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

Short title: Climate Exposure and Firm Lobbying

Keywords: Climate Change, Earnings Calls, Environmental Politics, Firms, Lobbying

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We are very grateful to Erik Voeten, Hye Young You, and Kris Ramsay for their repeated support, as well as to In Song Kim and the LobbyView team for their generous assistance with the LobbyView data. We further thank Patrick Bayer, Isabelle DeSisto, Charlotte Fitzek, Alex Gazmararian, Karam Kang, Helen Milner, Adrian Pietrzak, Marc Ratkovic, Maria Silfa, Reilly Steel, Guadalupe Tuñon, Andreas Wiedemann, Grace Zeng, and audiences at Princeton, APSA, IPES, and IPSA for helpful comments. Christian Baehr and Vincent Heddesheimer received support for this project from the Andlinger Center for Energy and the Environment.

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Abstract

When and how do firms engage in climate politics? We argue that regulatory concerns, business opportunities, and physical risks activate policy preferences and lobbying efforts. We measure firm-level exposure to opportunity, regulatory, and physical aspects of climate change based on discussion in quarterly earnings call transcripts for 11,705 publicly traded firms between 2001 and 2023. We estimate the effect of climate exposure on climate lobbying instances (extensive margin), amount (intensive margin), and targets (political entities). We find that more exposed companies, especially in terms of opportunities and regulation, are more likely to lobby. The type of climate exposure, both absolute and relative to industry peers, dictates whether firms lobby, how much they spend on lobbying, and their choice of government target. Taken together, our findings demonstrate the importance of disaggregating firm-level perceptions of climate impacts to understand patterns in political activity.

Verification Materials: The data and materials required to verify the computational reproducibility of the results, procedures and analyses in this article are available on the American Journal of Political Science Dataverse within the Harvard Dataverse Network, at: https://doi.org/10.7910/DVN/UN95JK.

The Cornell Center for Social Sciences verified that the data and replication code submitted to the AJPS Dataverse replicates the numerical results reported in the main text of this article.

Word count: 10,118

Private sector lobbying both catalyzes and constrains climate action. For instance, in 2019, California became a climate flashpoint as Toyota and Fiat Chrysler backed the Trump administration's opposition to fuel standards while Ford and Volkswagen aligned with California to build cleaner trucks.[1] Under the Biden administration, policy support shifted again as all-electric makers like Tesla pushed for even stricter tailpipe emissions standards.[2] Meanwhile, legacy automakers urged a slower pace, with Ford warning that the Environmental Protection Agency's (EPA) proposal was unrealistic given current electric vehicle (EV) supply chain limits, instead pushing for an approach that "does not go too far too fast."[3] Such cleavages are a symptom of how climate change triggers both real and perceived asset revaluation (Colgan, Green and Hale, 2021), with variation in firms' responses, even within the same industry.

How does exposure to climate change affect when and how firms engage in climate politics? A growing body of research explains how companies react to government regulation to mitigate climate change (Cory, Lerner and Osgood, 2021; Genovese, 2019; Kennard, 2020; Meckling, 2015). Firms most negatively affected by regulation push against pro-climate policy, while early adopters seek relative advantages over direct competitors. However, regulatory policy represents but a slice of firms' overall climate exposure. We know less about how the broader universe of climate issues such as green industrial policies or increasingly extreme weather patterns impacts the trade-offs firms make when deciding to become politically active.

In this paper, we develop a broader theoretical framework that explains how the type of climate change exposure matters for firms' political behavior. Crucially, we observe that exposure to climate change can be positive or negative, reflecting potential growth opportu-

[1]Brady Dennis and Juliet Eilperin, "GM, Toyota, and Chrysler side with White House in fight over California fuel standards, exposing auto industry split," *The Washington Post*, October 28, 2019.

[2]Camila Domonoske and Michael Copley, "In a boost for EVs, EPA finalizes strict new limits on tailpipe emissions," *NPR*, March 20, 2024.

[3]Ford Motor Company. 7 July 2023. "Comments on Proposed Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles." Page 3. Submitted to Federal Register at https://www.regulations.gov/comment/EPA-HQ-OAR-2022-0829-0605.

nities for some and business threats to others. Companies with greater exposure, including both upside and downside, to the impacts of climate change are generally more likely to lobby on climate issues, but the specifics depend on exposure type. We focus on three types of exposure: opportunity, regulatory, and physical. We argue that the type of exposure to climate change affects whether firms lobby, how much they lobby, and who they target when they lobby. These decisions depend on firm expectations over the costs and benefits of lobbying, which are shaped by: 1) motivation to secure gains versus avert losses, 2) whether policy change will generate public or private goods, and 3) the time horizon of impact. Because these expectations vary between exposure types, they therefore translate into different levels and types of lobbying. We anticipate that opportunity and regulatory exposure lead to a higher likelihood, and higher levels, of climate lobbying than physical exposure. Further, we expect that differences in exposure type also determine the government target of lobbying based on which branch and agency is most relevant. We emphasize that what matters most is relative exposure compared to industry competitors (Kennard, 2020), but depart from prior research by arguing that it explains both pro- and anti-climate lobbying. As such, we expect that firms with relatively high climate change exposure compared to their rivals will be more likely to lobby on climate policies, even if this means going against industry-wide interests.

To test our hypotheses, we construct an original panel data set of 11,705 publicly traded firms over 2001-2023 that connects firms' climate change exposure to lobbying. Estimating the firm-level impact of climate change is difficult because measures such as carbon emissions or environmental-social-governance (ESG) scores suffer from selection bias and reflect historical business models rather than perceptions of future climate impacts. We overcome these shortcomings by using a novel measure of differentiated climate change exposure developed by Sautner et al. (2023) based on earnings call transcripts from public companies to identify the attention participants pay to climate change. This approach is useful for understanding the extent to which climate change is important to a given company, including how it perceives risks versus opportunities. We merge these climate change exposure measures with the universe of climate lobbying reports in the United States (US). Our dataset provides crucial information needed to analyze companies' climate lobbying, including climate change exposure, lobbying occurrence, amount, content (e.g., specific issues and agencies targeted), industry, and firm characteristics.

We focus on federal lobbying in the US as our key measure of political behavior for several reasons. First, it accounts for roughly 70% of total US lobbying expenses since 2015.[4] Second, lobbying is central to interest group politics (Ansolabehere, de Figueiredo and Snyder Jr, 2003; Baumgartner et al., 2009; You, 2017). Third, it influences climate policy outcomes (e.g., Kang, 2016; Mildenberger, 2020; Stokes, 2020). For example, Meng and Rode (2019) estimate that lobbying reduced the likelihood of enacting the Waxman-Markey Bill by 13 percentage points, with an associated $60 billion social cost. Finally, federal lobbying is observable due to federal disclosure laws, providing empirical leverage. While we emphasize lobbying, our theory extends beyond it and beyond the US: we expect climate exposure to shape firms' political behavior more broadly, even as tactics vary by context.

We find that firms with higher perceived exposure to climate change, relative to industry peers, are more politically active on climate issues. 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 exposed to climate opportunities, followed by regulatory exposure. However, we find that physical exposure is not a key predictor of climate lobbying. We also find that heterogeneous exposure to climate change drives firms to target different government entities. Firms with high opportunity exposure are more likely to target the Department of Energy (DOE) given its oversight of programs such as R&D funding, while those with regulatory concerns focus on rulemaking by the EPA. We further present suggestive evidence that climate lobbying is more mitigation- than adaptation-focused, with

[4] Based on Federal and State Lobbying, Open Secrets.

regulatory exposure linked to both pro- and anti-climate efforts, while physical and opportunity exposures steer firms away from anti-climate activity. These findings show that the type of climate exposure that a firm faces plays a key role in explaining lobbying strategies.

To complement our quantitative findings, we present a case study of the automotive sector to show how differential climate exposure shapes lobbying. Using data from earnings calls, lobbying reports, and CDP[5] disclosures, we trace how variation in exposure across firms within the same industry translates into lobbying behavior. More exposed firms lobby more, with industry leaders supporting mitigation policies and laggards seeking to limit regulatory costs. This supports our claim that the type – and especially the relative degree – of exposure is key to understanding firms' political strategies.

Our paper contributes to research on firm-level climate preferences and political activity in several ways. First, we address calls to better explain patterns in corporate support for, or resistance to, climate policy (Genovese, 2021; Lerner and Osgood, 2023; Liu, Wei and Zhang, 2023). Rather than classifying industries, or even firms, into climate "winners" and "losers," we highlight that firms can simultaneously benefit from and be harmed by climate change. This approach improves on existing typologies by recognizing that firms can hold both climate-forcing and climate-vulnerable assets (Colgan, Green and Hale, 2021). Variation in exposure type is critical, as firms adopt policy positions tailored to their specific vulnerabilities and advantages, which in turn influence both the scale and focus of their lobbying. Drawing on work on firm heterogeneity (Kennard, 2020; Kim, 2017), we show how specific climate impacts shape political behavior – moving beyond accounts that emphasize obstructionism or treat exposure as unidimensional. Instead, we recognize that companies are already adapting to climate change and will continue to do so, some facing existential threats and others seeing vast opportunities.

Second, we add to the literature by highlighting different features of lobbying behavior. Previous research has often treated lobbying as a bundled activity. Instead, we study the

[5] Formerly the Carbon Disclosure Project.

effects of climate exposure on extensive and intensive margins and also test hypotheses about targeting specific entities. Climate change can affect firms in more complex ways than trade policy (Kim, 2017). We stress that depending on the specific type of exposure, firms must strategically decide which government entity to target. In doing so, we emphasize the theoretical and empirical importance of unraveling the different trade-offs that firms face when deciding to become politically active.

Lastly, we contribute to a growing body of research that leverages earnings call data to the study of firms' political behavior. By applying recently developed methods from economics and linguistics (Hassan et al., 2019; Mahdavi et al., 2022; Sautner et al., 2023), we improve our ability to identify the various risks and opportunities of firms. This method overcomes the shortcomings of previous empirical approaches that are purely historical (emissions) or subject to greenwashing (CSR reports). Together, these contributions address long-standing challenges in the field of assessing firm-level climate impact and understanding associated political behavior.

Firm Behavior in Response to Climate Change

When and how do firms engage in climate politics? Firms are subject to diverse climate effects, including threats to physical assets, regulatory actions, and technological opportunities. Physical risks from increasingly common acute severe weather and changes in climatological patterns pose random shocks to company assets that can increase costs while climate-preserving regulatory actions affect costs by requiring energy efficiency or pollution reduction. However, the effects of climate change and related policies can also create opportunities, especially for innovative companies that benefit from climate regulation or have options to expand market power.

Previous research has focused predominantly on firms' reactions to government regulation to mitigate climate change. The literature emphasizes that regulation is likely to increase production costs, especially for firms with high greenhouse gas (GHG) emissions. Most affected companies push against pro-climate policy (e.g., Brulle, 2018; Cheon and Urpelainen, 2013; Cory, Lerner and Osgood, 2021; Delmas, Jinghui Lim and Nairn-Birch, 2016; Stokes, 2020), either through direct opposition or hedging (Meckling, 2015). In addition to regulatory risks, potential opportunities arising from climate change can induce companies to become politically active. Early adopters of environmental standards, or those with lower adjustment costs, may seek relative advantages over direct competitors through political action (Genovese and Tvinnereim, 2019; Kim, Urpelainen and Yang, 2016; Vogel, 1995).

More generally, adjustment cost variation induces preferences for regulation among low-cost firms across institutional environments and industries (Kennard, 2020). There is also some evidence suggesting that the experience of physical shocks related to climate change can induce companies to lobby on climate issues (Gazmararian and Milner, 2023). Firm behavior can also evolve dynamically in response to regulation (Vormedal and Meckling, 2024), as policies may generate payoffs that shift incentives or strengthen political power for some and create a feedback loop (Campbell, 2012; Pierson, 1993).

However, existing work does not provide an overarching theory for how firms make trade-offs in response to different types of climate exposure. That is, prior research cannot tell us whether the *type* of expected benefits or costs matters. Yet, we know firms care about detailed policy content within bills (Kang, 2016) and likely respond to specific stimuli in unique ways. In addition, previous research often focuses on particular industries, congressional sessions, or bills, making it unclear whether and how the theoretical expectations translate more generally. Therefore, we develop a broader argument, seeking to explain how the type of climate change exposure matters for firms' political behavior. We expect that different exposure should lead to distinct trade-offs for firms, affecting their political behavior. Answering this question is important as competition between interest groups influences the content of policy (Cheon and Urpelainen, 2013) and firm-level exposure is likely to shift as the impacts of climate change are increasingly realized.

Why does existing work fail to recognize the range of exposure, both positive and negative, that firms have to climate change? First, research to date has largely focused on private sector obstructionism. This is unsurprising, as companies with high carbon emissions faced massive cost increases and even existential threat (Colgan, Green and Hale, 2021; Kelsey, 2018) that made preventing ambitious climate policy paramount. However, this dynamic has changed over time and in important ways. As climate policy accumulates and the cost of renewable energy technology decreases, many firms increasingly see opportunities to expand revenue related to climate action. Additionally, firms have started to observe and experience the physical impacts of climate change in the form of wildfires, flooding, and extreme weather. Thus, we can no longer think about the exposure firms have to climate change in a unidimensional manner.

A second reason is the empirical challenges associated with systematically measuring both the opportunities and risks posed by climate change. Previous research relies largely on GHG emissions or ESG reports, but these are mostly historical and suffer from selection biases. An important contribution is to draw on novel data from financial economics to measure comprehensive exposure to climate change, allowing us to build on previous efforts.

Risk, Opportunity, and Climate Lobbying

We develop a theory of firm decision-making that explains how the multifaceted impacts of climate change translate into political behavior. Firms can influence climate politics in many ways, including through campaign contributions (Ard, Garcia and Kelly, 2017), ex ante and ex post lobbying (Brulle, 2018; You, 2017), and strategic (mis)information campaigns (Oreskes, 2010). We focus on federal lobbying in the US as our key outcome of political behavior for reasons described in the introduction.

We start with the assumption that firms are rational, profit-interested actors that make strategic choices within a competitive environment about how to maximize revenue and minimize costs. In response to exposure to climate change, companies select across political and economic actions based on anticipated distributional effects (Green et al., 2022; Meckling, 2011). Such actions are complements, rather than substitutes. Companies can attempt to influence policy and simultaneously adjust economically. This implies that when the expected benefits of lobbying for profits outweigh the costs of taking action, firms engage in such activity.

What affects firms' expectations regarding the costs and benefits of lobbying? We focus on three factors, or mechanisms: 1) motive, 2) type of policy good, and 3) time horizon. We argue that firms are differentially driven to engage in political activity based on the combination of these factors and make trade-offs accordingly. First, what is a firm's motivation? Is it to maintain the status quo, prevent losses, or secure rents? All three are likely to motivate lobbying, although to varying degrees. Second, is the policy good expected to have diffuse or concentrated benefits? Collective action is a known barrier to lobbying, meaning that firms are more likely to lobby when they expect private goods (Bombardini and Trebbi, 2012; Olson, 1965). Moreover, firms can choose to lobby specific government entities depending on which has the most control over such a good. Finally, how imminent is the climate impact and how quickly will policy change associated with lobbying have payoffs? Companies, especially when publicly traded, privilege the present over the future, in part because uncertainty increases with extended time horizons (Poterba and Summers, 1995). This implies that when policy payoffs are likely to be realized in the near term, firms will be more motivated to lobby and at higher levels.

Disaggregating Exposure Type

Using this framework, how does exposure to different aspects of climate change explain lobbying patterns? We focus on three specific types of exposure: opportunity, regulatory, and physical. We define opportunity exposure as whether climate change presents options for market expansion or creation. Examples include competitive advantages for low-carbon products or the 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 regulations broadly related to carbon mitigation efforts that require firm-level compliance with pollution controls and emissions reduction. Finally, physical exposure is vulnerability to the physical effects of climate change, such as extreme weather or natural disasters. Existing research from financial economics shows that the valuation of a company is directly related to its GHG emissions profile (Bolton and Kacperczyk, 2021), along with policy and technological factors (Bolton and Kacperczyk, 2023). These are typically grouped into physical and transition risks (Giglio, Kelly and Stroebel, 2021), with the first corresponding to our concept of physical exposure while our definitions of regulatory and opportunity exposure would both relate to the latter (one encompassing downside risk, the other upside). As such, together these three exposure types encompass the range of climate change effects that firms experience while allowing us to disentangle the factors that influence the expected costs and benefits of lobbying.

We argue that the specific type of exposure to climate change affects *whether* firms lobby, *how much* they lobby, and *who* they target when they lobby. Figure 1 summarizes our expectations about the relationship between exposure to climate change and lobbying.

[–Figure 1 about here–]

Firms face trade-offs when making these decisions. Operating under budget constraints, they allocate resources to the most effective strategies. Thus, companies will choose to lobby only if the expected benefits of lobbying exceed their expected costs (Grossman and Helpman, 1994). Furthermore, given limited resources, companies must strategically decide which entity to target. We anticipate that companies will focus their lobbying efforts on the entity that can deliver the desired outcomes more efficiently.

Opportunity: If a firm expects many climate-related opportunities, lobbying offers the possibility of achieving additional gains through policies such as federal subsidies or research and development (R&D) grants. Policy goals likely center on pro-mitigation policies, with platforms emphasizing energy efficiency programs or infrastructure development. Such policies create private goods, particularly for companies focused on green technologies or those able to get special carve-outs. Moreover, the rewards of opportunity-related policies are likely experienced in the short term, as once enacted, a firm can more immediately translate these policy victories into actions such as government-funded R&D programs or subsidized production. Because such lobbying offers the opportunity for short-term rents via private policy goods, we expect that climate opportunity exposure is highly motivating of political activity – both for firms to decide to lobby and to increase expenditures. Those who are highly exposed to opportunities should focus efforts on the executive branch, including agencies such as the DOE that offer private goods to firms via funding for R&D programs (You, 2017), although firms are also likely to lobby Congress given their central role in policymaking.

