.053 | 0.204 | 1.639 | 1247 |
| Mining & Extraction | 0.129 | 0.139 | 0.000 | 0.044 | 0.161 | 1.198 | 2591 |
| Transport Manufacturing | 0.185 | 0.253 | 0.000 | 0.046 | 0.217 | 2.275 | 2705 |
| Utilities | 0.827 | 0.637 | 0.011 | 0.385 | 1.087 | 4.333 | 3686 |
| Waste Management & Treatment | 0.136 | 0.128 | 0.000 | 0.047 | 0.174 | 0.754 | 243 |
| Wholesale | 0.175 | 0.523 | 0.000 | 0.014 | 0.069 | 3.616 | 887 |

Table 9: Opportunity Exposure

| Industry | Mean | SD | Min | P25 | P75 | Max | N |
|---|---|---|---|---|---|---|---|
| Agriculture, Horticulture & Livestock | 0.060 | 0.167 | 0.000 | 0.000 | 0.028 | 1.124 | 347 |
| Construction | 0.093 | 0.193 | 0.000 | 0.000 | 0.073 | 1.221 | 627 |
| Industrial, Electric & Electronic Machinery | 0.076 | 0.211 | 0.000 | 0.000 | 0.043 | 2.846 | 8969 |
| Leather, Stone, Clay & Glass products | 0.038 | 0.056 | 0.000 | 0.006 | 0.044 | 0.273 | 533 |
| Metals & Metal Products | 0.036 | 0.050 | 0.000 | 0.008 | 0.048 | 0.665 | 1247 |
| Mining & Extraction | 0.029 | 0.046 | 0.000 | 0.000 | 0.037 | 0.489 | 2591 |
| Transport Manufacturing | 0.098 | 0.174 | 0.000 | 0.013 | 0.113 | 1.695 | 2705 |
| Utilities | 0.340 | 0.351 | 0.000 | 0.114 | 0.436 | 3.236 | 3686 |
| Waste Management & Treatment | 0.036 | 0.040 | 0.000 | 0.009 | 0.044 | 0.222 | 243 |
| Wholesale | 0.060 | 0.175 | 0.000 | 0.000 | 0.023 | 1.169 | 887 |

Table 10: Regulatory Exposure

| Industry | Mean | SD | Min | P25 | P75 | Max | N |
|---|---|---|---|---|---|---|---|
| Agriculture, Horticulture & Livestock | 0.020 | 0.093 | 0.000 | 0.000 | 0.000 | 0.876 | 347 |
| Chemicals, Petroleum, Rubber & Plastic | 0.008 | 0.031 | 0.000 | 0.000 | 0.000 | 0.630 | 6300 |
| Industrial, Electric & Electronic Machinery | 0.005 | 0.022 | 0.000 | 0.000 | 0.000 | 0.524 | 8969 |
| Leather, Stone, Clay & Glass products | 0.006 | 0.015 | 0.000 | 0.000 | 0.006 | 0.103 | 533 |
| Metals & Metal Products | 0.011 | 0.024 | 0.000 | 0.000 | 0.011 | 0.223 | 1247 |
| Mining & Extraction | 0.011 | 0.027 | 0.000 | 0.000 | 0.011 | 0.365 | 2591 |
| Transport Manufacturing | 0.008 | 0.018 | 0.000 | 0.000 | 0.008 | 0.194 | 2705 |
| Transport, Freight & Storage | 0.005 | 0.015 | 0.000 | 0.000 | 0.006 | 0.230 | 3021 |
| Utilities | 0.057 | 0.077 | 0.000 | 0.007 | 0.078 | 0.561 | 3686 |
| Wholesale | 0.013 | 0.050 | 0.000 | 0.000 | 0.000 | 0.388 | 887 |

Table 11: Physical Exposure

| Industry | Mean | SD | Min | P25 | P75 | Max | N |
|---|---|---|---|---|---|---|---|
| Agriculture, Horticulture & Livestock | 0.003 | 0.009 | 0.000 | 0.000 | 0.000 | 0.049 | 347 |
| Chemicals, Petroleum, Rubber & Plastic | 0.001 | 0.007 | 0.000 | 0.000 | 0.000 | 0.145 | 6300 |
| Construction | 0.002 | 0.006 | 0.000 | 0.000 | 0.000 | 0.031 | 627 |
| Industrial, Electric & Electronic Machinery | 0.002 | 0.014 | 0.000 | 0.000 | 0.000 | 0.424 | 8969 |
| Leather, Stone, Clay & Glass products | 0.002 | 0.012 | 0.000 | 0.000 | 0.000 | 0.259 | 533 |
| Mining & Extraction | 0.002 | 0.006 | 0.000 | 0.000 | 0.000 | 0.112 | 2591 |
| Transport Manufacturing | 0.002 | 0.011 | 0.000 | 0.000 | 0.000 | 0.144 | 2705 |
| Utilities | 0.003 | 0.011 | 0.000 | 0.000 | 0.000 | 0.141 | 3686 |
| Wholesale | 0.002 | 0.006 | 0.000 | 0.000 | 0.000 | 0.056 | 887 |
| Wood, Furniture & Paper Manufacturing | 0.009 | 0.034 | 0.000 | 0.000 | 0.000 | 0.287 | 915 |

# C Alternative Model Specifications

## C.1 By Issue

In Table 12, we estimate separately the effect of exposure to climate change on lobbying in each of the individual areas of climate-related issues. We find that increased overall climate change exposure is positively associated with lobbying on Clean Air & Water (CAW), Energy (ENG), and the Environment (ENV). This aligns with our expectations that firms exposed to climate change will lobby on policeis associated with clean air, energy, and the environment.