Regulatory: Firms are also sensitive to regulation, although firm-level goals to minimize or alter the regulatory burden of climate mitigation likely involve combined interests in both securing gains and minimizing losses. This, along with the combination of private versus public good creation, depends on firms' adjustment costs and positioning to competitors. Moreover, economic adjustments to new regulatory risks are limited, either due to technological constraints, cost implications, or the speed of required changes. Therefore, lobbying becomes a crucial tool for firms to attempt to influence regulatory outcomes because direct alteration of regulatory frameworks often presents a more feasible and immediate solution compared to overhauling operational practices or technologies. However, when lobbying to soften or prevent regulations, expectations of industry-wide benefits can actually create a collective action problem and reduce lobbying by individual firms. Still, the achievement of such goals is realized in the short term and with a high level of certainty about the impacts on cost reduction. Thus, we expect that regulatory exposure is also highly influential on firms' choices to lobby. When considering who to target, firms should focus on those most responsible for relevant legislation and implementation. As such, regulatory-exposed firms are likely to prioritize lobbying Congress along with agencies such as the EPA to emphasize issues related to air quality standards or emissions rules whose outcomes may offer both public and private policy goods.

Physical: Finally, physical impacts from climate change present firm-level risks that may motivate lobbying to prevent future losses from climatic shocks. Any gains from related policies are diffuse, especially for mitigation policies that may only have a tenuous effect on whether a firm expects climate extremes. However, even adaptation policies largely create public goods. The impacts of such policies are realized over a much longer period of time and with greater uncertainty than those associated with opportunity or regulation. As a result, we expect that physical exposure will have a more limited relationship with lobbying than other exposures. However, companies with very high levels of physical risk are likely to see political action as one important tool at their disposal. Those who do lobby are most likely to focus on agencies responsible for implementing mitigation regulations such as the EPA and for overseeing disaster relief or storm monitoring (e.g., Federal Emergency Management Agency (FEMA), National Oceanic and Atmospheric Administration (NOAA)), generating public goods. Such firms may also lobby Congress, especially if there is opportunity for specific policy carveouts.

Industry Competition: Furthermore, we argue that exposure relative to industry peers is an important factor. When firms lobby individually (rather than through industry coalitions), they must have sufficiently strong policy preferences to motivate unilateral action. Expectations that companies will be uniquely affected by a particular policy compared to industry peers are likely to translate into divergent or more extreme policy preferences (Osgood, 2017), increasing the importance of lobbying for policy influence (Downie, 2017). Policy feedback also plays a role here, as when green industrial policy creates opportunity for certain firms within an industry, they will become even more likely to push for a continued policy trajectory (Meckling et al., 2015). As policies support different stages of technological development, the importance of intra-industry competition grows stronger based on firms' differential ability to capitalize on opportunity or adjust to regulation (Breetz, Mildenberger and Stokes, 2018). However, while prior arguments largely emphasize the role of industry competition in motivating support for regulation (Kennard, 2020; Vogel, 1995), we think relative exposure to risks versus opportunities helps explain both anti- and pro-climate lobbying. Leaders *and* laggards within an industry have distinct priorities compared to their competitors, generating unique policy preferences and potentially higher lobbying payoffs.

There is significant within-industry variation in climate exposure (see SI figure D.2, p. 8). Differences in corporate strategy, geographic distribution, supply chains, assets, and firm leadership can play a role in explaining the variation of climate exposure between firms.

Taking into account the mechanisms that motivate lobbying across these types of exposure, we generate testable hypotheses about lobbying activity and target. We develop two hypotheses about how general exposure to climate change relates to firms' political behavior. Building on our theoretical framework, we then propose two additional hypotheses on the differential impact of exposure types.

> **H1 (Activity):** Greater exposure to climate change increases the likelihood that a firm lobbies and spends more.
>
> **H2 (Competition):** Firms with greater exposure relative to others in their industry are more likely to lobby on climate policy and to spend more on lobbying.
>
> **H3 (Relative Importance):** Opportunity exposure is more important for lobbying than both regulatory and physical exposure, and regulatory exposure is more important than physical.
>
> **H4 (Target):** Firms determine their lobbying target based on their climate exposure.
>
> - **H4a:** Higher opportunity exposure increases the likelihood that firms lobby

innovation-oriented agencies that oversee R&D and technology funding programs (DOE).

- **H4b:** Higher regulatory exposure increases the likelihood that firms lobby regulatory agencies that oversee the implementation of laws and regulations (EPA).
- **H4c:** Higher physical exposure increases the likelihood that firms lobby agencies that oversee general mitigation regulations (EPA) and those relevant for climate adaptation (FEMA, NOAA).

Data

We construct an original panel dataset of 11,705 publicly traded firms (2001–2023) that links climate exposure, US federal lobbying, and firm characteristics (see SI section C, pp. 4/6, for details).

Climate Exposure

To understand the importance of climate change for a firm, we use a measure of "exposure" based on the amount of discussion devoted to climate change in quarterly earnings conference calls (Sautner et al., 2023, 2024). This measure captures the perceptions of firm climate exposure held by firm executives and investors, allowing us to gain insight into the importance of climate for a given company.

Public companies hold earnings calls open to financial analysts, journalists, and investors. Companies discuss earnings for a particular period, starting with an executive presentation about past performance and future expectations, and followed by a Q&A session with call participants. Earnings calls provide a sense of current and future issues and improve analysts' ability to accurately forecast earnings (Bowen, Davis and Matsumoto, 2004; Hollander, Pronk and Roelofsen, 2010). Furthermore, since information shared during calls can be verified ex post,[6] companies are generally honest (Demers and Vega, 2008) and provide additive information (Matsumoto, Pronk and Roelofsen, 2011).

We source measures of climate exposure based on earnings calls of publicly listed firms developed by Sautner et al. (2023). These authors use available English-language transcripts from 2001 to 2023 from the Refinitiv Eikon database. They adapt the keyword discovery algorithm from King, Lam and Roberts (2017) to produce bigrams related to climate change. These bigrams are associated with components of climate exposure: physical shocks, regulation, and business opportunity. SI table A.1 (p. 2) presents the 10 most frequent bigrams associated with the three measures.

We focus on measures of opportunity, regulatory, and physical exposure (Sautner et al., 2023). Each variable is defined as the relative frequency with which climate bigrams occur on calls, constructed by counting the number of such bigrams and dividing it by the total number of bigrams. We use a z-score transformation of our three exposure variables throughout the paper to facilitate interpretive comparisons. In the SI, we further provide examples of how the transcripts are mapped to the measures (SI table A.2, p. 3), present descriptives of the climate change exposure measures (SI figure D.1, p. 7), and show that there is substantial variation in climate change exposure within industries (SI figure D.2, p. 8).

The earnings call-based measures represent firm-level exposure to various impacts of climate change without assuming that firms focus on climate with an inherently risk-focused lens. Instead, exposure can be net positive or negative. The measures are also based on both prior and prospective considerations, including many that are outside the direct control of firms. This approach improves upon existing operationalizations centered on ex post metrics (e.g., emissions), selective disclosures (e.g., CDP disclosures), or self-marketing (e.g., CSR reports).

These measures capture firm executives' perceptions of the various risks and opportunities associated with climate change, rather than direct climate effects. This connects to

[6] The SEC Regulation Fair Disclosure rule forbids companies from sharing "material nonpublic" information, explaining transcripts are public.

a wider literature about how managers' beliefs affect firm actions (Gennaioli, 2018; Giglio, Kelly and Stroebel, 2021), although theorizing the process by which real climate exposure translates into perceptions is outside the scope of this paper. Further, even if true climate impacts are mediated by perceptions, the climate exposure measures correspond as expected with emissions, renewable investments, and public attention to climate (see SI section A.5, p. 3). We also build on a growing literature linking these measures with outcomes such as green patenting (von Shickfus, 2021), physical risk disclosure (Gostlow, 2020), carbon risk management (Duong et al., 2023), and lending (Ginglinger and Moreau, 2019).

Note that these measures have limitations: one notable concern is that executives strategically use calls to communicate with investors. However, misleading statements are liable under the US Exchange Act of 1934 (Pub. L. 37-291, sec. 10(b)). Further, companies must also respond to contemporaneous events that are mostly outside of their control. Understanding how managers strategically communicate on such issues provides valuable insight into their perceptions of opportunities and risks. For these reasons, earnings calls provide better information about firm perceptions of climate change exposure than other data types (Dzieliński et al., 2022). And, while calls are voluntary, selection is not a major concern because the vast majority of publicly traded firms hold calls.[7] Overall, there is strong reason to believe that earnings calls provide meaningful and unique information about a firm's exposure to climate change. We discuss the data generating process underlying the earnings call data in greater detail in SI section A.1 (p. 1).

We probe the robustness of our results to two alternative independent variables: first, an earnings-call-based measure that uses climate-related keywords to identify firm-level physical and transition risk (Li et al., 2024); second, a measure based on climate risk discussion in firms' 10-K disclosures (Berkman, Jona and Soderstrom, 2024) (see SI section A.6, pp. 3/4, for a comparison of the measures and SI section F.2, pp. 16/18, for results).

[7] According to the National Investors Relations Institute, 97% of US public firms hold earnings calls.

Lobbying Activity

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 LDA documents the federal lobbying activities of businesses, nonprofit organizations, and paid lobbyists. Registrants must file reports that disclose approximate spending and describe the issues subject to lobbying activities (see SI section B, pp. 4/5, for an example of an LDA report). Reports include information on lobbying clients and registrants, a textual description of lobbying activity, government entities lobbied, and respective lobbying issue codes.

For our main measure of climate lobbying, we investigate issues that reasonably relate to climate mitigation, adaptation, and related environmental quality as there is no overarching "climate" category. Specifically, we classify reports as "climate" if issue codes are associated with a) Clean Air & Water; b) Energy/Nuclear; c) Environmental; and d) Fuel/Gas/Oil.[8]

We measure lobbying *occurrence* using a binary variable indicating whether a firm lobbied on a climate change issue in a given quarter. For lobbying *amount*, we use the natural logarithm of one plus the dollars spent on climate lobbying in a given quarter. In SI figure D.3 (p. 9), we show that climate lobbying represents a substantial part of overall lobbying.

We further probe the robustness of our results to two alternative measures based on climate-related bills or keywords mentioned in the lobbying reports. For the bills measure, we collect all bills that contain climate-related keywords or phrases in the official bill title and code all lobbying reports as climate-related that mention one or more of these bills. For the keyword measure, we identify climate lobbying activity by searching for specific climate-related keywords in the lobbying report text. Our main results are very similar when using these alternative dependent variables (see SI table F.3, p. 19). The keyword approach further allows us to differentiate between keywords associated with climate *mitigation* versus

[8]This selection may predominantly capture lobbying centered around climate mitigation rather than adaptation. Climate adaptation efforts could be represented under more varied and less straightforward issue labels such as those related to infrastructure, public health, and disaster management.

adaptation (SI section F.2, pp. 16/18).

To investigate the choice of exposed firms to target specific government entities, we use a variable from the LobbyView data indicating which government entity registrants lobbied. We create two dichotomous variables that take the value one if a firm lobbied on climate *and* targeted the EPA or DOE in a given quarter, respectively.[9] We also construct target-specific measures of climate lobbying amount.

Finally, we seek to distinguish pro-climate versus anti-climate lobbying by linking the set of climate-lobbying firms to membership in explicitly pro- or anti-climate business coalitions (Cory, Lerner and Osgood, 2021) (SI section F.2, pp. 16/18). Note, this measure does not fully capture how each coalition's stance translates into individual members' actual lobbying efforts. Rather, it approximates the most likely direction of their political activities. In additional analyses, we use joining business coalitions as an alternative outcome.

Additional variables

We collect data for several covariates. From LobbyView, we calculate firms' total annual lobbying expenditure. From Orbis, we collect data on firms' earnings before interests and taxes (EBIT), basic earnings power (EBIT divided by total assets), and on whether a firm's headquarters is located in the US. For model specifications with additional controls, we also retrieve Orbis data on the number of employees and whether a firm operates as a multinational, and data from Lerner and Osgood (2023) on whether a firm has a Chief Sustainability Officer and whether it reports CO_2 emissions to the CDP.

[9] Only 45 of the 11,705 firms in our sample ever lobbied FEMA on climate issues and only 29 firms lobbied NOAA. This makes it impossible to obtain reliable estimates for the effects of climate exposure on lobbying these agencies.

Research Design

We seek to identify the effect of different types of climate change exposure on climate lobbying. Hence, our primary target of inference is the effect of each measure of climate exposure on firms' climate-related lobbying. Our main focus is on the *within-industry* variation in exposure: we aim to estimate how much additional (or reduced) lobbying activity we would observe, on average, if a firm were more (or less) affected by a given type of climate change exposure relative to its peers in the same industry, holding other observed factors constant.

To operationalize this estimand, we specify the following model:

$$Y_{fiqy} = \alpha + \beta_1 Opportunity_{fq} + \beta_2 Regulatory_{fq} + \beta_3 Physical_{fq} + \gamma \mathbf{X}_{fy} + \delta_{gy} + \epsilon_{fiqy}. \quad (1)$$

Here, f indexes firms, nested in industry i, for quarter q in year y. The coefficients $\beta_1 - \beta_3$ capture how each type of climate exposure, $Opportunity$, $Regulatory$, and $Physical$, affects climate lobbying Y_{fiqy} which measures climate lobbying occurrence or amount. $\mathbf{X}_{fy}$ represents a vector of firm-year-level covariates that might affect both climate change exposure and lobbying behavior. δ_{iy} represents industry-by-year fixed effects. Industry-by-quarter fixed effects marginally increase coefficient estimates but do not change substantive results (see SI section F.1, pp. 11/15).

We estimate equation 1 using ordinary least squares (OLS). The results remain largely unchanged when estimating logistic or Tobit models (see SI section F.1, pp. 11/15). Throughout our empirical analyses, we account for potential correlation of our modeling residuals by clustering standard errors at the firm and year level (Abadie et al., 2022).

Formally, each coefficient β_j (for $j \in \{1, 2, 3\}$) represents the average causal effect of a one-standard deviation change in that dimension of climate exposure on the lobbying outcome, conditional on the included covariates and fixed effects. Because we standardize the three exposure variables, a one-unit change in this context should be interpreted as moving one standard deviation above (or below) the mean of the unscaled variable.

In our research design, identification of $\beta_1 - \beta_3$ depends on the key assumption of conditional exogeneity between firms' climate exposure and climate lobbying. That is, we assume that once we control for relevant time-varying firm covariates and industry-by-year intercepts, no omitted factors systematically affect both climate exposure and lobbying outcomes. In other words, the error term ϵ_{fiqy} must be uncorrelated with Opportunity, Regulatory, and Physical, conditional on the included controls and fixed effects.

Two main concerns could invalidate this assumption. First, there may be *omitted variables* that shift both exposure and lobbying at the same time – for example, unobserved technological trends or policy shocks at the sector level. Second, there may be *policy feedback* or dynamic endogeneity, where a firm's prior lobbying efforts change its subsequent climate exposure (e.g. via regulatory carve-outs), which then influences current lobbying.

Our baseline model specified in equation 1 addresses these issues in two ways. First, we include firm-year-level controls – such as total lobbying expenditure, EBIT, the EBIT-to-asset ratio, and a US-headquarters dummy – that proxy for key drivers of lobbying capacity and climate vulnerability. In SI figure D.4 (p. 9), we show that more exposed firms have, on average, higher earnings but do not differ from less exposed firms on these other covariates included in our main specification. Second, we include industry-by-year fixed effects which absorb all shared year-to-year shocks within an industry, thereby limiting omitted-variable bias from sector-wide changes in regulation, macroeconomic conditions, or technological evolution. By restricting identification to within-industry, within-year variation in exposure, we reduce the possibility that a cross-industry or broad time trend drives the estimated effects.

We further probe robustness by (a) including additional firm-level covariates; (b) testing alternative fixed-effects structures (e.g. firm FEs); (c) including lagged dependent variables or error-correction models to address feedback; (d) performing sensitivity analyses to gauge how powerful a hidden confounder would need to be; and (e) running placebo tests on unrelated policy issues. These checks (detailed in the Robustness section) confirm our main findings are not driven by omitted-variable bias or dynamic endogeneity.

Results

We present our main results in figure 2. The figure displays the estimated effects of climate exposure for both sets of outcomes, using two different fixed effects specifications. Our preferred specification (equation 1), the industry-by-year effects model, captures the effect of within-industry exposure to climate change on climate lobbying activity. We also assess a year-effects model which captures the effect of both within- and cross-industry exposure to climate change in a given year.

[–Figure 2 about here–]

We find that both opportunity and regulatory exposure increase a firm's likelihood of lobbying on climate issues. The positive coefficients in the year-effects model support Hypothesis 1, suggesting that greater firm-level exposure to multiple aspects of climate change translates to increased political engagement. The industry-by-year effects model similarly finds positive effects of opportunity and regulatory exposure on both the decision to lobby and the level of expenditure. Although coefficients are slightly smaller when isolating within-industry exposure effects, they remain significant, reflecting the role of competition with industry peers in driving firm lobbying on climate issues, supporting Hypothesis 2. The results are consistent across both lobbying outcomes, indicating similar underlying logics in the decision to engage and the intensity of lobbying.

The findings in figure 2 provide partial support for Hypothesis 3. For both the year and industry-by-year effects models, we find that opportunity exposure is a more important driver of climate lobbying than regulatory exposure.[10] However, we find no evidence that greater physical exposure increases climate lobbying. While unexpected, this aligns with the fact that

[10] Wald tests available in SI table E.1 (p. 10) provide partial support that these differences in magnitude are statistically significant across specifications and outcomes.

policies addressing risks such as flooding or severe weather have long time horizons and diffuse benefits, making it more difficult for firms to justify lobbying costs. Additionally, perceived physical exposure may underestimate actual risk, further complicating firms' incentives to engage. Nonetheless, while opportunity and regulatory exposure were expected to be stronger drivers of climate lobbying, we anticipated finding some effect of physical exposure and rejecting the null hypothesis of no relationship.

The presented effect sizes are substantively meaningful. For a concrete example, consider two firms in the automobile industry: Ford Motor Company and Toyota Motor Corporation. In 2019Q4, Ford was investing heavily in EV production while Toyota remained focused on hybrids.[11] Predicted using the industry-by-year lobbying occurrence model (see eq. 1), the probability of Ford having lobbied on climate issues in 2019Q4 was 42%. How likely is it that Ford would have lobbied if not for the motivation of EV opportunities? If we substitute Ford's opportunity exposure (4.33) with Toyota's opportunity exposure (0.35) for the same quarter, the likelihood of this "synthetic" Ford having lobbied on climate issues drops to 34%, an 8 percentage point decrease.

Of course, these two firms may represent exceptional cases. Using a generic example of a synthetic firm in the automobile industry, we find that, on average, moving the opportunity exposure of this synthetic firm from mean opportunity in a given industry-year to two standard deviations (SD) above the mean corresponds to a 4.5 percentage point (or 51%) increase in the probability of lobbying on climate issues.[12] An equivalent +2SD change in regulatory exposure translates to a 1.7 p.p. (22%) increase in the probability of climate lobbying. By comparison, a +2SD change in physical exposure yields a 0.0004 p.p. (0.5%) decrease in the probability of climate lobbying. This exercise suggests that firms with greater exposure – compared to their industry peers – to climate-related opportunities and regulations are sig-

[11] See the Mechanisms section for a case study on the automotive manufacturing industry and SI section E.2 (pp. 10/11) for more details on this counterfactual exercise.

[12] More detail on constructing the synthetic firm in SI section E.2 (pp. 10/11). We do not estimate substantive effects for the amount models. Many firms in our data never lobby on climate issues. This can deflate predicted values and create challenges for interpretation of predicted amounts.

nificantly more likely to engage in climate lobbying, a political activity they would otherwise rarely pursue.

Next, we investigate whether differential exposure to climate change has an effect on firms' choice to target lobbying towards a specific government entity. Figure 3 illustrates that climate opportunity exposure induces firms to lobby both the EPA and DOE, but the magnitude of the coefficient for DOE lobbying is approximately three times that of the coefficient for EPA lobbying.[13] The finding shows that firms facing climate-related opportunities strategically target government entities best positioned to help them capitalize on these opportunities.[14] This supports Hypothesis 4a and underscores a core argument of the paper: analyzing both the different dimensions of firm climate exposure and the range of actions that firms take provides a more nuanced understanding of the link between climate exposure and firm political activity.[15]

[–Figure 3 about here–]

The findings for regulatory and physical exposure suggest less targeted lobbying efforts. Regulatory exposure has similar effects on lobbying both the EPA and the DOE, contrary to Hypothesis 4b, which expected a stronger emphasis on the EPA. This suggests that firms view multiple government agencies as avenues for addressing regulatory concerns – even those like the DOE, which, despite its innovation focus, holds important regulatory authority in select domains (e.g., through the Energy Policy and Conservation Act and emergency oversight through the Federal Power Act). Physical exposure appears to be a driver of EPA lobbying, although the coefficients for physical exposure are not statistically significant in either model.

[13] This meaningful difference in opportunity coefficients across targets is confirmed by Wald statistics of 11 and 9 for the occurrence and amount models, respectively, using Chi-squared tests with one degree of freedom.

[14] While the EPA's core function is regulatory, it also engages in non-regulatory efforts – such as public-private partnerships (e.g., Energy Star), grantmaking (e.g., the IRA's Green Bank), and innovation support (e.g., the Federal Technology Transfer Act). It is thus unsurprising that opportunity exposure drives EPA lobbying, although less than for the DOE.

[15] In SI section F.1 (pp. 11/15), we also analyze climate lobbying directed specifically at the US Congress. The results largely mirror the core results in figure 2. Congress is involved in allocating funds that might benefit both high opportunity firms and determine funding levels of agencies that dictate regulatory enforcement.

This aligns with our general findings that physical exposure is not a robust driver of climate lobbying, even to agencies designed to support climate mitigation.

In SI section F.2 (pp. 16/18), we further explore the direction of climate lobbying using a keyword-based approach to differentiate efforts oriented toward mitigation versus adaptation. We find that both opportunity and regulatory exposure significantly increase lobbying for both domains – with larger effect sizes for mitigation – suggesting that firms expect more immediate returns from mitigation-oriented lobbying. Physical exposure remains insignificant.

We also assess directionality by linking climate-lobbying firms to membership in pro- or anti-climate business coalitions (Lerner and Osgood, 2023). Our results indicate that physical exposure – and, to a lesser extent, opportunity exposure – is associated with a shift toward pro-climate and away from anti-climate lobbying, whereas regulatory exposure appears to spur both pro- and anti-climate efforts, particularly in terms of expenditure. Moreover, firms with higher physical and opportunity exposure are more likely to join pro-climate coalitions and less likely to join anti-climate ones, while regulatory exposure increases the likelihood of joining either type. Given that coalition membership may not fully capture the nuances of a firm's lobbying behavior, these findings should be viewed as suggestive rather than definitive.

Taken together, these results demonstrate that different dimensions of climate exposure drive firm political activity to varying extents. *Within*-industry exposure emerges as a critical determinant of climate-related lobbying. Both opportunity and regulatory exposure tend to increase firms' political engagement on climate issues. In contrast, physical exposure does not significantly drive lobbying activity – except when it involves agencies with explicit climate-mitigation mandates. The relationship between opportunity exposure and firm political activity also exhibits notable heterogeneity. While regulatory exposure prompts firms to cast a wide net in terms of lobbying targets, opportunity exposure leads firms to strategically target those government entities best positioned to facilitate climate-related opportunities. These findings offer new insight into how firms translate different types of climate exposure into political engagement. Firms pursue broad lobbying strategies in response to regulatory exposure, yet adopt more targeted approaches when seeking to capitalize on climate-related opportunities.

Robustness

We perform a number of checks to probe the robustness of our main results. First, we replicate our results across a range of alternative specifications (SI section F.1, pp. 11/16): different fixed effects structures, firm-year panel aggregation, Logit and Tobit models, an extended set of controls, and imputed covariates. The core results remain consistent. Only with firm fixed effects do we no longer detect a statistically significant effect of regulatory exposure. This could reflect limited within-firm variation, regulatory exposure operating primarily across firms (Mummolo and Peterson, 2018), or firms adjusting lobbying behavior with a delay (Imai and Kim, 2019).

In an effort to account for potential policy-feedback effects, we also estimate lagged dependent variable (LDV) and error-correction models. Coefficients for opportunity and regulatory exposure shrink but remain significant in LDV models. Error-correction models suggest persistent long-run effects from both opportunity and regulatory exposure, and short-run effects from opportunity and physical exposure. These patterns imply that policy feedback plays a role, particularly for opportunity and regulatory risks, but does not fully account for the within-industry effects we identify. We also account for the potential of both within- and between-firm exposure effects using an augmented between-within random effects model with time-invariant predictors (Bell and Jones, 2015).

Second, we confirm that results hold when including first-order interactions across exposure measures and when using alternative measures of climate exposure based on different input data sources (Berkman, Jona and Soderstrom, 2024; Li et al., 2024).

Third, we verify that findings are robust to alternative definitions of climate lobbying activity (SI section F.2, pp. 16/18). We further disaggregate lobbying by issue area (SI section F.4, p. 20), finding that opportunity and regulatory exposure are associated with lobbying on Clean Air/Water, Energy, and Environmental issues, but not Fuel/Oil/Gas; physical exposure shows no domain-specific effects.

Fourth, we rule out outlier influence by removing extreme values in the exposure and outcome variables (SI section F.3, p. 18).

Fifth, we address omitted variable bias through a sensitivity analysis (Cinelli and Hazlett, 2020; Imbens, 2003) (SI section G, pp. 20/24). Results indicate that a confounder would need to be 70 times stronger than our strongest observed predictor (US headquarters) to nullify the opportunity exposure effect at the 5% level. Similar robustness holds for regulatory exposure. This analysis also informs the role of policy feedback. Treating lagged lobbying as a hypothetical confounder, we find that nullifying the opportunity exposure effect would require a confounder 150–200% as strong as past lobbying. Regulatory exposure is more sensitive to such confounding; physical exposure remains unaffected. Since prior lobbying is among the strongest predictors of current behavior, an unobserved confounder of this strength is unlikely. Thus, while feedback dynamics matter, they are insufficient to account for our main findings.

Finally, we run placebo tests on unrelated lobbying issues (Eggers, Tuñón and Dafoe, 2024), using equivalence tests (Hartman and Hidalgo, 2018) to check for spurious correlations. We find no systematic relationship between climate exposure and lobbying on unrelated issues, supporting our interpretation that climate exposure drives issue-specific political engagement (SI section H, pp. 24/31).

Examining the Mechanisms: Auto Industry Case Study

For further evidence on how differential climate exposure translates into lobbying, we analyze the illustrative case of the auto-manufacturing industry. Climate exposure varies across the industry, as emissions reduction policies threaten automakers that are slow to transition, while green industrial policies present favorable conditions for clean technology leaders. These differences in exposure are shaped by multiple factors, including past firm decisions, the existing policy environment, and exogenous shocks such as natural disasters impacting supply chains. The auto industry is a "pathway," or "typical," case, as the variation in exposure types across firms within the industry lends itself to exploring the causal pathways underlying our theory (Ruffa, 2020). According to our argument, industry exposure to climate change, especially through regulatory compliance requirements and new market opportunities, should translate into lobbying when associated benefits outweigh the costs.

When is this the case for automakers? Relative leaders see opportunity from emissions regulations and EV subsidies, while laggards fear higher costs and loss of market share. This within-industry divergence helps explain lobbying differences. Companies embrace climate policy in proportion to their EV strategy, with Tesla, BMW, Volkswagen, General Motors, and Ford leading both in EV production and support for stringent regulations (InfluenceMap, 2023). For example, Ford has advocated for internal combustion engine (ICE) phase-out targets while also pushing for slower increases in corporate average fuel economy (CAFE) standards. In comparison, Toyota lobbied directly against CAFE standard increases and ICE phase-outs – even aligning with the Trump administration over Clean Air Act implementation (Tabuchi, 2021). This behavior follows from the relative opportunities versus risks perceived by each, as just 29% of Toyota's light-duty vehicle production by 2030 is forecasted to be EVs compared to 53% of Ford's production. The importance of relative opportunity for political behavior is reflected in the remarks of General Motor's CEO during a 2020 earnings call that the company is "well positioned...[and] looking forward to working with the administration on policies that support safer transportation with zero emissions...[to] seize every opportunity to drive growth, expand our markets and enter new ones."

We explore how lobbying content varies by exposure type across the industry using textual descriptions within LobbyView reports. We expect that automakers with high opportunity exposure lobby on issues related to EV expansion such as charging infrastructure, alternative fuels, and tax credits. Firms with high regulatory exposure should lobby more on CAFE standards, emissions regulations, and policy implementation. Finally, those with high physical exposure likely lobby on general climate issues such as GHG reductions and air pollution. We identify ten keywords each for opportunity, regulatory, and physical exposure to explore these theoretical expectations, drawing on Sautner et al. (2023) bigrams, CDP topics, and content knowledge. We calculate the keyword mention frequency in climate-related LobbyView reports relative to total words for transport manufacturing firms. See SI section I (pp. 32/33) for additional details.

Figure 4 shows a comparison of keyword frequency for auto-manufacturing firms above the median exposure and those at or below the median. The results provide descriptive evidence that differential types of exposure are associated with specific lobbying topics. Firms more exposed to opportunity focus on technology development and EV infrastructure expansion, those with regulatory exposure emphasize specific rules, and physically exposed firms are more concerned about broad climate issues than less exposed firms, as our theory would predict. A company-specific review further demonstrates how lobbying content aligns with expectations about firm priorities. For example, in 2020, General Motors lobbies for "EV tax credits and electric charging," while Toyota lobbies "to increase the availability of full cell infrastructure," reflecting their strategies toward decarbonization.

[–Figure 4 about here–]

Finally, to understand whether exposure differences translate into these observed lobbying patterns by our hypothesized mechanisms of motive, policy good, and time horizon, we conduct a qualitative review of CDP reports from 2010-2018.[16] In these reports, identified

[16]The full sample of reports includes BMW, Mercedes-Benz, Fiat-Chrysler, Ford, General Motors, Groupe PSA, Honda, Hyundai, Nissan-Renault, Suzuki, Toyota, and Volkswagen. CDP is an NGO that surveys companies about emission reduction activities, including questions about perceptions of and responses to risks and opportunities. While there is some selection by firms to report, it is widely-utilized by the top automakers.

opportunities are more likely to be classified as having a short time horizon, high likelihood, and high impact magnitude as opposed to physical or regulatory risks that tend to longer time horizons and mixed likelihoods. This supports our argument that firms think about market opportunity and regulatory burden differently (see SI section I.3, pp. 32/33, for additional details).

Furthermore, discussion of risk depends on relative position. As an example, Toyota emphasizes the risk of stranded combustion engine assets due to regulation, while Ford discusses concerns over a lack of regulatory harmonization and low market acceptance of EVs. This difference in priorities translates into the policy actions described by each in the CDP reports. Toyota recounts lobbying for "promotion of hydrogen/fuel cell strategy" (their competitive advantage), and otherwise only mentions general alignment with business association interests.[17] In contrast, companies like Ford and General Motors provide details about supporting policies on charging infrastructure, supply chain investments, and tax exemptions. Ford also describes how decisions to "make [their] stance clear," even when "views don't align with the positions of the [industry] associations," are done on a "case-by-case basis."[18] As an example, they reference making a public statement in support of the Paris Climate Agreement and against reducing CAFE standards. This suggests that firms focus lobbying efforts on issues where they have competitive advantage and are willing to lobby independently, given expectations about private benefits in the short term, as predicted by our theory.

Generalizing from this case indicates that type of climate exposure matters for lobbying activity, especially relative to industry competitors. Firms with high potential regulatory burden and those that see new market opportunity lobby on climate change issues at higher levels than those facing physical risks (more limited in the auto industry). Furthermore, expectations about the costs and benefits of lobbying in relation to motive, policy good, and time-horizon represent a key factor explaining why different forms of climate exposure

[17] Toyota 2022 CDP Report.
[18] Ford 2018 CDP Report.

within the auto industry translate into unique levels, targets, and topics of lobbying.

Conclusion

When and how do firms become politically active on climate issues? In this paper, we contend that understanding the various types of climate impact expected by companies is essential to explain political engagement. Importantly, we note that exposure to climate change can have positive or negative implications, presenting growth opportunities for some and posing threats to others. We overcome theoretical and empirical shortcomings of the existing literature by combining a novel measure of differentiated climate change exposure derived from firm-level earnings call data with firms' lobbying activity for 2001–2023. This allows us to analyze the relationship between opportunity, regulatory, and physical exposure to the effects of climate change and lobbying on climate policy.

We provide evidence that greater exposure to climate change increases the likelihood that firms lobby on climate issues. Firms are more likely to lobby, and increase expenditures, on climate issues when they are exposed to opportunity and regulatory impacts. Physical exposure does not drive lobbying to the same extent. We also show that the type of climate exposure influences which government entities firms target when they lobby. High opportunity exposure increases lobbying on programs overseen by the DOE, while regulatory concerns lead firms to take a broader targeting approach. Complementary evidence from a case study of the auto-manufacturing industry lends further credibility to our results.

Our findings have several implications for the importance of firms and interest groups in the development of climate policies (Cory, Lerner and Osgood, 2021; Kennard, 2020). We emphasize that a single firm can be affected by climate change in multiple ways and that disaggregating exposure is critical for explaining lobbying. Climate policies are highly specialized (Kang, 2016), and the typical "winners" versus "losers" framework does not tell us how or why firms engage in specific aspects of climate lobbying. Our paper improves on existing models of firm climate lobbying by offering a framework that incorporates the multidimensional impacts of climate change. In addition, we emphasize the importance of distinguishing these impacts empirically and offer a solution by using exposure measures derived from quarterly earnings calls. Alternative approaches to rigorously measuring climate impact on firms represent an area ripe for future research.

Second, our findings add more nuance to different aspects of lobbying. By analyzing the extensive and intensive margins, the target, and the topic, we emphasize the importance of separating the many choices that firms make about political engagement. We expect these findings to generalize to other issues and contexts. Our theory is likely to apply to firm-level lobbying on issues where firms are cross-pressured by both risks and opportunities, or where different time horizons play a role. Future research could test the extent to which our argument extends to firm lobbying on topics like trade or artificial intelligence, and examine whether these different strategies are actually successful in increasing firms' gains or decreasing their losses. We also expect such dynamics to travel geographically, as various types of climate exposure should translate into the same concerns for firms internationally, even if the exact tactics and targets of political influence change based on context (see e.g., Klüver (2013) on lobbying in the EU generally, and Genovese and Tvinnereim (2019) and Toenshoff (2024) on climate lobbying in the EU).

Finally, our research has broader implications for the future of climate policymaking. The impacts of climate change will grow in coming years, with consequences for how firms are likely to participate in climate policy processes. Our findings deepen our understanding of the distributive politics of climate change, showing the importance of disaggregating firm-level exposure. If firms are more likely to lobby based on opportunity generation, rather than physical impacts, there may be increased activity supporting pro-mitigation policies as technological advancement continues. This provides reason for cautious optimism about the speed of decarbonization, especially given the potential for positive feedback loops in response to green industrial policy. It may also indicate that policies to support active adaptation to the increasingly felt physical impacts of climate change will 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 contestation over future climate policies.

References

Abadie, Alberto, Susan Athey, Guido W Imbens and Jeffrey M Wooldridge. 2022. "When Should You Adjust Standard Errors for Clustering?" *The Quarterly Journal of Economics* 138:1–35.
URL: *https://academic.oup.com/qje/article/138/1/1/6750017*

Ansolabehere, Stephen, John M. de Figueiredo and James M. Snyder Jr. 2003. "Why is There so Little Money in U.S. Politics?" *Journal of Economic Perspectives* 17(1):105–130.
URL: *https://www.aeaweb.org/articles?id=10.1257/089533003321164976*

Ard, Kerry, Nick Garcia and Paige Kelly. 2017. "Another avenue of action: an examination of climate change countermovement industries' use of PAC donations and their relationship to Congressional voting over time." *Environmental Politics* 26(6):1107–1131.
URL: *https://doi.org/10.1080/09644016.2017.1366291*

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.
URL: *http://ebookcentral.proquest.com/lib/princeton/detail.action?docID=471787*

Bell, Andrew and Kelvyn Jones. 2015. "Explaining fixed effects: Random effects modeling of time-series cross-sectional and panel data." *Political Science Research and Methods* 3(1):133–153.

Berkman, Hank, Jonathan Jona and Naomi Soderstrom. 2024. "Firm-specific climate risk and market valuation." *Accounting, Organizations and Society* 112.