Table 12: Effect of Exposure on Lobbying, Decomposed by Issue Area

| | Clean Air and Water | Energy | Environment | Fuel, Gas, and Oil |
|---|---|---|---|---|
| DV=*Issue* Lobby Dummy | (1) | (2) | (3) | (4) |
| Overall Exposure | 0.148*** | 0.735*** | 0.288*** | 0.056 |
| | (0.026) | (0.193) | (0.077) | (0.246) |
| EBIT | 0.134 | 0.000 | 0.038 | 0.171 |
| | (0.100) | (0.049) | (0.053) | (0.198) |
| EBIT/Assets | 0.008*** | −0.001*** | −0.001*** | 0.011* |
| | (0.001) | (0.000) | (0.000) | (0.006) |
| US HQ | 0.590 | −0.150 | 0.042 | 0.369 |
| | (0.368) | (0.241) | (0.254) | (0.269) |
| Total Lobbying ($) | 1.508*** | 2.078*** | 2.371*** | 0.226* |
| | (0.314) | (0.313) | (0.432) | (0.134) |
| Observations | 32 239 | 42 353 | 41 730 | 30 447 |
| R2-Pseudo | 0.274 | 0.275 | 0.234 | 0.134 |
| Year FE | X | X | X | X |
| Industry FE | X | X | X | X |
| Year*Industry FE | X | X | X | X |

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors clustered by year and industry.

However, we find no relationship between climate change exposure and the likelihood that a firm lobbies on issues related to Fuel, Gas, and Oil (FUE). This is somewhat surprising, as the outcome variable is a binary indicator as to whether a firm lobbies on the issue and is agnostic of the direction of lobbying (i.e., in favor or against certain regulation). We would expect industries that have a high degree of exposure to climate change would also be lobbying on issues related to fuel, oil, and gas (at least in order to curtail the extent of regulation). Similarly, we might expect that competing firms competing (e.g., renewables) lobby against policies that favor the fossil fuel industry. As the exposure coefficient in Model 4 is statistically insignificant, we treat this as a null result.

The large exposure coefficient in Model 2 suggests that exposure to climate change is a particularly strong driver of lobbying related to energy issues. One explanation for this particularly strong relationship is that the government is often an active partner in subsidizing clean energy development, so opportunity exposure could translate more directly into government lobbying on this issue. Firms with high opportunity exposure, especially relative to others in their industry, are likely investing in clean energy technology and seek to secure individual benefits through lobbying. To investigate what type of exposure is driving lobbying on each of the issue areas, we again break down our overall measure into

its components and estimate their effects on climate lobbying separately by issue area. The results are shown in Table 13.

Table 13: Effect of Exposure on Lobbying, by Exposure Type and Decomposed by Issue Area

| | Climate | Clean Air and Water | Energy | Environment | Fuel, Gas, and Oil |
|---|---|---|---|---|---|
| DV=*Issue* Lobby Dummy | (1) | (2) | (3) | (4) | (5) |
| Opportunity Exposure | 0.479*** | 0.056 | 0.535*** | 0.097** | −0.073 |
| | (0.151) | (0.037) | (0.133) | (0.047) | (0.170) |
| Regulatory Exposure | 0.471*** | 0.110** | 0.231*** | 0.203*** | 0.115* |
| | (0.114) | (0.045) | (0.072) | (0.049) | (0.067) |
| Physical Exposure | 0.182** | 0.107** | 0.062 | 0.110*** | 0.091 |
| | (0.080) | (0.043) | (0.050) | (0.029) | (0.092) |
| EBIT | 0.005 | 0.133 | −0.002 | 0.040 | 0.172 |
| | (0.041) | (0.100) | (0.049) | (0.053) | (0.197) |
| EBIT/Assets | −0.001*** | 0.008*** | −0.001*** | −0.001*** | 0.011** |
| | (0.000) | (0.001) | (0.000) | (0.000) | (0.006) |
| US HQ | −0.047 | 0.588 | −0.145 | 0.045 | 0.372 |
| | (0.267) | (0.372) | (0.252) | (0.264) | (0.284) |
| Total Lobbying ($) | 2.389*** | 1.499*** | 2.053*** | 2.344*** | 0.224* |
| | (0.429) | (0.313) | (0.313) | (0.430) | (0.131) |
| Observations | 43 976 | 32 239 | 42 353 | 41 730 | 30 447 |
| R2-Pseudo | 0.288 | 0.277 | 0.272 | 0.236 | 0.138 |
| Year FE | X | X | X | X | X |
| Industry FE | X | X | X | X | X |
| Year*Industry FE | X | X | X | X | X |

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors clustered by year and industry.