Bolton, Patrick and Marcin Kacperczyk. 2021. "Do investors care about carbon risk?" *Journal of Financial Economics* 142(2):517–549.
URL: *https://www.sciencedirect.com/science/article/pii/S0304405X21001902*

Bolton, Patrick and Marcin Kacperczyk. 2023. "Global Pricing of Carbon-Transition Risk." *The Journal of Finance* 78(6):3677–3754.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.1111/jofi.13272*

Bombardini, Matilde and Francesco Trebbi. 2012. "Competition and political organization: Together or alone in lobbying for trade policy?" *Journal of International Economics* 87(1):18–26.
URL: *https://www.sciencedirect.com/science/article/pii/S0022199611001498*

Bowen, Robert M., Angela K. Davis and Dawn A. Matsumoto. 2004. "Do Conference Calls Affect Analysts' Forecasts?" *The Accounting Review* 77(2):285–316.
URL: *https://doi.org/10.2308/accr.2002.77.2.285*

Breetz, Hanna, Matto Mildenberger and Leah Stokes. 2018. "The Political Logics of Clean Energy Transitions." *Business and Politics* 20(4):492–522.

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.
URL: *https://doi.org/10.1007/s10584-018-2241-z*

Campbell, Andrea Louise. 2012. "Policy Makes Mass Politics." *Annual Review of Political Science* 15(Volume 15, 2012):333–351.
URL: *https://www.annualreviews.org/content/journals/10.1146/annurev-polisci-012610-135202*

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.
URL: *https://doi.org/10.1111/1467-9248.12006*

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.
URL: *https://www.cambridge.org/core/journals/international-organization/article/asset-revaluation-and-the-existential-politics-of-climate-change/0963988860A37F6988E73738EA93E0A1*

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.
URL: *http://onlinelibrary.wiley.com/doi/abs/10.1111/ajps.12525*

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* .
URL: *https://www.federalreserve.gov/econres/ifdp/soft-information-in-earnings-announcements-news-or-noise.htm*

Downie, Christian. 2017. "Business actors, political resistance, and strategies for policymakers." *Energy Policy* 108:583–592.
URL: *https://www.sciencedirect.com/science/article/pii/S0301421517303725*

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." *Working Paper* .
URL: *https://papers.ssrn.com/abstract=4004509*

Dzieliński, Michał, Florian Eugster, Emma Sjöström and Alexander F. Wagner. 2022. "Do Firms Walk the Climate Talk?" *Swiss Finance Institute Research Paper Series* .
URL: *https://papers.ssrn.com/abstract=4021061*

Eggers, Andrew C., Guadalupe Tuñón and Allan Dafoe. 2024. "Placebo Tests for Causal Inference." *American Journal of Political Science* 68:1106–1121.
URL: *https://onlinelibrary.wiley.com/doi/10.1111/ajps.12818*

Gazmararian, Alexander F. and Helen V. Milner. 2023. "Firm Responses to Climate Change: Exit and Voice." *Working Paper* .

Gennaioli, Nicola. 2018. *A Crisis of Beliefs : Investor Psychology and Financial Fragility*. Princeton, NJ: Princeton University Press.

Genovese, Federica. 2019. "Sectors, Pollution, and Trade: How Industrial Interests Shape Domestic Positions on Global Climate Agreements." *International Studies Quarterly* 63(4):819–836.
URL: *https://doi.org/10.1093/isq/sqz062*

Genovese, Federica. 2021. "Market responses to global governance: International climate cooperation and Europe's carbon trading." *Business and Politics* 23(1):91–123.
URL: *https://www.cambridge.org/core/journals/business-and-politics/article/market-responses-to-global-governance-international-climate-cooperation-and-europes-carbon-trading/40E0920174E62B42ABCF3218B9C94E9F*

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.
URL: *https://doi.org/10.1007/s11558-018-9318-3*

Giglio, Stefano, Bryan Kelly and Johannes Stroebel. 2021. "Climate Finance." *Annual Review of Financial Economics* 13(Volume 13, 2021):15–36.
URL: *https://www.annualreviews.org/content/journals/10.1146/annurev-financial-102620-103311*

Ginglinger, Edith and Quentin Moreau. 2019. "Climate Risk and Capital Structure." *Working Paper* .
URL: *https://papers.ssrn.com/abstract=3327185*

Gostlow, Glen. 2020. "The Materiality and Measurement of Physical Climate Risk: Evidence from Form 8-K." *Working Paper* .
URL: *https://papers.ssrn.com/abstract=3736100*

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.
URL: *https://doi.org/10.1080/09692290.2021.1946708*

Grossman, Gene M and Elhanan Helpman. 1994. "Protection for Sale." *American Economic Review* 84:833–850.

Hartman, Erin and F. Daniel Hidalgo. 2018. "An Equivalence Approach to Balance and Placebo Tests." *American Journal of Political Science* 62:1000–1013.

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.
URL: *https://doi.org/10.1093/qje/qjz021*

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.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1475-679X.2010.00365.x*

Imai, Kosuke and In Song Kim. 2019. "When should we use unit fixed effects regression models for causal inference with longitudinal data?" *American Journal of Political Science* 63(2):467–490.

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 InfluenceMap.
URL: *https://automotive.influencemap.org/index.html*

Kang, Karam. 2016. "Policy Influence and Private Returns from Lobbying in the Energy Sector." *The Review of Economic Studies* 83(1):269–305.
URL: *https://doi.org/10.1093/restud/rdv029*

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.
URL: *https://www.cambridge.org/core/journals/business-and-politics/article/industry-type-and-environmental-policy-industry-characteristics-shape-the-potential-for-policymaking-success-in-energy-and-the-environment/9900296EB3895014E7415FAD850CDC7E*

Kennard, Amanda. 2020. "The Enemy of My Enemy: When Firms Support Climate Change Regulation." *International Organization* 74(2):187–221.
URL: *https://www.cambridge.org/core/journals/international-organization/article/enemy-of-my-enemy-when-firms-support-climate-change-regulation/303288E63A9BDC6E284741B8C55DE66D*

Kim, In Song. 2017. "Political Cleavages within Industry: Firm-level Lobbying for Trade Liberalization." *American Political Science Review* 111(1):1–20.
URL: *https://www.cambridge.org/core/journals/american-political-science-review/article/political-cleavages-within-industry-firmlevel-lobbying-for-trade-liberalization/FA5AE772209D42DD825A7E2284A494F3*

Kim, In Song. 2018. "LobbyView: Firm-level Lobbying & Congressional Bills Database." *Working Paper* .
URL: *http://web.mit.edu/insong/www/pdf/lobbyview.pdf*

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.
URL: *http://www.cambridge.org/core/journals/journal-of-public-policy/article/electric-utilities-and-american-climate-policy-lobbying-by-expected-winners-and-losers/D9EE7E78817A05A7A8CB007DBF2AC034*

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.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.1111/ajps.12291*

Klüver, Heike. 2013. *Lobbying in the European Union: Interest Groups, Lobbying Coalitions, and Policy Change*. OUP Oxford.

Lerner, Michael and Iain Osgood. 2023. "Across the Boards: Explaining Firm Support for Climate Policy." *British Journal of Political Science* 53:934–957.

Li, Qing, Hongyu Shan, Yuehua Tang and Vincent Yao. 2024. "Corporate Climate Risk: Measurements and Responses." *The Review of Financial Studies* 37:1778–1830.

Liu, Huchen, Sijing Wei and Jiarui Zhang. 2023. "Corporate Lobbying and ESG Reports: Patterns among US Companies, 1999–2017." *Business and Politics* pp. 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.
URL: *https://www.jstor.org/stable/23045606*

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.
URL: *http://muse.jhu.edu/article/581145*

Meckling, Jonas, Nina Kelsey, Eric Biber and John Zysman. 2015. "Winning Coalitions for Climate Policy." *Science* 349(6253):1170–1171.

Meng, Kyle C. and Ashwin Rode. 2019. "The social cost of lobbying over climate policy." *Nature Climate Change* 9(6):472–476.
URL: *https://www.nature.com/articles/s41558-019-0489-6*

Mildenberger, Matto. 2020. *Carbon captured : how business and labor control climate politics.* Cambridge, Massachusetts: The MIT Press.
URL: *https://ebookcentral.proquest.com/lib/Princeton/detail.action?docID=6031625*

Mummolo, Jonathan and Erik Peterson. 2018. "Improving the Interpretation of Fixed Effects Regression Results." *Political Science Research and Methods* 6:829–835.
URL: *https://www.cambridge.org/core/product/identifier/S2049847017000449/type/journal_article*

Olson, Mancur. 1965. *The Logic of Collective Action.* Harvard University Press.

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. 2017. "Industrial Fragmentation over Trade: The Role of Variation in Global Engagement." *International Studies Quarterly* 61(3):642–659.
URL: *https://doi.org/10.1093/isq/sqx027*

Pierson, Paul. 1993. "When Effect Becomes Cause: Policy Feedback and Political Change." *World Politics* 45(4):595–628.
URL: *https://www.cambridge.org/core/journals/world-politics/article/abs/when-effect-becomes-cause-policy-feedback-and-political-change/EB310F82411B3E31406E03C1381E6740*

Poterba, James M. and Lawrence H. Summers. 1995. "A CEO Survey of U.S. Companies' Time Horizons and Hurdle Rates." *Sloan management review* 37(1):43.

Ruffa, Chiara. 2020. Case Study Methods: Case Selection and Case Analysis. In *The SAGE Handbook of Research Methods in Political Science and International Relations.* SAGE Publications pp. 1133–47.
URL: *https://doi.org/10.4135/9781526486387.n62*

Sautner, Zacharias, Laurence Van Lent, Grigory Vilkov and Ruishen Zhang. 2023. "Firm-Level Climate Change Exposure." *The Journal of Finance* 78(3):1449–1498.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.1111/jofi.13219*

Sautner, Zacharias, Laurence Van Lent, Grigory Vilkov and Ruishen Zhang. 2024. "Data for 'Firm-level Climate Change Exposure'.".
URL: *https://doi.org/10.17605/OSF.IO/FD6JQ*

Stokes, Leah Cardamore. 2020. *Short Circuiting Policy: Interest Groups and the Battle Over Clean Energy and Climate Policy in the American States.* Oxford Scholarship.
URL: *https://oxford.universitypressscholarship.com/view/10.1093/oso/9780190074258.001.0001/oso-9780190074258*

Tabuchi, Hiroko. 2021. "Toyota Led on Clean Cars. Now Critics Say It Works to Delay Them." *The New York Times* .
URL: *https://www.nytimes.com/2021/07/25/climate/toyota-electric-hydrogen.html*

Toenshoff, Christina. 2024. *Hiding in the Crowd: Business Climate Lobbying in the Age of Stakeholder Pressure*. Unpublished Book Project.

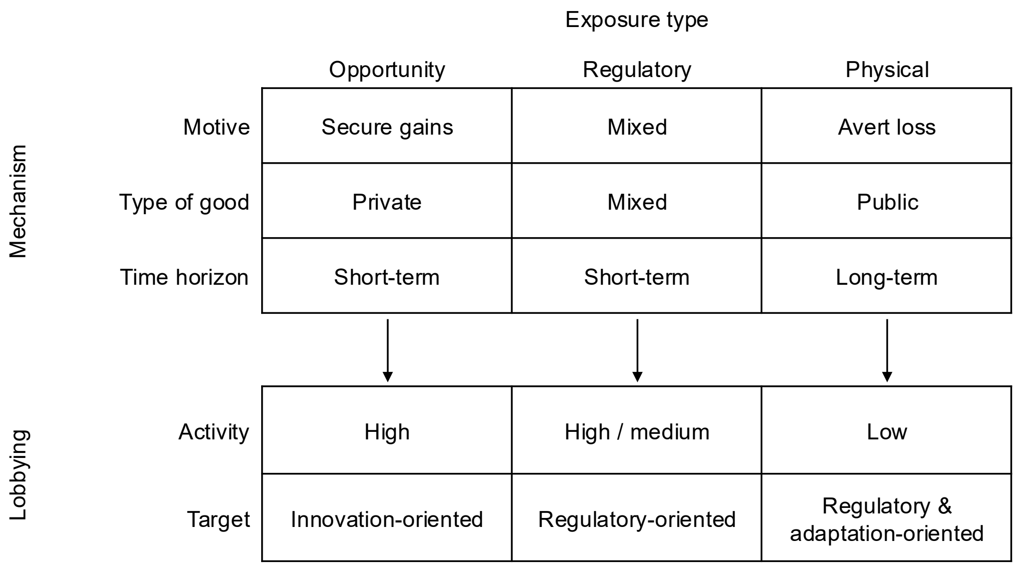
Vogel, David. 1995. *Trading up : consumer and environmental regulation in a global economy*. Cambridge, Mass: Harvard University Press.

von Shickfus, Marie-Theres. 2021. "Institutional Investors, Climate Policy Risk, and Directed Innovation." *IFO Working Papers* .
URL: *https://www.ifo.de/en/publications/2021/working-paper/institutional-investors-climate-policy-risk-and-directed-innovation*

Vormedal, Irja and Jonas Meckling. 2024. "How Foes Become Allies: The Shifting Role of Business in Climate Politics." *Policy Sciences* 57(1):101–124.

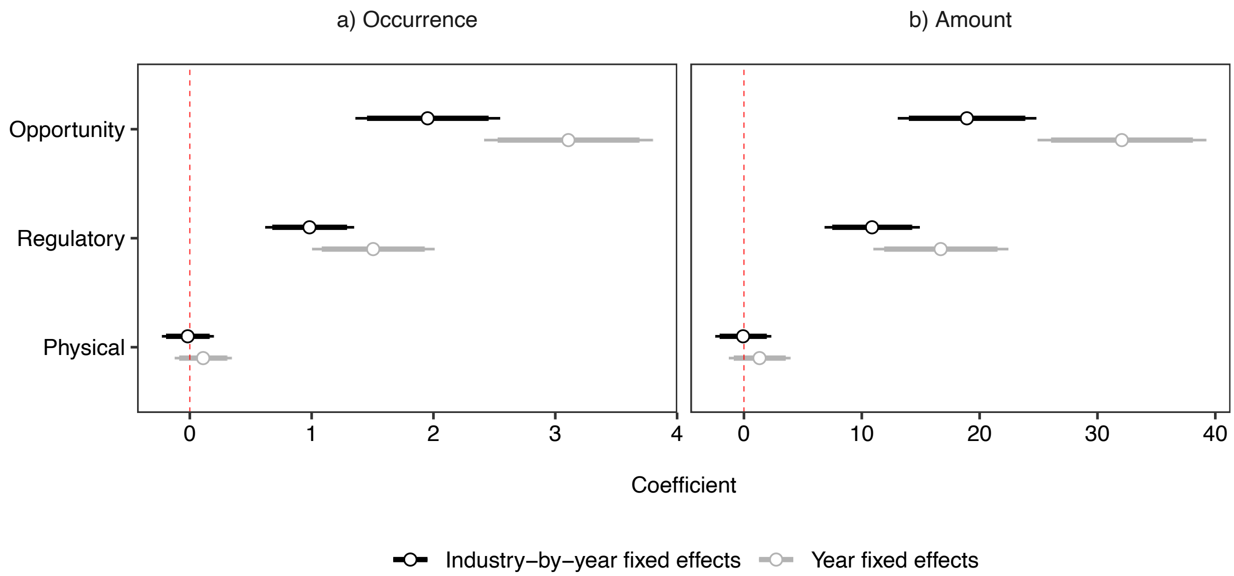
You, Hye Young. 2017. "Ex Post Lobbying." *The Journal of Politics* 79(4):1162–1176.
URL: *https://www.journals.uchicago.edu/doi/abs/10.1086/692473*

Figure 1: Explaining the effect of climate exposure on lobbying



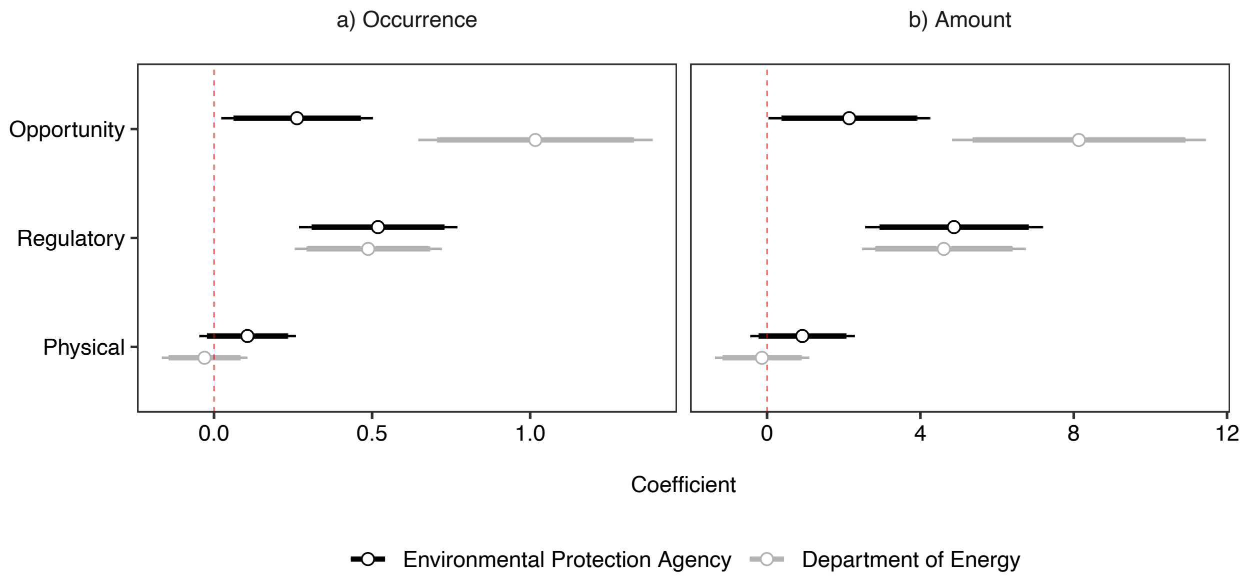
Notes: This figure provides a summary of our theoretical argument about how different types of exposure translate into varying levels and targets of lobbying.