Since, as before, we expect that greater overall exposure should be associated with a higher probability of lobbying, we assume that each of the specific components of exposure also have a positive association with lobbying. Our hypothesis is confirmed for lobbying on the Environment across measures of exposure (and for overall climate issues, given that it aggregates these topics). Furthermore, exposure to regulatory aspects of climate change is associated with increased lobbying activity on all issue areas. Opportunity exposure is associated with Energy and Environment lobbying, with the effect size largest on the former. This reinforces the suggestion that the strength of the relationship between exposure and Energy may be attributable to patterns of government investment in renewable energy where firms can obtain specialized subsidies or incentives. Again, we find little evidence of a relationship between exposure and lobbying on the Fuel issue area as only the regulatory exposure is statistically significant and weakly so. This implies that even as the type of exposure varies, firms see little benefit from increased engagement with government officials on Fuel-specific issues. Collectively, these results reaffirm that the relationship between firm exposure to climate change and climate lobbying depends on both the character of a firm's exposure and varies by climate issue.

## C.2 Within Firm Changes

In this section we isolate the relationship strictly between changes in a firm's own climate exposure and the decision to lobby on climate issues. This is a more restrictive model than we consider in the main text – variation in a firm's position relative to the industry more broadly is factored out, and we strictly consider changes in a firm's own lobbying exposure and its impact on the decision on whether or not to lobby. An inferential advantage of this model is that it implicitly accounts for endowed characteristics of firms that are unobserved but that might drive both the climate exposure of the firm and the decision on whether to lobby.

Table 14: Effect of within-firm change in exposure on lobbying occurrence (Logit)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Opportunity Exposure | 0.827*** | 0.828*** | 0.801*** | 0.810*** | 0.079 |
| | (0.171) | (0.170) | (0.201) | (0.200) | (0.097) |
| Regulatory Exposure | 0.807*** | 0.830*** | 0.869*** | 0.890*** | 0.131* |
| | (0.119) | (0.120) | (0.136) | (0.135) | (0.075) |
| Physical Exposure | 0.186 | 0.185 | 0.269*** | 0.285*** | −0.036 |
| | (0.119) | (0.118) | (0.070) | (0.071) | (0.034) |
| EBIT | | | 0.066 | −0.065 | 0.110*** |
| | | | (0.040) | (0.047) | (0.023) |
| EBIT/Assets | | | −0.001*** | −0.001*** | 0.010 |
| | | | (0.000) | (0.000) | (0.007) |
| US HQ | | | | −0.145 | |
| | | | | (0.166) | |
| Total Lobbying ($) | | | | 2.080*** | 1.448*** |
| | | | | (0.420) | (0.323) |
| Num.Obs. | 59 531 | 59 531 | 47 433 | 47 433 | 19 535 |
| R2 | 0.113 | 0.116 | 0.118 | 0.165 | 0.379 |
| R2 Adj. | 0.113 | 0.116 | 0.117 | 0.164 | 0.345 |
| R2 Within | | 0.114 | 0.116 | 0.163 | 0.015 |
| R2 Within Adj. | | 0.114 | 0.116 | 0.163 | 0.015 |
| FE: year | | X | X | X | X |
| FE: gvkey | | | | | X |

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

Table 14 presents the results of this analysis. The first four columns are simply included for comparison – the important specification is represented in Column 5, which includes both year and firm fixed effects. The sample size shrinks significantly, as firms that lobby either in every period or none of the periods contribute no information to estimation of the coefficients and are therefore omitted. The coefficients for the exposure variables shrink considerably in magnitude and are estimated less precisely when firm fixed effects are included. This result compared to Column 4 suggests that variation *across* firms in a given year in climate exposure contributes significantly to the choice of whether to lobby. The only coefficient in Column 5 that meets a 90% significance threshold is regulatory exposure. This suggests that firms may respond to changes in their own regulatory exposure to climate change, independently of how regulation might affect their industry competition. The coefficients for both opportunity and regulatory exposure are both statistically insignificant, and the coefficient for physical

exposure flips signs. This result, in context with our main results from Table 4, implies that change simply in a firm's own physical or opportunity exposure is not sufficient to induce lobbying on climate issues to address the change in exposure. Rather, it is only in the context of change in exposure relative to industry competitors that drives firm political action on opportunities or physical risks from climate change.

These results do not contradict the findings in the main text. Our theory depends on the broader context than the firm itself in determining what drives climate change. Rather, the results suggest that it is in fact changes in exposure relative to industry peers, rather than firm-level variation, that is most important in driving climate lobbying.

## C.3 Expenditure with OLS

In this section we implement a simplified modeling strategy to estimate the effect of climate exposure on lobbying expenditures in dollars. We use an ordinary least squares model as a robustness test for the Tobit results in the main body. While we feel the Tobit structure better captures the character of our corner solution outcome variable, the OLS model should still express a positive relationship between climate exposure and lobbying.

Table 15 includes an equivalent set of covariate specifications as Table 5, but the coefficients are estimated using an OLS model. The outcome remains the same – we use the logarithm of one plus climate lobbying expenditure for a firm in a given year. The results obtained are similar in interpretation to the Tobit results in the main text, except that opportunity exposure is much more weakly associated with climate lobbying expenditures than in the Tobit model. This may be explained by a loss aversion motive, as the fear of loss associated with higher regulatory or physical risk might drive firms to spend more dollars on climate lobbying while climate opportunity does not engender as strong of a motivation.

Table 15: Effect of exposure on lobbying dollar expenditures (OLS)

| | (1) | (4) | (5) | (6) | (6) |
|---|---|---|---|---|---|
| Opportunity Exposure | 0.024** | 0.026** | 0.027** | 0.000 | 0.003 |
| | (0.011) | (0.012) | (0.013) | (0.009) | (0.010) |
| Regulatory Exposure | 0.042*** | 0.043*** | 0.043*** | 0.024*** | 0.026*** |
| | (0.009) | (0.009) | (0.009) | (0.007) | (0.007) |
| Physical Exposure | 0.016 | 0.029*** | 0.029** | 0.024** | 0.024** |
| | (0.011) | (0.010) | (0.010) | (0.009) | (0.009) |
| EBIT | | 0.011 | 0.010 | 0.017* | 0.018* |
| | | (0.009) | (0.009) | (0.009) | (0.009) |
| EBIT/Assets | | 0.000* | 0.000*** | 0.000 | 0.000 |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| US HQ | | 0.026 | 0.025 | 0.051* | 0.051* |
| | | (0.025) | (0.025) | (0.027) | (0.028) |
| Total Lobbying ($) | | 0.183*** | 0.183*** | 0.181*** | 0.181*** |
| | | (0.052) | (0.052) | (0.048) | (0.048) |
| Num.Obs. | 59 531 | 47 433 | 47 433 | 47 433 | 47 433 |
| R2 | 0.026 | 0.285 | 0.287 | 0.347 | 0.357 |
| R2 Adj. | 0.026 | 0.285 | 0.287 | 0.347 | 0.348 |
| R2 Within | | | 0.285 | 0.281 | 0.284 |
| R2 Within Adj. | | | 0.285 | 0.281 | 0.284 |
| Year FE | | | X | X | X |
| Industry FE | | | | X | X |
| Year*Industry FE | | | | | X |

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

## C.4 Logit with Multiple Imputation

In this section we evaluate the possibility of non-random missingness introducing sample selection issues into our analysis. The *EBIT* and *EBIT/Assets* variables (pulled from the ORBIS database) both have missingness, which reduces our sample by $\sim 20\%$ when including these variables in our regression specifications. By listwise deleting these data, we are making the assumption that our data are *missing completely at random*. To weaken this assumption, we implement a multiple imputation approach for missing data. Multiple imputation assumes a multivariate normal distribution across covariates in the data and estimates this distribution using the non-missing data. The approach then produces $n$ complete datasets with imputed values drawn from this distribution plugged in for missing values. This stochastic approach to missing data imputation is intended to incorporate the uncertainty of predicted data into downstream model estimation. The multiple imputation approach assumes a *missing at random* structure for the missing data – in other words, missingness is not systematic once observed covariates are conditioned on.

We impute missing data for *EBIT* and *EBIT/Assets* using all other covariates included in the models, including our climate exposure measures. We generate 100 complete datasets using the multiple imputation model. We estimate the model specifications with each of our imputed datasets, with coefficients and standard errors adjusted for uncertainty of imputed data.

Table 16: Effect of exposure on lobbying occurrence (Logit w/ multiple imputed covariates)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Opportunity Exposure | 0.827*** | 0.840*** | 0.838*** | 0.484*** | 0.489*** |
| | (4.80) | (4.93) | (4.96) | (3.92) | (3.81) |
| Regulatory Exposure | 0.807*** | 0.831*** | 0.851*** | 0.447*** | 0.452*** |
| | (6.13) | (6.29) | (6.33) | (4.28) | (4.26) |
| Physical Exposure | 0.186 | 0.195 | 0.196 | 0.0899 | 0.0985 |
| | (1.54) | (1.49) | (1.50) | (0.79) | (0.85) |
| EBIT | | -0.0471 | -0.0520 | 0.0140 | -0.00383 |
| | | (-1.28) | (-1.37) | (0.34) | (-0.08) |
| EBIT/Assets | | -0.000991** | -0.000955** | -0.00101** | -0.000988** |
| | | (-2.95) | (-2.82) | (-2.95) | (-2.89) |
| US HQ | | -0.155 | -0.165 | -0.147 | -0.153 |
| | | (-1.07) | (-1.13) | (-0.88) | (-0.90) |
| Total Lobbying ($) | | 2.110*** | 2.109*** | 2.348*** | 2.428*** |
| | | (6.32) | (6.30) | (6.18) | (5.97) |
| Observations | 59531 | 59531 | 59531 | 59176 | 55569 |