Figure 2: Effect of climate exposure on firm climate lobbying



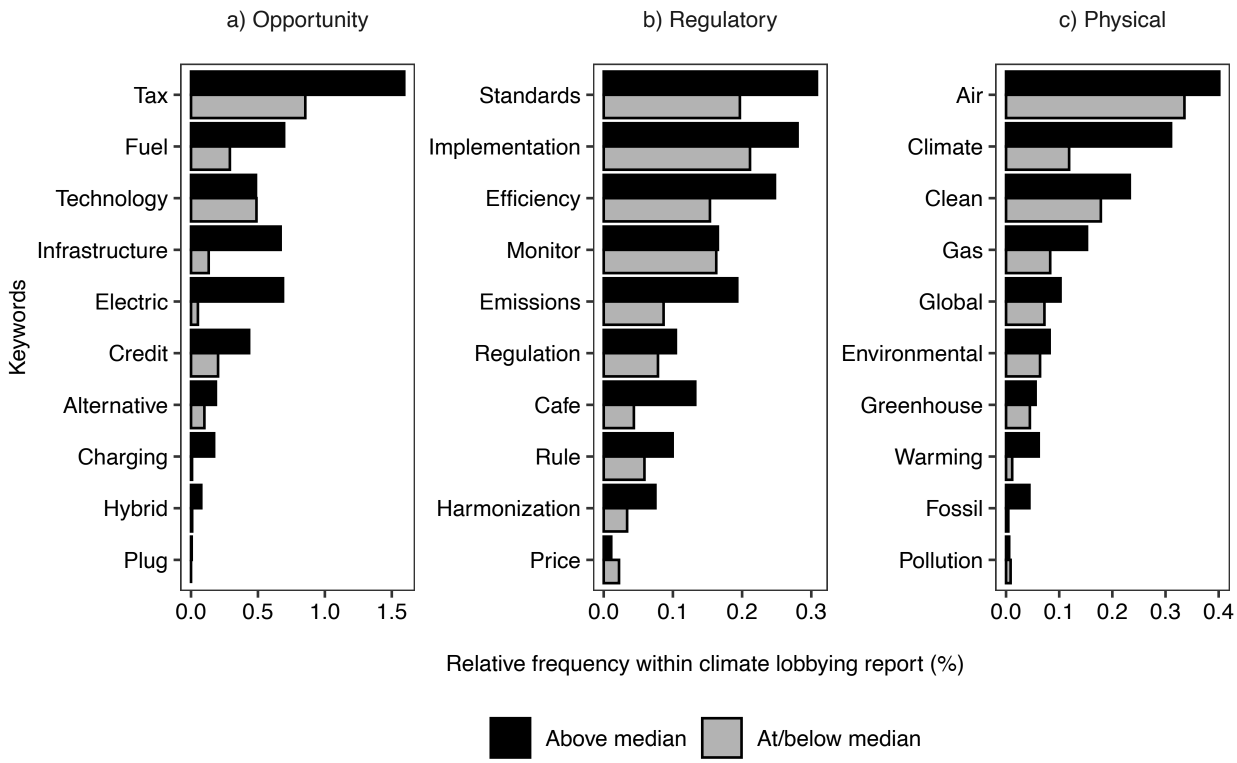
Notes: Coefficient estimates (OLS) of climate-related lobbying on climate exposure, with 90%/95% confidence intervals. Coefficients scaled by 100 to ease interpretation. The left panel shows lobbying occurrence (binary), and the right panel shows log-lobbying amounts. Gray bars use year FEs; black bars use industry-by-year FEs. All models control for EBIT, EBIT/Assets, US HQ indicator, and total lobbying expenditure. Standard errors are two-way clustered by firm and year. Exposure measures are standardized. Full results in SI table E.1 (p. 10).

Figure 3: Heterogeneous effects of climate exposure by lobbying target



Notes: Coefficient estimates (OLS) of climate-related lobbying on climate exposure, with 90%/95% confidence intervals. Coefficients scaled by 100 to ease interpretation. The left panel shows lobbying occurrence (binary), and the right panel shows log-lobbying amounts, by target (EPA in black, DOE in gray). All models include industry-by-year FEs plus controls (EBIT, EBIT/Assets, US HQ, total lobbying). Standard errors are two-way clustered by firm and year. Exposure measures are standardized. Full results in SI table E.1 (p. 10).

Figure 4: Relative frequency of keywords above and at/below the median



Notes: This figure compares the frequency of climate-related keywords for auto-manufacturing firms above and below median exposure to climate.

Supplemental Information (Online Only)

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

Christian Baehr, Fiona Bare, Vincent Heddesheimer

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A Information on Climate Change Exposure Measures

A.1 Use of Earnings Calls & Data Generating Process

A well-documented challenge in the study of climate change and economics is the need to "obtain measures of different assets' exposure to both physical and climate risks." (Giglio et al., 2021) Much of the existing literature uses carbon intensity to proxy for regulatory risk, as in the work of Bolton and Kacperczyk (2021). However, many argue that such data are limited as a proxy for climate exposure given their historical nature and their inability to reflect that climate change can present both costs and opportunities for firms (Giglio et al., 2021; Sautner et al., 2023). The turn to earnings calls builds on a growing body of research using them to identify firms' risks and opportunities (Hassan et al., 2019; Mahdavi et al., 2022).

How should we understand the data generating process? Publicly traded companies hold regular earnings calls, typically quarterly, to discuss their earnings for a particular period and provide a forward outlook. While calls are not voluntary, selection is not a major concern because the vast majority of publicly traded firms hold calls.[19] These are important corporate events where financial analysts, journalists, and investors listen to management and are able to ask questions (Hollander et al., 2010). Studies find that nearly all calls follow the same structure, including an introduction, legal disclaimer, prepared remarks, Q&A session, and a closing statement. They also tend to all be similar in length, around 7,000 word per call according to one study by a business advisory group.[20] An advantage of earnings calls as data is the lack of selection concerns and the availability of data on regular intervals over a long time period.

We acknowledge there is likely strategic communication, where managers focus attention on topics that are favorable to the firm. However, calls are conducted live and the Q&A portion means that managers do not retain total control over the agenda. This means that discussions are fundamentally unscripted, which makes them a better source of information than published reports, press releases, or SEC filings. Additionally, we argue that the strategic interaction is actually an advantage in this data source, as it tells us more about the firm's priorities and its positioning vis-a-vis climate issues. Furthermore, there is a wealth of financial economics literature demonstrating that earnings calls cover both current and future issues, improving analysts' ability to forecast earnings and providing relevant information to the market (see e.g., Bowen et al., 2004; Hollander et al., 2010). This is because companies are honest in information provision (Demers and Vega, 2008) and provide additive information that is not available elsewhere (Matsumoto et al., 2011), with emphasis on topics such as climate change in the calls when climate is more important to the firm (Dzieliński et al., 2022).

Based on the research in financial economics, we argue that earnings calls reflect a balance of both historical and projected information that informs perception of exposure to climate change. Calls are likely to contain publicly available information that investors have access to, as executives have incentives to address this information proactively, otherwise they will face questions about risks based on factors like new regulation and carbon intensity. Therefore, the earnings call measures capture information such as that used by Bolton and Kacperczyk (2021) to estimate risk. In addition, we gain some prospective information about firm climate exposure through forward-looking (but plausibly honest) strategic communication by executives and through forward-looking questions from investors during the Q&A portion. We argue that using a perception-based measure is appropriate for testing how climate exposure drives political behavior since it reflects the views of those making lobbying decisions. This aligns with finance research showing that executives' beliefs shape firm actions, even when biased (Gennaioli, 2018; Giglio et al., 2021), and with literature emphasizing the role of individuals in firm-level climate action (e.g., Hsueh, 2019; Huang and Lin, 2022; Prakash, 2001).

[19] According to the National Investors Relations Institute, 97% of US publicly traded firms hold earnings calls.

[20] Riley Back and Edward Stephens, "Too Big for Earnings Calls," Brunswick Group, January 17 2019.

A.2 Climate Change Bigrams

Sautner et al. (2023) adapt the keyword discovery algorithm proposed by King et al. (2017) that requires a small set of "bigrams" that are unambiguously related to climate change. Using those bigrams, the algorithm searches for new bigrams that are likely to also indicate a climate change conversation in the transcripts. Using a combination of the initial bigrams and the new bigrams, the algorithm constructs a model predicting whether a sentence is related to climate change. Reversing back the machine learning process to trace 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 including the initial ones and those 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.

Table A.1: Top-10 Bigrams by Climate Change Exposure

Opportunity		**Regulatory**		**Physical**	
Bigrams	Frequency	Bigrams	Frequency	Bigrams	Frequency
renewable energy	15,605	greenhouse gas	3,416	global warm	837
electric vehicle	9,508	carbon emission	2,088	coastal area	816
clean energy	6,430	gas emission	1,910	electric bus	709
new energy	4,544	carbon dioxide	1,583	snow ice	538
wind power	4,253	air pollution	1,127	forest land	512
wind energy	4,035	carbon price	999	wind speed	498
solar energy	2,511	energy regulatory	967	provide water	429
battery electric	1,121	carbon tax	928	sea level	421
solar farm	971	combine heat	718	area florida	402
heat power	951	environmental standard	593	coastal region	389

Notes: Top-10 Bigrams by exposure based on Table IA.IX in Sautner et al. (2023).

Sautner et al. (2023) take several steps to validate the bigrams. First, they pass a simple face-validity test. Second, a team of graduate students performed a structured human audit to manually code over 2000 transcript excerpts. The findings confirmed that the algorithm reliably captured bigrams in climate change discussions. Third, they compare this approach with one using pre-specified keywords from alternative sources and find similar results. However, the discovery approach has the advantage of being able to adapt to the idiosyncratic ways that particular experts within industries discuss climate issues. Fourth, the measures are robust to excluding one keyword at a time from the initial. Fifth, the keyword-search-based algorithm performed much better than an alternative approach that uses only the initial keywords.

A.3 Definition of exposure

The exposure measures are defined as follows: $\text{Exposure}_{i,t} = 1/B_{i,t} \times \sum_b^{B_{i,t}} (\mathbb{1}[b \in \mathbb{C}])$ where $b = 0, 1, \ldots B_{i,t}$ are the bigrams in the earnings call transcripts of firm i in quarter t and $\mathbb{1}[\cdot]$ is the indicator function and $\mathbb{C}$ is the set of bigrams for each measure.

A.4 Exposure Scores and Transcript Excerpts

To provide a brief illustration of how transcripts are mapped to exposure measures, Table A.2 compares Q1 2019 exposure scores between BMW, General Motors, and Toyota. They do not discuss regulatory or physical issues much during the quarter, but all mention EV-related opportunities. The varying attention to such opportunities translates into different exposure scores.

Table A.2: Q1 2019 Auto Industry Climate Exposure Scores & Call Excerpts

Firm	**Opp**	**Reg**	**Phys**	**Excerpt from CEO Presentation**
BMW	7.20	0.58	-0.1	"In Europe, our percentage of ***electrified vehicles*** delivered is 3x the industry average. In 2018, we were the market leader for electrification in both Europe and Germany, not just in the premium segment but in the market as a whole. We plan to maintain a leading position going forward, both in Europe and worldwide. To do so we will continue to introduce more electrified models across all brands and model series."
GM	1.87	-0.18	-0.1	"I want to address media coverage of the various industry partnerships around ***battery, electric vehicles*** and trucks. As you know, GM has an industry-leading truck franchise and industry-leading electrification capability. I assure you, we will not cede our leadership on either front. We intend to create an all-***electric future*** that includes a complete range of EVs, including full-size pickups. And we will share additional information when competitively appropriate."
Toyota	0.9	-0.18	-0.1	"Next, we would like to explain activities for enhancing our competitiveness... The third area concerns investment in future technologies in order to enhance our competitiveness in a future society of mobility, we're accelerating collaborations with other companies with and without committing capital investment, while allocating more resources to electrification, autonomous driving and connectivity."

Notes: This table includes climate exposure scores and select quotes from earnings calls for three auto manufacturing companies in Q1 2019. ***Emphasis*** on bigrams included in Sautner et al. (2023) Top-100 Bigrams for any of the exposure measures.

A.5 Validation of Exposure Measure

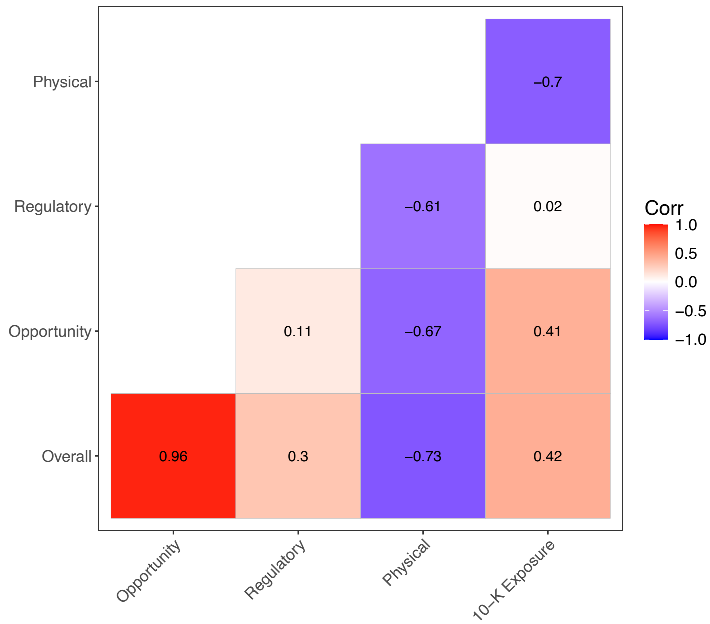
Sautner et al. (2023) validate the exposure measures using several strategies, providing confidence that these measures capture firm-level climate change exposure. Industry patterns among the measures are plausible as high-emitting sectors have high exposure scores and key firms within those sectors are also highly ranked by exposure. Additionally, exposure measures correlate with firms' carbon emissions, especially for regulatory exposure which aligns with expectations that firms emitting the most GHGs are also most exposed to climate regulation. They also show that time-series variation in public attention to climate change, proxied using the Wall Street Journal Climate Change News Index, aligns with variation in firm-level opportunity and regulatory exposure. This means that when overall public attention to climate change is high, firms are more likely to spend more time discussing regulatory concerns and opportunities. They do not find a relationship with physical exposure, indicating that most discussion of physical shocks focuses on firm-specific issues rather than topics in the Wall Street Journal. Sautner et al. (2023) also conduct a variance decomposition analysis. By doing so, they ensure that the variance within the firm-year captures meaningful economic heterogeneity rather than idiosyncratic measurement error.

The exposure measures also correlate with key economic outcomes. Sautner et al. (2023) show that the climate exposure measures help predict the creation of green technology jobs and green patents for a firm in the following year, even when including several controls. Firms with higher overall exposure are more likely to post job openings in green technology in the following year, showing that they need employees with climate-relevant skills. Similarly, those with greater climate change exposure file for more green patents.

A.6 Comparison of Alternative Exposure Measures

We display the relationship between alternative measures of climate exposure in figure A.1. These measures include the earnings call-based composite measure of climate exposure from Sautner et al. (2023), each of the three sub-components of the composite measure, and a Form 10-K-based measure of climate exposure produced by Berkman et al. (2024). The overall earnings call-based measure is strongly and positively correlated to opportunity exposure, positively but less strongly to regulatory exposure, and is negatively correlated with physical exposure. The relationship between the earnings call-based measure of overall exposure and each sub-component is similar to that of the 10-K-based measure and each of the earnings call-based sub-component measures. These descriptive statistics suggest that, even across disclosure platforms with varying degrees of legal restrictions on corporate communication, firms' characterization of their own exposure to climate change tends to reflect climate opportunities for the firm rather than regulatory or physical exposure of the firm to climate change.

Figure A.1: Correlation between climate exposure measures



Notes: This figure shows correlations between different measures of climate exposure: overall exposure as well as opportunity, regulatory, and physical exposure to climate change as measured from corporate earnings calls as well as an overall estimate of climate exposure as measured from Form 10-K reports.

B LDA Report Example

To illustrate the nature of the lobbying data, Table B.1 summarizes the information included in a 2020 General Motors lobbying report submitted through the LDA. Each report is filed by a specific registrant for a given quarter-year. Reports indicate the registrant's lobbying expenditure in the quarter alongside detailed information about the specific lobbying issues, including bill numbers and lobbied government entities. 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 others) on bills related to higher octane fuels, EVs, and air standards.

C Additional Information on Data Processing

To mitigate selection bias, we cast as wide a net as possible and include all publicly traded firms for which both quarterly earnings call and Orbis data are available. These two datasets contain a firm-level identifier—International Security Identification Number (`isin`)—which we use to merge them. Firms

Table B.1: 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; - H.R.2256/S.1094, Driving America Forward Act, EV tax credit, EV infrastructure; - H.R.431, CAFE Standards Repeal Act of 2019, fuel economy; - H.R.978, Clean and Efficient Cars Act of 2019, CAFE; - S.1022, Greener Air Standards Mean Our National Security, Environment and Youth Saved Act, CAFE; - H.R. 5545, No Exhaust Act of 2020, EV infrastructure; 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

Notes: This table illustrates a quarterly report submitted to the LDA. Reports include the registrant, client, expense, issue code, specific issues, and government entities.

without a clean merge across these datasets are excluded.[21] This set of matched firms thus defines the firms in our sample.

Approximately 8% (1,247) of the 15,368 firms in the earnings call data contain non-unique `isin` or `gvkey` codes. These are dropped to avoid drawing on the same Orbis record multiple times. After this step, 14,121 firms remain, of which 2,416 lack matches in Orbis, leaving us with 11,705 firms in the merged earnings call–Orbis dataset.

We then merge this intermediate dataset with the LobbyView lobbying data using two identifiers: Compustat's `gvkey` and Bureau van Dijk's `bvdid`. The earnings call data provides `gvkey`, while Orbis provides `bvdid`, so we leverage both to maximize matched firms. We first merge using `gvkey`, then supplement with `bvdid` matches (dropping duplicates where both matches exist to avoid duplication).

Lobbying data from LobbyView is based on quarterly reports filed by firms under the Lobbying Disclosure Act (LDA). We merge lobbying report data with client-level information using the report identifier (`lob_id`). Since firms can file amendments to previous reports, we process these carefully. Specifically, we identify cases with multiple amendments to the same lobbying report and compute the average reported lobbying amount across amendments. If multiple amendments exist and the reported amounts differ, we replace the originally reported amount with the mean of the amended values. This ensures consistent and conservative estimates of lobbying expenditures.