$t$ statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of our Logit specifications, estimated using imputed data, are included in Table 16. The

results are similar to those in Table 4 of the main text. The physical exposure measure, however, is near zero and statistically insignificant across specifications. This result is puzzling, and suggests that the listwise deleted observations may systematically have a weaker association between physical exposure and climate lobbying than observations for which we have complete data. There is no theoretical reason to expect this is true – it is not immediately clear what characteristics of firms might drive them to underreport financial statistics and also ignore physical exposure to climate change. We thus take these results with a grain of salt, noting them with caution but also recognizing that the results correspond closely to our listwise deleted results for two of the three exposure variables.

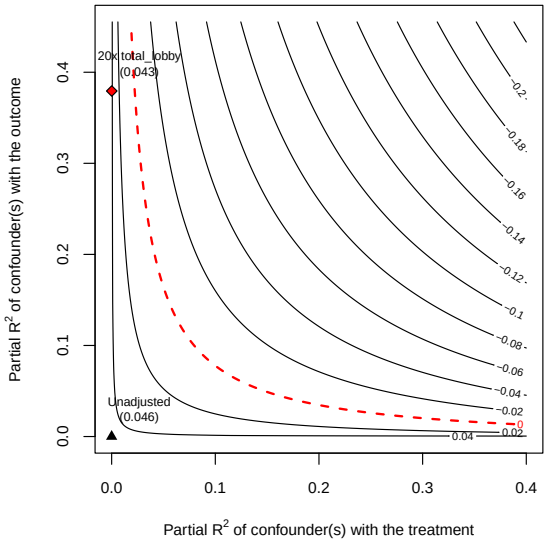
# D Sensitivity Analysis

We conduct a sensitivity analysis to estimate how strong an unobserved confounder would have to be to bring the lower bound of the ATT estimate to 0 at the 5% significance level. We implement the method of Cinelli and Hazlett (2020) and use their `sensemakr` package for this analysis. Note, that we are using linear models for the analysis of both lobbying occurrence and expenditure due to computational requirements.

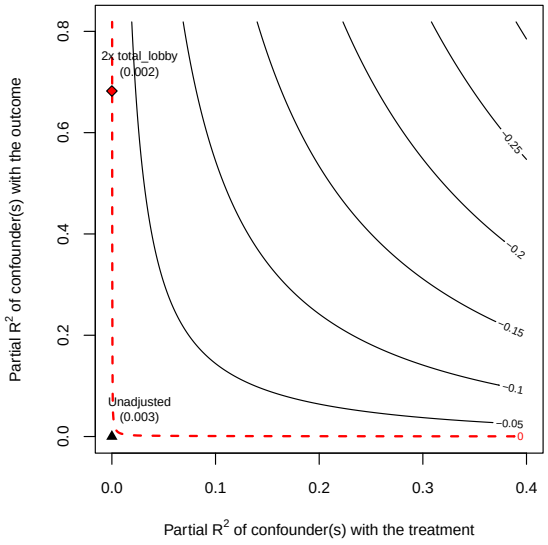
Figures 11 to 12 summarize the results of this exercise for the *Opportunity* and *Physical* exposure measures, respectively. A point in the plot represents a hypothetical unobserved confounder. The x-coordinate represents the partial $R^2$ of the confounder with respect to the treatment (dialectal distance) and its y-coordinate represents the partial $R^2$ with respect to the outcome (lobbying occurrence or expenditure). For reference, we have included the partial $R^2$ values for the total lobbying covariate as well as a hypothetical confounder that is multiple orders of magnitudes as strong as the total lobbying measure. Next to the variable names we also indicate the effect size of the independent variable if an unobserved confounder with the respective strength were included in the model.