We then join this cleaned lobbying dataset with issue-level and text-level lobbying data. This allows

[21] We explored fuzzy matching to account for potential coding errors in `isin`, but found no near-matches, confirming unmatched firms are absent in one of the two datasets.

us to distinguish climate-related lobbying from other issues and match reports to the exposure measures discussed in the main text.

To address the possibility that some firms may not be required to disclose their lobbying under the LDA (e.g., due to size or expenditure thresholds), we include control variables that influence a firm's propensity to lobby, including firm productivity, earnings, and headquarters location. We also consult LDA guidelines directly, which confirm that there are no restrictions based on organizational type or location that would make publicly traded firms ineligible for lobbying (Senate Office of Public Records, 2021, p. 6).

These steps ensure that our sample captures as broad a set as possible of publicly traded firms that could potentially engage in US lobbying. We code firms without matched lobbying data as having engaged in no lobbying. The final merged dataset contains 2,245 firms with complete earnings call, Orbis, and LobbyView information. This implies that approximately 9,500 of the 11,705 firms in our panel never lobbied on any issue during the 2001–2023 period. This is consistent with existing literature, which shows that only a minority of firms engage in lobbying at all (de Figueiredo and Richter, 2014).

D Data Description

D.1 Summary Statistics

Table D.1: Summary Statistics

	Mean	SD	Min	Max	N
Climate Lobbying Occurrence	0.02	0.14	0.00	1.00	1076860
Climate Lobbying Expenditure	2433.13	35 722.74	0.00	6 467 500.00	1076860
Opportunity	0.00	0.00	0.00	0.05	356393
Regulatory	0.00	0.00	0.00	0.02	356393
Physical	0.00	0.00	0.00	0.01	356393
Earnings Before Interest and Taxes (EBIT) ($M)	420.45	2666.62	−73 007.00	307 456.55	657464
EBIT/Total Assets (Productivity)	−0.47	150.76	−42 534.50	37 338.00	647612
Total Lobbying Per Quarter($M)	23.55	212.91	0.00	25 870.00	1076860
US Headquarter	0.53	0.50	0.00	1.00	1076860

Notes: The table presents summary statistics for the firms that constitute the sample used for all main results. Exposure measures are not transformed.

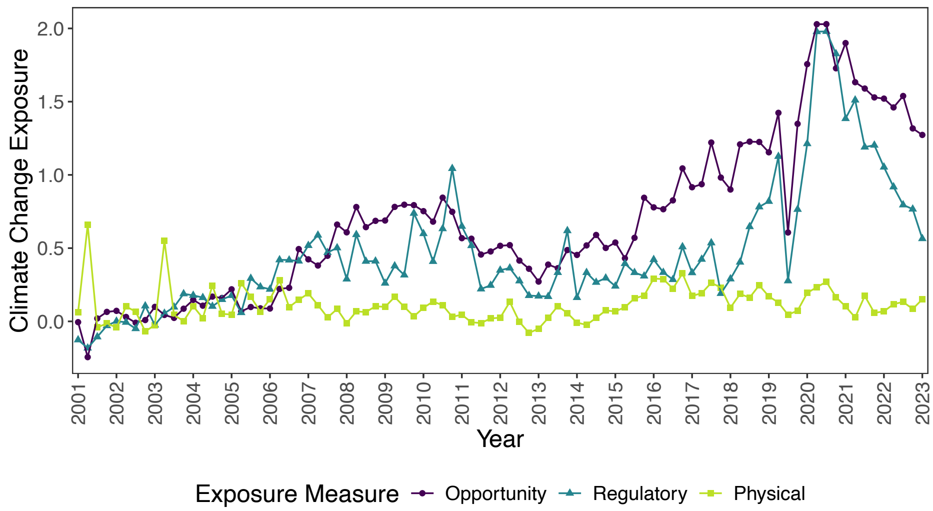
D.2 Climate Change Exposure Over Time

Figure D.1 shows rising opportunity and regulatory exposure over time, peaking in 2020–2021 before declining slightly but remaining above pre-2020 levels. Physical exposure remains relatively stable throughout.

D.3 Variation Within Industries

By Hypothesis 2, we expect that some companies lobby in response to differential exposure relative to industry competitors. Here, we verify that climate exposure varies meaningfully within industries. Figure D.2 shows the distribution of firm exposure within the 15 industries with the highest variance. There is significant variation, with firms differing most by opportunities. Within-industry variation in physical or regulatory risk is lower. These descriptive results motivate our analysis of within-industry variation in exposure and the effects on climate lobbying.

Figure D.1: Climate Change Exposure over Time



Notes: This figure shows average climate change exposure over time for the firms in our sample.

D.4 Climate Lobbying

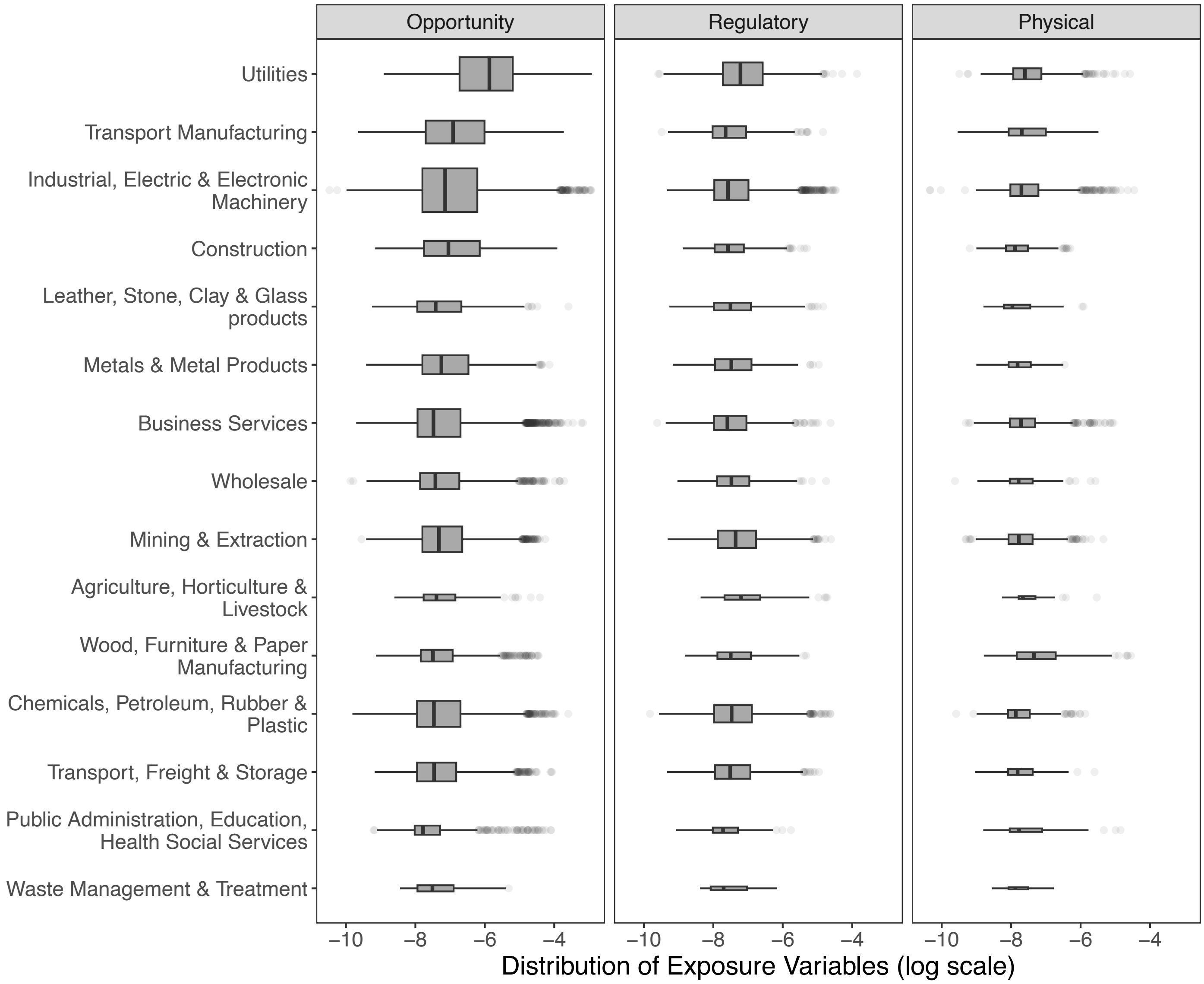
Using total reported lobbying expenditures by issue, we compare climate issues with all other issue areas. Figure D.3 shows the share of climate lobbying expenditure to total lobbying from 2001 to 2023. Within this time frame, the proportion of lobbying expenditure focused on climate issues peaked around 2010 due to ACES before decreasing. This is somewhat surprising, as the distributive implications of climate change have increased in recent years. However, this can be rationalized given the failure of ACES and the limited opportunity for federal climate policy progress under the Trump administration.

D.5 Balance

To examine how the different exposure measures correlate with firm-level covariates, we calculate correlation coefficients for Q1 2010. Specifically, we compare the covariate values of firms above and below the median exposure level. To isolate within-industry relationships, we regress both the exposure measures and all covariates on industry fixed effects and compute correlations between the resulting residuals.

Figure D.4 shows that opportunity exposure is positively correlated with regulatory exposure, EBIT, CDP reporting, CSO presence, and multinational status, and negatively correlated with being headquartered in the US Regulatory exposure shows similar patterns. Physical exposure is only significantly correlated with EBIT and the other two exposure measures.

Figure D.2: Within Industry Variation of Climate Change Exposure

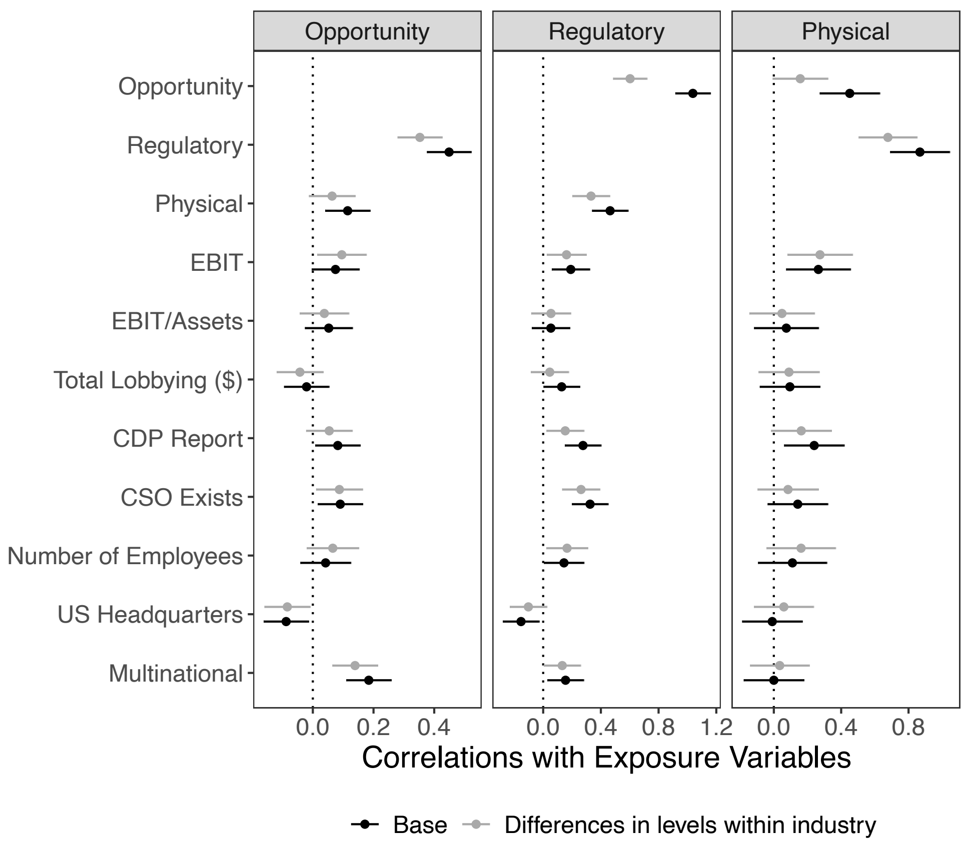


Notes: The figure visualizes within-industry variation in climate change exposure across the 15 industries with the highest mean variance across exposure variables. The exposure measures are shown on a logarithmic scale to better visualize the distribution. We use the original, non-standardized values before taking the logarithm. Each box plot represents the distribution of firm-level exposure scores within an industry, where the box shows the interquartile range (IQR), the horizontal line indicates the median, and the whiskers extend to 1.5 times the IQR. The width of each box is proportional to the square root of the number of observations.

Figure D.3: Lobbying Expenditure on Climate Lobbying Over Time

Notes: This figure depicts the share of climate lobbying expenditure to total lobbying from 2001 to 2023.

Figure D.4: Balance Between Firms Above and Below Median Exposure



Notes: The figure presents information on balance in terms of levels in Q1 2010. We compare the difference in average covariate values of firms above and below median exposure levels. We present balance both based on a simple comparison, as well as based on comparison that include industry fixed effects. The latter is similar to our preferred specification, which utilizes within-industry variation in changes in climate exposure. The unit of the analysis is firm, since all variables shown here are measured at the firm level.

E Additional Information on Primary Models

E.1 Details on the Main Results

In table E.1 we report full model results, including control coefficients, and diagnostics for the model results presented in Figures 2 and 3. The Wald statistics test the exposure coefficients for equivalence under the null hypothesis of $\beta_1 = \beta_2$ and the alternative hypothesis of $\beta_1 \neq \beta_2$, with rejection of the null indicating coefficients of different magnitudes. Test statistics for the Wald test of a single linear restriction between coefficients are interpreted with respect to the t-distribution.

Table E.1: Results and Diagnostics for Figure 2 and 3 Models

	Year FE Occ	Ind-Yr FE Occ	EPA Occ	DOE Occ	Year FE Amt	Ind-Yr FE Amt	EPA Amt	DOE Amt
Opportunity Exposure	3.108***	1.952***	0.262**	1.016***	32.065***	18.917***	2.142*	8.133***
	(0.353)	(0.302)	(0.122)	(0.189)	(3.642)	(2.990)	(1.074)	(1.685)
Regulatory Exposure	1.505***	0.982***	0.519***	0.488***	16.696***	10.868***	4.876***	4.610***
	(0.256)	(0.185)	(0.127)	(0.118)	(2.912)	(2.050)	(1.181)	(1.087)
Physical Exposure	0.109	-0.017	0.106	-0.030	1.323	-0.074	0.921	-0.134
	(0.119)	(0.108)	(0.078)	(0.069)	(1.327)	(1.204)	(0.693)	(0.625)
EBIT	0.613**	0.671**	0.561**	0.373*	6.696**	7.364**	4.783**	3.136
	(0.270)	(0.267)	(0.245)	(0.205)	(3.120)	(3.095)	(2.285)	(1.979)
EBIT/Assets	142.095***	144.312***	65.564**	41.529**	1444.365***	1450.405***	567.069**	337.383**
	(46.494)	(49.409)	(24.075)	(16.714)	(477.117)	(500.988)	(212.627)	(138.543)
US HQ	4.799***	5.326***	1.910***	1.512***	47.752***	53.285***	16.640***	12.500***
	(0.417)	(0.421)	(0.233)	(0.238)	(4.407)	(4.453)	(2.123)	(2.137)
Total Lobbying ($)	4.423***	4.228***	2.268***	2.430***	54.760***	52.633***	22.533***	24.055***
	(0.584)	(0.553)	(0.418)	(0.393)	(7.383)	(7.010)	(4.216)	(3.989)
Num. Obs.	328065	328065	328065	328065	328065	328065	328065	328065
Adj. R-Squared	0.164	0.206	0.126	0.134	0.198	0.241	0.139	0.152
Year FE	✓				✓			
Industry x Year FE		✓	✓	✓		✓	✓	✓
Wald (Op-Rg=0)	4.176	2.773	1.528	2.303	3.788	2.220	1.796	1.713
Wald (Op-Ph=0)	8.007	5.957	1.013	4.830	7.909	5.662	0.884	4.257
Wald (Rg-Ph=0)	4.935	4.581	2.621	3.767	4.812	4.494	2.736	3.743

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

Notes: Coefficients scaled by 100 for ease of interpretation. Standard errors clustered by firm and year. * p<0.1, ** p<0.05, *** p<0.01.

E.2 Estimation of Substantive Effects

Ford & Toyota: We estimate the probability of Ford having lobbied on climate issues in 2019Q4, using the main industry-by-year fixed effects lobbying occurrence model (table E.1 column 2) and the Ford Motor Company's exposure and covariate data for the quarter. We then substitute Ford's opportunity exposure value (4.33) with Toyota's opportunity exposure value (0.35) for 2019Q4 and again estimate the predicted value of the outcome using this synthetic firm profile. Note that these opportunity exposure values for Ford and Toyota have been processed from their original values through a z-score transformation.

Synthetic firm: To further illustrate the substantive effects of changing exposure on the probability of climate lobbying, we construct a synthetic firm within the automotive industry for a given quarter. We assign this synthetic firm the quarterly median automobile industry value for all covariates and headquarter it in the US. We then isolate a single exposure type and, holding the other two exposure types constant at the quarterly automobile industry median, compute the change in the outcome for the synthetic automobile firm when the isolated exposure type moves from the quarterly automobile industry mean to 2SD above the mean. We do this exercise for each quarter from 2001Q1 to 2023Q4 and compute the change in outcome when an automobile firm moves from the industry mean to 2SD above it. Prediction is done using the estimated coefficients of our lobbying occurrence model specification with industry-by-year fixed effects from table E.1 column 2. Finally, we take the average of the predicted change in the outcome across all quarters to obtain the average predicted change in the outcome.

F Additional Results

F.1 Alternative Model Specifications

We replicate and extend our main results from table E.1 across a broad set of alternative specifications, and find that our core results hold. Tables F.1 and F.2 display results for alternative model specifications using the occurrence and amount dependent variables, respectively.

Congress: We include a target model (Column 1) with Congress as the intended climate lobbying target, with results that closely mirror our main results.

Industry-by-quarter: We then test the robustness of our models to alternative estimation strategies. We substitute the industry-by-year fixed effects specification with industry-by-year-quarter fixed effects (Column 2).

Logit & Tobit: We next estimate a logistic regression analog for our model of lobbying occurrence. For the amount DV, we estimate a Tobit regression analog of our main model to account for censoring of climate lobbying amounts at zero. One advantage of Logit and Tobit models is that they more naturally accommodate the binary and zero-inflated nature of our outcomes than OLS. However, they can produce biased estimates in shorter panels with many fixed effects and rely on additional distributional assumptions (e.g., censoring at zero for Tobit) that may not hold in all settings (Amore and Murtinu, 2021).

Annual panel: We next aggregate our panel to the annual level by taking the mean annual value of each variable that is measured quarterly, and re-estimate our main model specification (Column 4). The results with the annualized panel are somewhat distinct from our main model results. Opportunity and regulatory exposure continue to exert a positive and statistically significant impact on climate lobbying, but the coefficient for physical exposure becomes positive. This suggests the possibility that even though physical exposure to climate change is generally a longer-term type of exposure by nature, it may not translate into climate political activity in the very near term (quarter), but begins to do so over the medium term (year).

Firm fixed effects: One potential concern is that time-invariant, firm-specific confounders may bias our estimates. To address this, we estimate a specification that includes both industry-by-year and firm fixed effects (Column 5). Conceptually, this model "residualizes" each firm's exposure relative to its own time-invariant mean, so identification comes from within-firm changes in exposure relative to other firms in the same industry-year. While methodologically useful, this approach imposes a strong constraint on the variation used for identification, a concern emphasized by Mummolo and Peterson (2018). In practice, we observe limited short-run within-firm variation in climate exposure. As Mummolo and Peterson show, fixed effects estimators often discard substantial between-unit variance, leading to reductions in both statistical power and the plausibility of the counterfactuals implicitly invoked. In our case, even moderate changes in exposure are often the result of persistent structural differences between firms rather than within-firm changes over time. Thus, the limited within-firm variation likely contributes to the loss of statistical significance in this specification. Moreover, firm fixed effects eliminate all between-firm variation, which may be where most of the meaningful and policy-relevant variation lies. If exposure primarily operates through cross-sectional differences – i.e., some firms are structurally more exposed than others – firm FEs remove an important source of theoretically relevant variation. This underscores that the appropriate estimand may not be a "within-firm" causal effect, but rather the average effect of exposure across firms in a given industry-year context. Nevertheless, in the firm fixed effects specification, opportunity exposure remains linked to climate lobbying, whereas the coefficient for regulatory exposure becomes statistically insignificant. These results do not rule out the possibility that within-firm shifts in regulatory exposure influence political activity, but they suggest that firms may not adjust their climate lobbying in response to changes in regulatory exposure contemporaneously. Later in this section, we detail an error correction approach used to capture longer-run dynamics.

Augmented controls: We also include a model specification with an augmented set of control variables drawn from Orbis and Lerner and Osgood (2023) to improve our ability to account for potential confounders in the relationship between climate exposure and firm political activity (Column 6). We account for the number of employees in a firm, whether or not a firm has a Chief Sustainability Officer, and whether a firm reports CO_2 emissions to the Climate Disclosure Project as additional controls in our model, at the expense of truncating our sample to 2000-2019. Even though each of our added covariates is statistically significant in the augmented model, the exposure coefficient estimates nevertheless remain comparable to those in the main specifications.

Multiple imputation: We also test our model with multiple imputation of missing values for the $EBIT$ and $EBIT/Assets$ variables that would otherwise be listwise-deleted (Column 7). We impute missing data for $EBIT$ and $EBIT/Assets$ using all other covariates included in the models, including our climate exposure measures. We generate 20 complete datasets using the multiple imputation model. We then estimate the main model specification with each of our imputed datasets, with standard errors adjusted using Rubin's Rules for variance in coefficient estimates within and between models. The results are nearly identical to our main results, indicating that listwise deletion of missing data is not a significant threat to inference.

Lagged DV & error correction: To further probe the dynamics of the relationship between climate exposure and political activity, we incorporate a lagged dependent variable into our main model (Column 8) and report results from an error-correction model (Column 9) of the following form:

$$\begin{aligned}
\Delta Y_{fiqy} \;=\; & \alpha + \phi\, Y_{fi,q-1,y} \\
& + \left[\beta_1^{\text{Opp}}\, \mathit{Opportunity}_{f,q-1} + \beta_2^{\text{Reg}}\, \mathit{Regulatory}_{f,q-1} + \beta_3^{\text{Phy}}\, \mathit{Physical}_{f,q-1}\right] \\
& + \left[\gamma_1^{\text{Opp}}\, \Delta \mathit{Opportunity}_{fq} + \gamma_2^{\text{Reg}}\, \Delta \mathit{Regulatory}_{fq} + \gamma_3^{\text{Phy}}\, \Delta \mathit{Physical}_{fq}\right] \\
& + \lambda\, \mathbf{X}_{fy} + \delta_{iy} + \varepsilon_{fiqy}.
\end{aligned}$$

The term $\phi\, Y_{fi,q-1,y}$ captures policy feedback: a significant ϕ means that past lobbying activity pulls current lobbying back toward its long-run equilibrium, regulating the pace of adjustment after any shock. Lagged exposure levels (β-terms) capture how persistent climate change exposure shapes that equilibrium, while first differences (γ-terms) register the immediate, within-quarter impact of exposure shocks. The outcome in the error correction model becomes the change in the outcome from the previous to the current period. Long-run multipliers (LRM) are computed as a fraction with the lagged DV coefficient in the numerator and the long-run effect as the denominator.[22]

[22] Standard errors are estimated using the approximate variance of a ratio of coefficients with known variances (De Boef and Keele, 2008); formally $Var(a/b) = \frac{1}{b^2}Var(a) + \frac{a^2}{b^4}Var(b) - 2\frac{a}{b^3}Cov(a,b)$.

The significance of the lagged dependent variable in both columns suggests the potential for policy feedback effects, particularly in the translation of climate regulatory exposure to climate political action. The error correction model results imply that while all three exposure measures have some long-run dynamics with climate lobbying (as captured by the lagged independent variable coefficients), only opportunity exposure and physical exposure exhibit evidence of an overall effect on climate lobbying (as captured by the LRMs). Regulatory exposure appears to have little impact on climate lobbying over the short-run, but effects emerge over the long-run. This absence of a short-run effect for regulatory exposure helps explain the absence of an effect in the firm fixed effects models for regulatory exposure, which are identified based on contemporaneous response of the outcome to a change in exposure of the firm.

Between-within: We also estimate a "between-within" random effects model with time-invariant predictors to explore how much of the relationship between climate exposure and lobbying is driven by changes within firms relative to changes across firms (Bell and Jones, 2015). The results generally mirror our main results, with opportunity and regulatory exposure both within and between firms corresponding to increased lobbying activity and null effects for physical exposure. Furthermore, the between-firm effects are of a larger magnitude than the within-firm effects for both occurrence and amount, as confirmed by Wald tests. These results help explain the deflated exposure effects in the firm fixed effect models, which isolate the effect of *within-firm* change in exposure.

Exposure interactions: We also estimate a model specification permitting for interaction effects between our exposure variables (Column 10). We see some suggestive evidence that the presence of both opportunity and physical exposure exerts a negative influence on climate lobbying. Our main coefficient estimates are largely unchanged by the presence of these interaction effects.

Exposure sentiment & risk: Next, we incorporate alternative versions of our main independent variables of climate exposure. First, we implement measures of the *sentiment* with which climate opportunity, regulatory, and physical issues are discussed in firm earnings calls (Column 11). Higher values of opportunity sentiment are defined by the difference in the share of bigrams in a call referencing climate opportunities in positive terms and those referencing opportunities in negative terms, normalized by the total number of bigrams in the call. Analogous measures are built for regulatory and physical sentiment. We employ similar measures for climate exposure *risks* (Column 12). Results for these alternative exposure measures are similar to our main results.

10-K exposure: We next incorporate an operationalization of our independent variable – climate change exposure – derived from firm Form 10-K filings rather than firm earnings calls, as constructed by Berkman et al. (2024) (Column 14). The US Securities and Exchange Commission requires annual filing of Form 10-K reports, which detail firm financial performance. The 10-K-based exposure measure is an aggregate measure of climate exposure, and so we benchmark it against the aggregate climate exposure measure produced by Sautner et al. (2023, 2024) in Column 13. The results across the two aggregate exposure measures are similar.

Physical and transition risks: Finally, we consider an alternative operationalization of climate exposure derived from earnings call transcripts in Column 15, using measures from Li et al. (2024). The authors use a keyword dictionary to identify firm-level physical and transition risks associated with climate change based on earnings call discussions. We pool the authors' measure of acute and chronic physical climate risks into a single physical risk measure. We find positive effects for both this pooled measure of physical risk and for the measure of transition risk. Notably, the transition risk effect sizes are of similar magnitude as the sum of opportunity and regulatory exposure coefficients in our primary model specification.

Table F.1: Effect of Climate Exposure on Climate Lobbying Occurrence

	CONG	Ind-Qtr FE	Logit	Yr Panel	Firm FE	Aug Ctrl	Impute	Lag DV	Err Cor	Btwn-Wthn	Intr.	Sent	Risk	Ovrl	10-K	Li et al
Opportunity	1.911***	1.961***	21.214***	4.977***	0.319**	1.943***	1.885***	0.155***			2.101***	1.536***	0.399***			
	(0.295)	(0.303)	(2.698)	(0.894)	(0.134)	(0.402)	(0.294)	(0.028)			(0.305)	(0.191)	(0.135)			
Regulatory	0.949***	0.994***	10.44***	5.862***	0.068	1.302***	0.98***	0.062***			1.046***	0.385***	0.132*			
	(0.187)	(0.186)	(1.493)	(0.804)	(0.049)	(0.301)	(0.18)	(0.02)			(0.193)	(0.084)	(0.08)			
Physical	-0.048	-0.018	1.079	3.024***	0.019	0.031	-0.017	0.025			0.099	-0.059	0.048			0.364***
	(0.107)	(0.108)	(1.609)	(0.927)	(0.043)	(0.149)	(0.104)	(0.017)			(0.107)	(0.061)	(0.03)			(0.109)
Lagged DV								92.383***	-7.775***							
								(0.516)	(0.539)							
Opp_{t-1}									0.199***							
									(0.036)							
Reg_{t-1}									0.12***							
									(0.031)							
Phy_{t-1}									0.128***							
									(0.032)							
Opp Δ									0.045**							
									(0.022)							
Reg Δ									0.02							
									(0.025)							
Phy Δ									0.034*							
									(0.019)							
Opp_{LRM}									2.564***							
									(0.575)							
Reg_{LRM}									1.641***							
									(0.476)							
Phy_{LRM}									0.258							
									(0.327)							
Opp_{WTHN}										0.448***						
										(0.033)						
Reg_{WTHN}										0.119***						
										(0.024)						
Phy_{WTHN}										-0.005						
										(0.024)						
Opp_{BTWN}										1.858***						
										(0.151)						
Reg_{BTWN}										2.903***						
										(0.226)						
Phy_{BTWN}										-0.014						
										(0.200)						
Op. x Rg.											-0.053					
											(0.045)					
Op. x Ph.											-0.073***					
											(0.019)					
Rg. x Ph.											0.042					
											(0.051)					
Exposure														6.177***	6.432***	
														(1.186)	(1.083)	
Transition																3.585***
																(0.459)
Num. Obs.	328065	328065	305746	15851	328065	218054	355133	328061	285873	327612	328065	328065	328065	13364	14879	188771
Adj. R-Squared	0.207	0.203	0.306	0.324	0.705	0.237	0.2	0.882	0.038	0.608	0.206	0.201	0.196	0.289	0.288	0.26
Industry x Year FE	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Industry x Qtr FE		✓														
Firm FE					✓					Random						
Firm Controls	✓	✓	✓	✓	✓	Augm.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lagged DV								✓	✓							
Climate Measure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Sentiment	Risk	Ovrl. Expo.	10-K Expo.	Li et al.
Estimation	OLS	OLS	Logit	OLS	OLS	OLS	OLS	OLS	OLS	GLS	OLS	OLS	OLS	OLS	OLS	OLS
Panel	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Yr	Firm-Qtr	Firm-Qtr	Imputed FQ	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Yr	Firm-Yr	Firm-Qtr
Wald (Op-Rg=0)	2.786	2.756	3.549	0.681	1.762	1.272	2.644	3.464			3.005	5.649	1.904			
Wald (Op-Ph=0)	6.005	5.968	6.507	1.528	2.17	4.476	5.939	4.042			6.193	8.009	2.397			
Wald (Rg-Ph=0)	4.519	4.612	4.264	2.22	0.722	3.749	4.694	1.469			4.292	4.169	1.067			

Notes: Coefficients scaled by 100 for ease of interpretation. Standard errors clustered by firm and year (between-within model clustered only by firm). * p<0.1, ** p<0.05, *** p<0.01.

Table F.2: Effect of Climate Exposure on Climate Lobbying Amount

	CONG	Ind-Qtr FE	Tobit	Yr Panel	Firm FE	Aug Ctrl	Impute	Lag DV	Err Cor	Btwn-Wthn	Intr.	Sent	Risk	Ovrl	10-K	Li et al
Opportunity	18.121***	19.014***	274.055***	51.258***	2.513*	18.041***	18.254***	1.314***			20.259***	15.67***	3.574**			
	(2.871)	(3.001)	(21.119)	(10.618)	(1.419)	(3.937)	(2.925)	(0.258)			(3.007)	(1.939)	(1.411)			
Regulatory	10.197***	10.982***	148.299***	70.882***	0.577	14.567***	10.811***	0.533***			11.313***	4.489***	1.826**			
	(1.95)	(2.064)	(15.534)	(10.179)	(0.477)	(3.383)	(1.996)	(0.187)			(2.127)	(0.98)	(0.891)			
Physical	-0.467	-0.081	23.854*	33.863***	0.154	0.598	-0.054	0.183			1.154	-0.473	0.59			3.691***
	(1.111)	(1.21)	(14.249)	(11.796)	(0.415)	(1.675)	(1.164)	(0.142)			(1.222)	(0.661)	(0.362)			(1.179)
Lagged DV								93.366***	-6.828***							
								(0.429)	(0.450)							
Opp_{t-1}									1.687***							
									(0.331)							
Reg_{t-1}									0.968***							
									(0.316)							
Phy_{t-1}									1.185***							
									(0.305)							
Opp Δ									0.351							
									(0.255)							
Reg Δ									0.209							
									(0.247)							
Phy Δ									0.236							
									(0.174)							
Opp_{LRM}									24.711***							
									(5.663)							
Reg_{LRM}									17.354***							
									(4.999)							
Phy_{LRM}									3.064							
									(3.594)							
Opp_{WTHN}										4.303***						
										(0.329)						
Reg_{WTHN}										1.211***						
										(0.242)						
Phy_{WTHN}										-0.095						
										(0.243)						
Opp_{BTWN}										18.774***						
										(1.581)						
Reg_{BTWN}										30.519***						
										(2.373)						
Phy_{BTWN}										-0.876						
										(2.094)						
Op. x Rg.											-0.398					
											(0.471)					
Op. x Ph.											-0.739***					
											(0.188)					
Rg. x Ph.											0.34					
											(0.583)					
Exposure														73.213***	82.604***	
														(14.286)	(13.160)	
Transition																36.728***
																(4.899)
Num. Obs.	328065	328065	328065	15851	328065	218054	355133	328061	285873	327612	328065	328065	328065	13364	14879	188771
Adj. R-Squared	0.237	0.238	0	0.357	0.741	0.276	0.234	0.901	0.034	0.647	0.241	0.237	0.232	0.329	0.333	0.299
Industry x Year FE	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Industry x Qtr FE		✓														
Firm FE					✓					Random						
Firm Controls	✓	✓	✓	✓	✓	Augm.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lagged DV								✓	✓							
Climate Measure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Sentiment	Risk	Ovrl Expo.	10-K Expo.	Li et al.
Estimation	OLS	OLS	Tobit	OLS	OLS	OLS	OLS	OLS	OLS	GLS	OLS	OLS	OLS	OLS	OLS	OLS
Panel	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Yr	Firm-Qtr	Firm-Qtr	Imputed FQ	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Yr	Firm-Yr	Firm-Qtr
Wald (Op-Rg=0)	2.294	2.209	4.621	1.237	1.248	0.668	2.088	2.967			2.462	5.412	1.174			
Wald (Op-Ph=0)	5.762	5.675	9.777	1.078	1.605	4.049	5.608	3.818			5.851	8.105	1.946			
Wald (Rg-Ph=0)	4.58	4.517	5.509	2.24	0.653	3.64	4.579	1.56			4.09	4.089	1.368			

Notes: Coefficients scaled by 100 for ease of interpretation. Standard errors clustered by firm and year (between-within model clustered only by firm). * p<0.1, ** p<0.05, *** p<0.01.

F.2 Alternative Dependent Variable Models

Next, we turn to alternative operationalizations of the dependent variable in table F.3.

Climate bills: We construct an alternative measure grounded in legislative data from the Congressional record. Specifically, we use data from all bills introduced in the 107th through 118th Congress (2001–2024) across both the House and the Senate, as recorded on `Congress.gov`, and we track all actions on those bills (from introduction to final disposition). We define a bill as "climate–related" if any of the following keywords or phrases appear in the bill's official title:

> `climate change, global warming, greenhouse gas, carbon emission, cap and trade, low carbon, carbon pricing, carbon capture, carbon tax, methane emission, renewable energy, clean energy, renewable electricity, climate mitigation, climate adaptation`.

All legislation that meets these criteria is considered a "climate bill" for this alternative definition.

In collaboration with the LobbyView team, we then link these climate bills back to lobbying reports to identify lobbying activities that specifically reference them. Each lobbying report that cites at least one of these climate bills is coded as "climate lobbying." The results (Columns 1, 7) are very similar to the core findings of the paper.

Climate keywords: Next, we implement a keyword-based approach to identify climate-related lobbying activity, as well as to determine whether lobbying is related to climate adaptation or climate mitigation. For **mitigation**, our list of keywords includes:

> `climate change, global warming, greenhouse gas, carbon emission, cap and trade, low carbon, carbon pricing, carbon capture, carbon tax, methane emission, renewable energy, clean energy, climate mitigation, Paris Agreement, Kyoto, clean power plan`.