Figure 11: Sensitivity analysis: Opportunity

(a) Occurrence



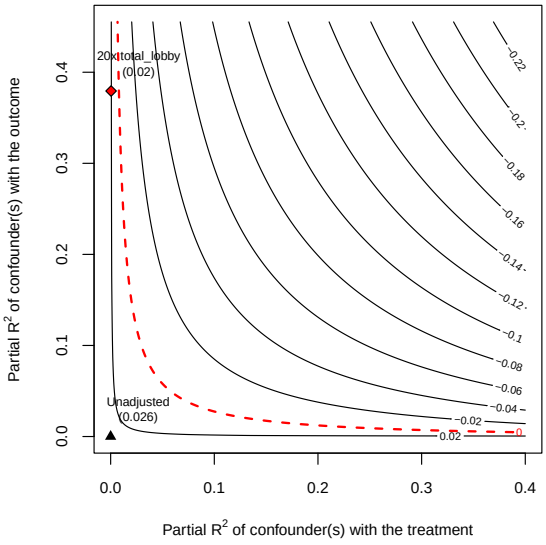

(b) Expenditure



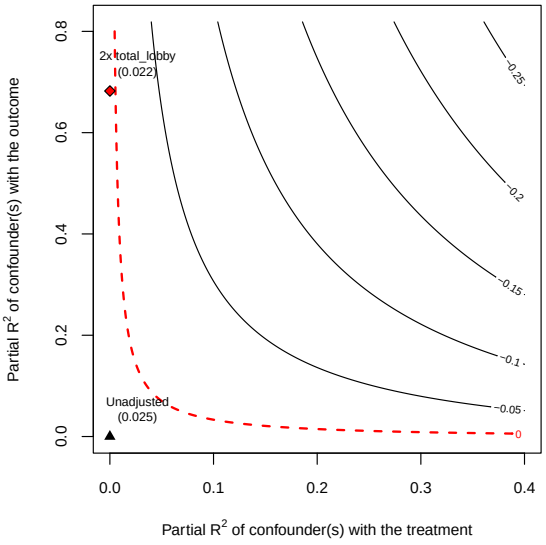

***Notes:*** Results from the sensitivity analysis for *Opportunity* exposure.

Figure 12: Sensitivity analysis: Physical

(a) Occurrence




(b) Expenditure




***Notes:*** Results from the sensitivity analysis for *Physical* exposure.

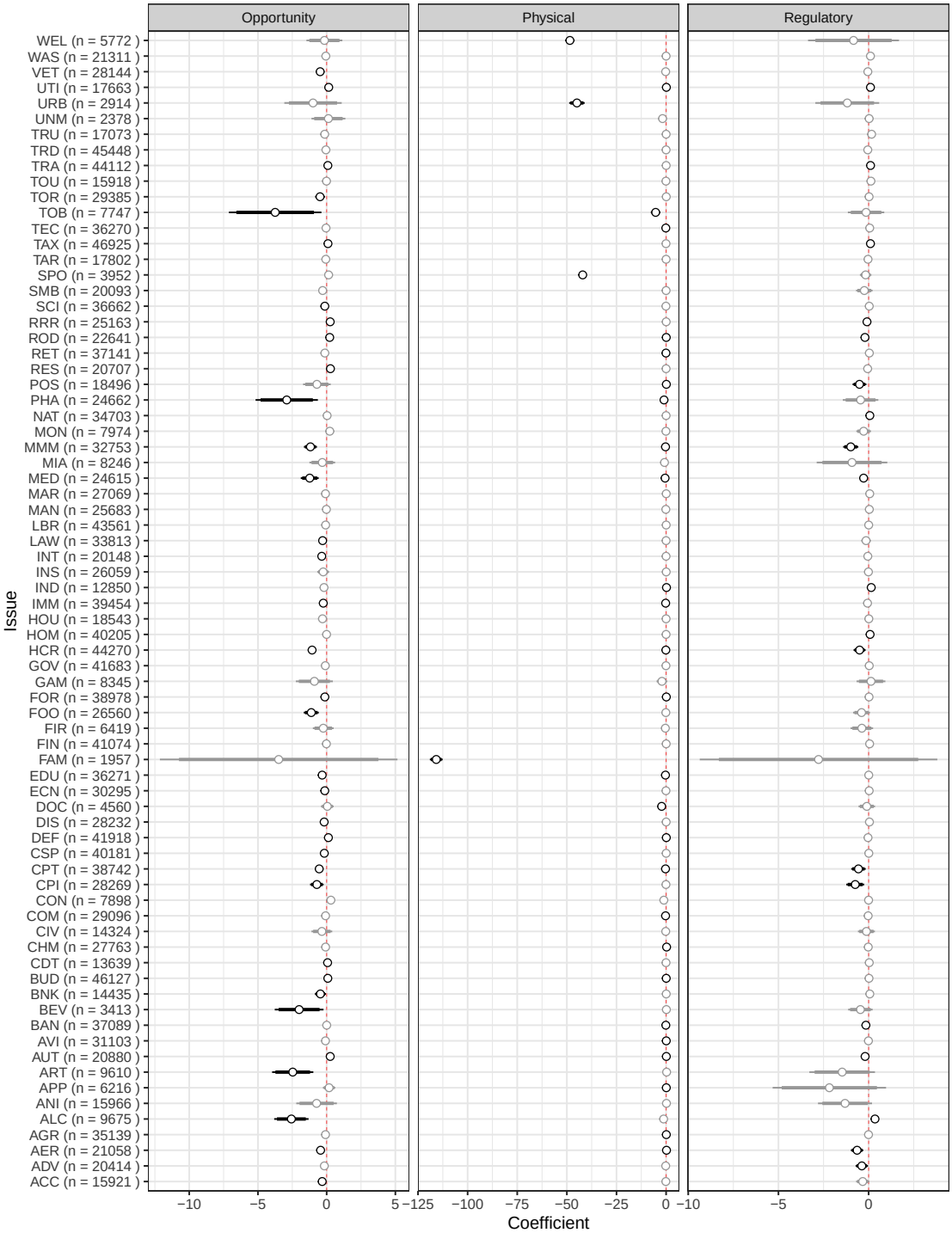
# E Placebo Tests

We test the theory that climate change exposure affects climate policy lobbying by conducting placebo tests. If lobbying also rises in areas that are unrelated to climate change exposure, this would indicate a different cause for the political activity. However, if the rise is only seen in lobbying related to climate exposure, it supports our theory that relative climate exposure drives firms' political activities.

To be as transparent as possible, we estimate our most rigorous model specifications with industry, year, and industry-year fixed effects and all controls for all other issue areas and for both lobbying occurrence (logit) and expenditure (ols). For a description of issue codes see 17. If our theoretical expectations are true, we should not see any systematic relation between our climate exposure variables and lobbying issues that are unrelated to climate exposure such as "FIR = Firearms/Guns/Ammunition" or "MIA = Media (Information/Publishing)". In contrast, firms are more likely on areas that are not directly related to climate policy but still affected by climate exposure such as "TAX = Taxation" or "AUT = Automotive Industry." Figures 13 and 14 plot the results of this exercise.

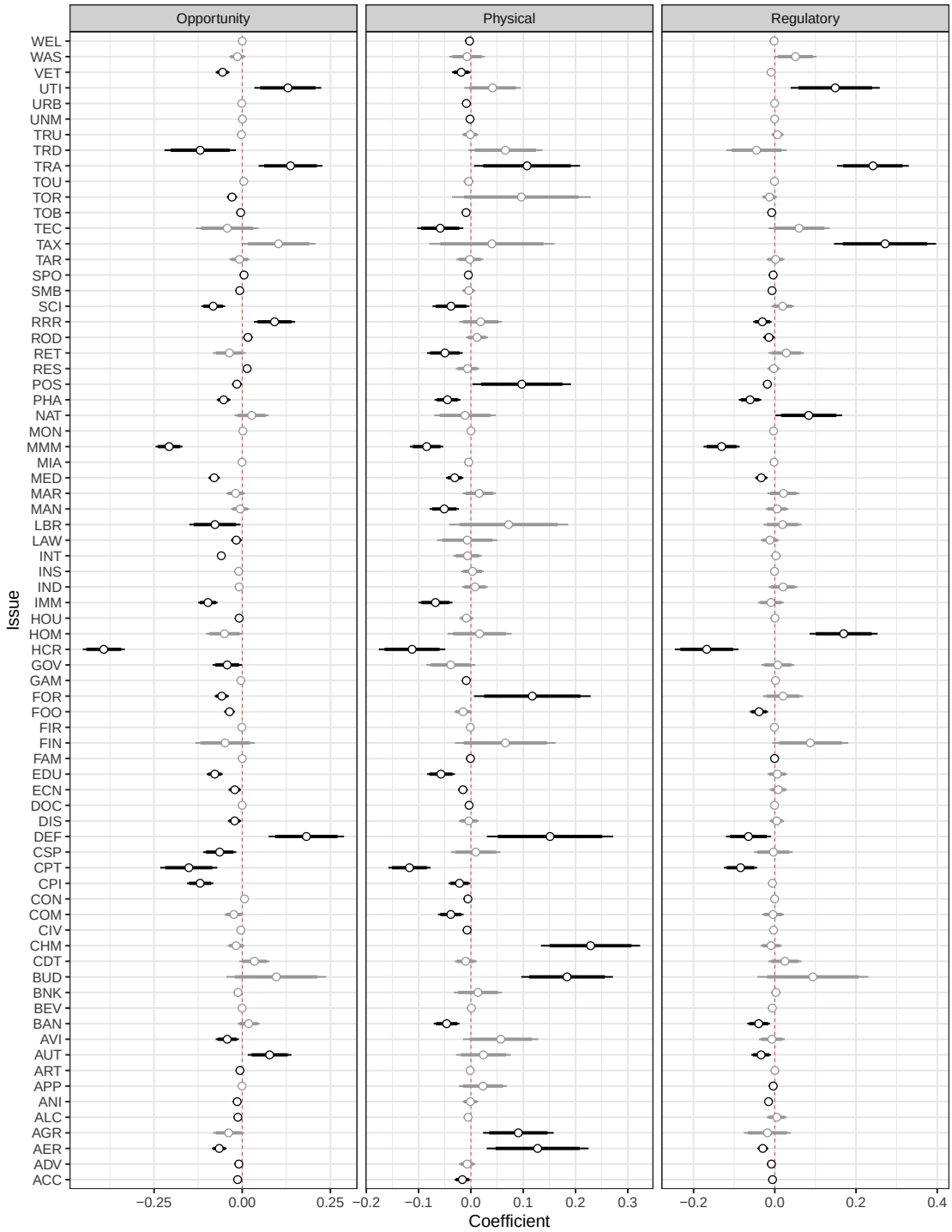
Overall, we do not find any systematic relationship between our climate exposure variables and lobbying on non-climate relevant issues that raise concern for our results. The relationship between climate exposure and many irrelevant issues are near-zero and insignificant for lobbying at both the extensive and intensive margin. We do find a relationship between climate exposure and issue areas that are plausibly related to climate change issues. While climate change exposure has a statistically significant relationship with some unexpected issue areas (e.g., "TOB = Tobacco"), such effects are largely negative (i.e., reduce the likelihood of lobbying) with no clear theoretical rationale or pattern. It is also important to note that the large estimates and confidence intervals in some cases is due to a lower number of observations of lobbying on a given issue area.

Figure 13: Placebo Tests: Occurrence




***Notes:*** Estimates from logit regression of non-climate lobbying instances (placebos) on climate exposure variables. Horizontal bars denote 90% (thick lines) and 95% (thin lines) confidence intervals. Number of observations for each model are indicated on the y-axis behind each issue code. Issue code descriptions are in table 17. Black (grey) points and bars denote estimates that are (not) significant at the 95% confidence level.

Figure 14: Placebo Tests: Expenditure




***Notes:*** Estimates from OLS regression of non-climate lobbying expenditure (placebos) on climate exposure variables. Horizontal bars denote 90% (thick lines) and 95% (thin lines) confidence intervals. Issue code descriptions are in table 17. Black (grey) points and bars denote estimates that are (not) significant at the 95% confidence level.

Table 17: Lobbying Report Issue Codes

| Code | Description |
|---|---|
| ACC | Accounting |
| ADV | Advertising |
| AER | Aerospace |
| AGR | Agriculture |
| ALC | Alcohol & Drug Abuse |
| ANI | Animals |
| APP | Apparel/Clothing Industry/Textiles |
| ART | Arts/Entertainment |
| AUT | Automotive Industry |
| AVI | Aviation/Aircraft/Airlines |
| BAN | Banking |
| BNK | Bankruptcy |
| BEV | Beverage Industry |
| BUD | Budget/Appropriations |
| CAW | Clean Air & Water (Quality) |
| CDT | Commodities (Big Ticket) |
| CHM | Chemicals/Chemical Industry |
| CIV | Civil Rights/Civil Liberties |
| COM | Communications/Broadcasting/Radio/TV |
| CPI | Computer Industry |
| CSP | Consumer Issues/Safety/Protection |
| CON | Constitution |
| CPT | Copyright/Patent/Trademark |
| DEF | Defense |
| DOC | District of Columbia |
| DIS | Disaster Planning/Emergencies |
| ECN | Economics/Economic Development |
| EDU | Education |
| ENG | Energy/Nuclear |
| ENV | Environmental/Superfund |
| FAM | Family Issues/Abortion/Adoption |
| FIR | Firearms/Guns/Ammunition |
| FIN | Financial Institutions/Investments/Securities |

| | |
|---|---|
| FOO | Food Industry (Safety, Labeling, etc.) |
| FOR | Foreign Relations |
| FUE | Fuel/Gas/Oil |
| GAM | Gaming/Gambling/Casino |
| GOV | Government Issues |
| HCR | Health Issues |
| HOM | Homeland Security |
| HOU | Housing |
| IMM | Immigration |
| IND | Indian/Native American Affairs |
| INS | Insurance |
| LBR | Labor Issues/Antitrust/Workplace |
| INT | Intelligence and Surveillance |
| LAW | Law Enforcement/Crime/Criminal Justice |
| MAN | Manufacturing |
| MAR | Marine/Maritime/Boating/Fisheries |
| MED | Medical/Disease Research/Clinical Labs |
| MIA | Media (Information/Publishing) |
| MMM | Medicare/Medicaid |
| MON | Minting/Money/Gold Standard |
| NAT | Natural Resources |
| PHA | Pharmacy |
| POS | Postal |
| RRR | Railroads |
| RES | Real Estate/Land Use/Conservation |
| REL | Religion |
| RET | Retirement |
| ROD | Roads/Highway |
| SCI | Science/Technology |
| SMB | Small Business |
| SPO | Sports/Athletics |
| TAR | Miscellaneous Tariff Bills |
| TAX | Taxation/Internal Revenue Code |
| TEC | Telecommunications |
| TOB | Tobacco |
| TOR | Torts |

| | |
|---|---|
| TRD | Trade (Domestic & Foreign) |
| TRA | Transportation |
| TOU | Travel/Tourism |
| TRU | Trucking/Shipping |
| URB | Urban Development/Municipalities |
| UNM | Unemployment |
| UTI | Utilities |
| VET | Veterans |
| WAS | Waste (hazardous/solid/interstate/nuclear) |
| WEL | Welfare |

***Notes:*** Issue codes used in Lobbying Reports.