For **adaptation**, we use:

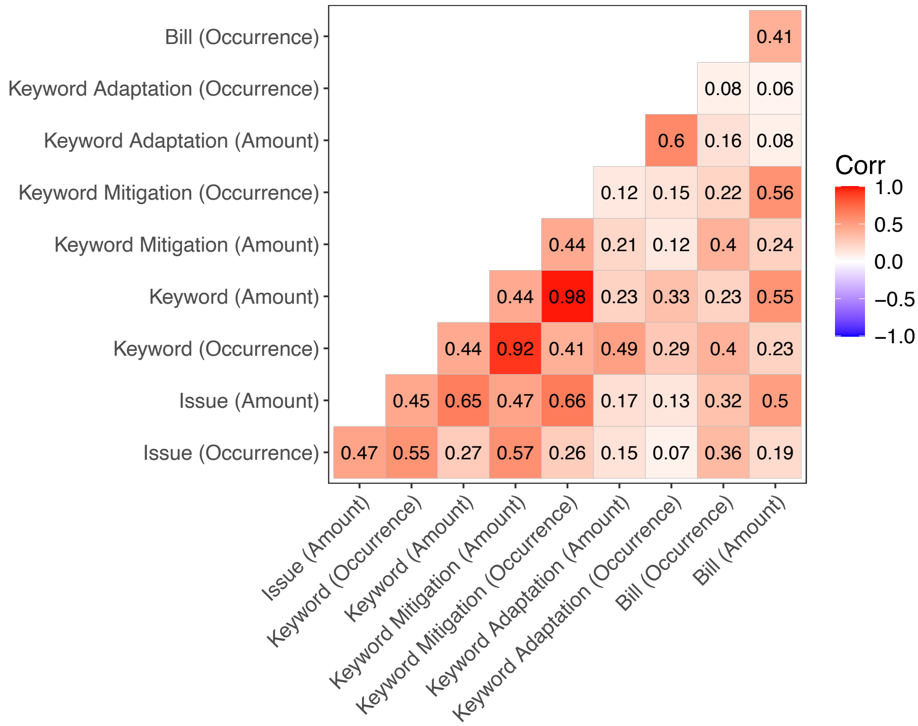
> `climate resilience, climate risk, extreme weather, natural disaster, coastal area, sea level, flood, storm water, extreme heat, coastal erosion, wildfire, storm surge, drought, hurricane, heatwave, climate insurance, federal emergency, resilient building, risk management.`

This keyword approach is similar to that of Cory et al. (2021). If such keywords are present in lobbying reports, then we code that as an instance of climate lobbying. We create a measure of climate-related lobbying amount by multiplying the total lobbying amount of a firm in a given quarter by the proportion of climate-related keywords in the lobbying text. Formally, $\text{Climate Amount}_{fq} = \text{Total Lobby Amount}_{fq} \times N_{fq}^{\text{Climate Keywords}}/N_{fq}^{Bigrams}$. This effectively distributes the total lobbying amount based on how climate-focused the lobbying text is, with separate calculations for mitigation and adaptation keywords. The results (Column 2-4, 8-10) are again similar to the core results of the paper. Moreover, opportunity and regulatory exposure are significantly and positively related to lobbying in both domains, while physical exposure remains insignificant. Further, the effect sizes for adaptation are smaller than those for mitigation, suggesting that firms perceive more immediate returns to lobbying on mitigation.

Figure F.1 shows that these alternative measures correlate with the original issue-based measures at 0.36–0.65, demonstrating moderate overlap between different measurement approaches.

Directionality: Next, in an effort to delineate pro-climate lobbying activity from anti-climate activity, we construct an additional extension of the LobbyView data leveraging data on pro- vs. anti- climate business coalitions provided by Cory et al. (2021). Using our original measure of climate lobbying, we code lobbying as "pro-climate" if a climate-lobbying firm is a member of a pro-climate business coalition,

Figure F.1: Correlation between different climate lobbying measures



Notes: This figure shows correlations between different methods of measuring climate lobbying: issue code-based (main results), keyword-based, and climate bill-based identification. For each method, we consider both the occurrence and dollar amount of lobbying.

and as "anti-climate" if a climate-lobbying firm is a member of an anti-climate business coalition following (Lerner and Osgood, 2023). We urge caution in interpreting these results, as we are unable to validate the extent to which the composite measures truly capture the directionality of lobbying. The results suggest that regulatory exposure is a significant driver both of pro- (Column 5-6) and anti-climate (Column 11-12) lobbying efforts. There are multiple potential explanations. Firms with high regulatory exposure are not necessarily opposed to climate regulation; some may be both vulnerable to and well-positioned for regulatory change, leading them to support continued stringency or engage in preemptive self-regulation through pro climate coalitions. For example, one of the coalitions in (Cory et al., 2021)'s dataset is the Business Council on Climate Change whose climate position is coded as "strongly favor." The Pacific Gas & Electric (PG&E) Company is a member of this coalition, a utility company that is highly exposed to climate change regulation. Yet, PG&E has also invested more in decarbonization and voluntary disclosures than other utilities – exemplifying that firms may have high regulatory exposure but also be relatively well-positioned.[23] That said, we view coalition membership only as a proxy as firms may join both pro- and anti-regulatory groups for strategic reasons, and not all coalitions are equally active or aligned with genuine support for strong climate policy. As such, firms with high regulatory exposure may also join pro-climate coalitions without engaging in pro-climate lobbying.

According to the results, both opportunity and physical climate exposure both translate to less anti-

[23] Ian Gray and Gretchen Bakke, "Pacific Gas and Electric is a company that was just bankrupted by climate change. It won't be the last." *The Washington Post,* January 30, 2019.

climate lobbying, but only to more pro-climate lobbying in the case of physical exposure and weakly so. Surprisingly, opportunity exposure does not translate to increased pro-climate lobbying according to this measure of pro-climate lobbying. However, this may be an artifact of the fact that climate-related opportunities are often highly firm-specific, and coordination with other firms in business coalitions may thus not be a preferred mode of action for high-opportunity firms. It may also be due to the coarse nature of this measure of directionality. We encourage future research to probe more deeply the directionality of firm political action on climate change.

Business coalitions: Finally, we directly estimate the effect of climate exposure on the probability of a firm joining a pro- or anti-climate business coalition (Column 13-14). Our findings indicate that increased regulatory and physical exposure drives firms to join pro-climate coalitions, and that opportunity exposure does not. Although we do not explicitly theorize about the process of joining climate coalitions, these results make sense in light of our assumption that opportunity exposure can be addressed through policies that are more private to the firm, while regulatory and physical exposure are addressed by broader policy solutions that many firms may be affected by. We find that both opportunity and physical exposure *decrease* the likelihood of a firm joining an anti-climate coalition while regulatory exposure increases the likelihood. The presence of a positive effect for regulatory exposure both for joining pro- and anti-climate coalitions is consistent with our expectation that regulatory exposure can either stand to benefit or harm a firm. The negative coefficient for opportunity exposure is unsurprising given that firms exposed to opportunities stemming from climate change are unlikely to take steps to hold up climate policy. The divergent effects of physical exposure across the two models suggest that firms exposed to physical aspects of climate change prefer to pursue group-based political activities rooted in support of climate policymaking rather than in holding up climate policy.

F.3 Excluding Outliers

We address the concern that a small number of extreme observations in either our independent variables or the dependent variables might distort the estimates. Specifically, we remove outliers by excluding observations whose absolute z-scores exceed four, either on our climate-exposure variables ("No IV Outliers") or on our lobbying amount outcome ("No DV Outliers"). Table F.4 compares these restricted samples with our original baseline. Across both occurrence and expenditure models, the positive coefficients on Opportunity and Regulatory exposures remain highly significant, often slightly larger in magnitude than in the main specification. By contrast, Physical exposure is not significant in the baseline but becomes statistically significant in some restricted samples, albeit at a comparatively small level. Overall, trimming extreme values does not overturn our core patterns; if anything, the results are reinforced once outliers are removed.

Table F.3: Alternative Dependent Variable Models

	Bills (Occ)	Kywd (Occ)	Miti (Occ)	Adpt (Occ)	Pro Clim Oc	Anti Clim Oc	Bills (Amt)	Kywd (Amt)	Miti (Amt)	Adpt (Amt)	Pro Clim Am	Anti Clim Am	Join Pro Coal	Join Anti Coal
Opportunity	0.541***	1.192***	1.196***	0.171**	1.108*	-0.502	5.068***	9.067***	9.082***	1.074**	9.407	-10.365*	0.975	-0.807*
	(0.18)	(0.206)	(0.207)	(0.073)	(0.606)	(0.319)	(1.76)	(1.679)	(1.688)	(0.511)	(9.619)	(5.952)	(0.841)	(0.449)
Regulatory	0.238**	0.621***	0.618***	0.093**	0.719	0.486	2.536**	5.46***	5.405***	0.685**	29.121***	28.694***	2.245**	2.142***
	(0.106)	(0.141)	(0.142)	(0.04)	(0.651)	(0.532)	(1.166)	(1.219)	(1.229)	(0.299)	(10.759)	(10.119)	(1)	(0.716)
Physical	-0.009	-0.081	-0.091	-0.019	3.121***	-0.42	-0.087	-0.597	-0.653	-0.115	30.882*	-15.682**	2.311*	-1.238**
	(0.052)	(0.072)	(0.073)	(0.016)	(1.115)	(0.317)	(0.498)	(0.629)	(0.641)	(0.118)	(17.034)	(7.817)	(1.195)	(0.578)
Num. Obs.	328065	328184	328184	328184	11259	11259	328065	328184	328184	328184	11259	11259	11259	11259
Adj. R-Squared	0.308	0.194	0.187	0.053	0.112	0.092	0.361	0.22	0.211	0.055	0.193	0.144	0.173	0.137
Industry x Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Climate Measure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure
Estimation	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Panel	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Yr	Firm-Yr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Yr	Firm-Yr	Firm-Yr	Firm-Yr
Wald (Op-Rg=0)	1.664	2.452	2.487	1.028	0.439	1.474	1.409	1.85	1.88	0.707	1.326	3.036	0.881	3.23
Wald (Op-Ph=0)	2.794	5.475	5.485	2.382	1.526	0.234	2.679	5.006	4.99	2.168	1.075	0.602	0.921	0.626
Wald (Rg-Ph=0)	2.019	4.206	4.205	2.37	1.826	1.181	1.964	4.207	4.165	2.347	0.08	2.843	0.038	3.034

Notes: Coefficients scaled by 100 for ease of interpretation. Standard errors clustered by firm and year. * p<0.1, ** p<0.05, *** p<0.01.

Table F.4: Excluding Outliers

	Main (Occ)	No IV Outliers (Occ)	No Outliers (Occ)	Main (Amt)	No IV Outliers (Amt)	No DV Outliers (Amt)	No Outliers (Amt)
Opportunity	1.948***	3.172***	2.830***	18.875***	31.683***	17.163***	26.822***
	(0.003)	(0.004)	(0.004)	(0.030)	(0.045)	(0.029)	(0.042)
Regulatory	0.982***	2.300***	1.883***	10.864***	25.197***	7.087***	19.036***
	(0.002)	(0.004)	(0.003)	(0.020)	(0.041)	(0.017)	(0.034)
Physical	-0.017***	0.750***	0.582***	-0.072***	8.248***	-0.678***	5.719***
	(0.001)	(0.003)	(0.002)	(0.012)	(0.029)	(0.009)	(0.026)
Adj. R2	0.206	0.193	0.111	0.241	0.226	0.104	0.116
Industry x Year FE	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓

Notes: Coefficients scaled by 100 for ease of interpretation. Standard errors clustered by firm and year. * p<0.1, ** p<0.05, *** p<0.01.

F.4 Effects By Issue

In Table F.5, we replicate our core findings from Figure 2 for each individual area of climate-related issues. We find that opportunity exposure is positively and significantly associated with lobbying on Clean Air and Water (CAW), Energy (ENG) and Environment (ENV), with the largest effect size for ENG. This reinforces the suggestion that the strength of the relationship between exposure and ENG may be attributable to patterns of government investment in renewable energy where firms can obtain specialized subsidies or incentives. Regulatory exposure is associated with increased lobbying activity across issue areas, with effect sizes larger than opportunity both for CAW and ENV. Firms with regulatory concerns are likely to lobby for emissions standards and pollution rules, which are typically categorized as these issue areas. Finally, we do not see a relationship between physical exposure and any of the relevant issue areas. Overall, we find little evidence of a relationship between exposure and lobbying on the Fuel/oil/gas (FUE) issue area – only regulatory exposure appears to affect FUE lobbying, though the coefficient size is small in comparison to other issue areas. This implies that even as the type of exposure varies, companies see little benefit from increasing 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 the character of a firm's exposure and that there are good theoretical reasons to expect that exposure type drives lobbying activity and content.

Table F.5: Effect of Climate Exposure on Climate Lobbying, Decomposed by Issue Area

	CAW (Occ)	ENG (Occ)	ENV (Occ)	FUE (Occ)	CAW (Amt)	ENG (Amt)	ENV (Amt)	FUE (Amt)
Opportunity	0.266	2.016***	0.758***	0.059	2.394	19.028***	6.302***	0.654
	(0.165)	(0.299)	(0.165)	(0.079)	(1.571)	(2.905)	(1.468)	(0.755)
Regulatory	0.42***	0.872***	0.657***	0.181***	4.364***	9.376***	6.655***	1.636**
	(0.13)	(0.18)	(0.151)	(0.064)	(1.36)	(1.907)	(1.553)	(0.693)
Physical	0.075	-0.101	0.013	0.05	0.644	-0.999	0.172	0.493
	(0.082)	(0.088)	(0.077)	(0.063)	(0.838)	(0.96)	(0.789)	(0.564)
Num. Obs.	328065	328065	328065	328065	328065	328065	328065	328065
Adj. R-Squared	0.137	0.194	0.178	0.057	0.146	0.217	0.202	0.062
Industry x Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓
Climate Measure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure	Exposure
Estimation	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Panel	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr	Firm-Qtr
Wald (Op-Rg=0)	0.808	3.289	0.458	1.423	1.043	2.73	0.164	1.133
Wald (Op-Ph=0)	0.935	6.592	3.881	0.083	0.878	6.292	3.48	0.161
Wald (Rg-Ph=0)	2.122	4.689	3.636	1.53	2.197	4.723	3.559	1.36

Notes: Coefficients scaled by 100 for ease of interpretation. Standard errors clustered by firm and year. * p<0.1, ** p<0.05, *** p<0.01.

G Sensitivity Analysis

We perform a sensitivity analysis to estimate how strong an unobserved confounder would have to be to bring the lower bound of the Average Treatment Effect on the Treated (ATT) estimate to zero. We implement the method of Cinelli and Hazlett (2020) and use their `sensemakr` R package for this test.

Robustness values: Table G.1 summarizes the key quantities from these robustness checks for each climate-exposure variable and across the two lobbying outcomes. The columns report the regression coefficient and standard error for the treatment of interest, the t-ratio for this coefficient, the partial $R^2_{Y\sim D|\mathbf{X}}$ of the treatment with the outcome (after partialing out the observed covariates), and two robustness values, which indicate how large the partial R^2 of a hypothetical unobserved confounder (orthogonal to all included covariates) with the treatment and the outcome must be in order to bring the point estimate to 0 ($RV_{q=1}$) or to reduce the estimate to a range where it is no longer statistically different from 0 at the 5% significance level ($RV_{q=1,\alpha=0.05}$).

Table G.1: Sensitivity Analysis to Unobserved Confounding

		Statistics			Robustness Values			Bounds (50x Z)	
Model	Treatment	Estimate	SE	t-stat	$R^2_{Y\sim D\mid\mathbf{X}}$	$RV_{q=1}$	$RV_{q=1,\alpha=0.05}$	$R^2_{D\sim Z\mid\mathbf{X}}$	$R^2_{Y\sim Z\mid\mathbf{X},D}$
Occurrence	Opportunity	0.0195	0.0030	6.46	0.012757%	1.12%	0.8%	0.047%	0.5%
Occurrence	Regulatory	0.0098	0.0019	5.31	0.008600%	0.92%	0.6%	0.004%	0.5%
Occurrence	Physical	-0.0002	0.0011	-0.16	0.000008%	0.03%	0.0%	0.004%	0.5%
Amount	Opportunity	0.1892	0.0299	6.33	0.012226%	1.10%	0.8%	0.047%	0.4%
Amount	Regulatory	0.1087	0.0205	5.30	0.008584%	0.92%	0.6%	0.004%	0.4%
Amount	Physical	-0.0007	0.0120	-0.06	0.000001%	0.01%	0.0%	0.004%	0.4%

Notes: This table presents sensitivity analysis results for our main models. $R^2_{Y\sim D\mid\mathbf{X}}$ represents the partial R^2 of the treatment with the outcome. $RV_{q=1}$ shows how strong confounding would need to be (relative to all controls) to reduce the treatment effect to zero. $RV_{q=1,\alpha=0.05}$ shows the confounding strength needed to reduce the treatment to statistical insignificance. $R^2_{D\sim Z\mid\mathbf{X}}$ and $R^2_{Y\sim Z\mid\mathbf{X},D}$ show the partial R^2 of a confounder 50 times as strong as the US headquarter covariate with the treatment and outcome, respectively, after adjusting for controls. Standard errors are clustered by firm and year, and the t statistic as well as the robustness values and bounds are calculated based on these standard errors.

The robustness values show that, for each of the significant results (particularly for opportunity and regulatory), an unobserved confounder would need to explain between $0.9 - 1.1\%$ of the residual variance of both the treatment and the outcome to bring the point estimate to 0 and between $0.6 - 0.8\%$ to reduce the estimate to a range where it is no longer statistically different from 0 at the 5% significance level. By contrast, for physical exposure (where the coefficient is very small), the low t-statistic and minuscule partial R^2 confirm that its estimated effect is already close to zero, meaning that the sensitivity result is correspondingly trivial.

To provide context for these robustness values, the last two columns show bounds based on using the US headquarter binary variable as a benchmark confounder, scaled up by a factor of 50. We choose the US headquarters variable as a benchmark confounder because it is an important predictor of exposure to climate change (see balance figure D.4) and is the covariate for which we find the largest significant relationship with climate lobbying in our main models.

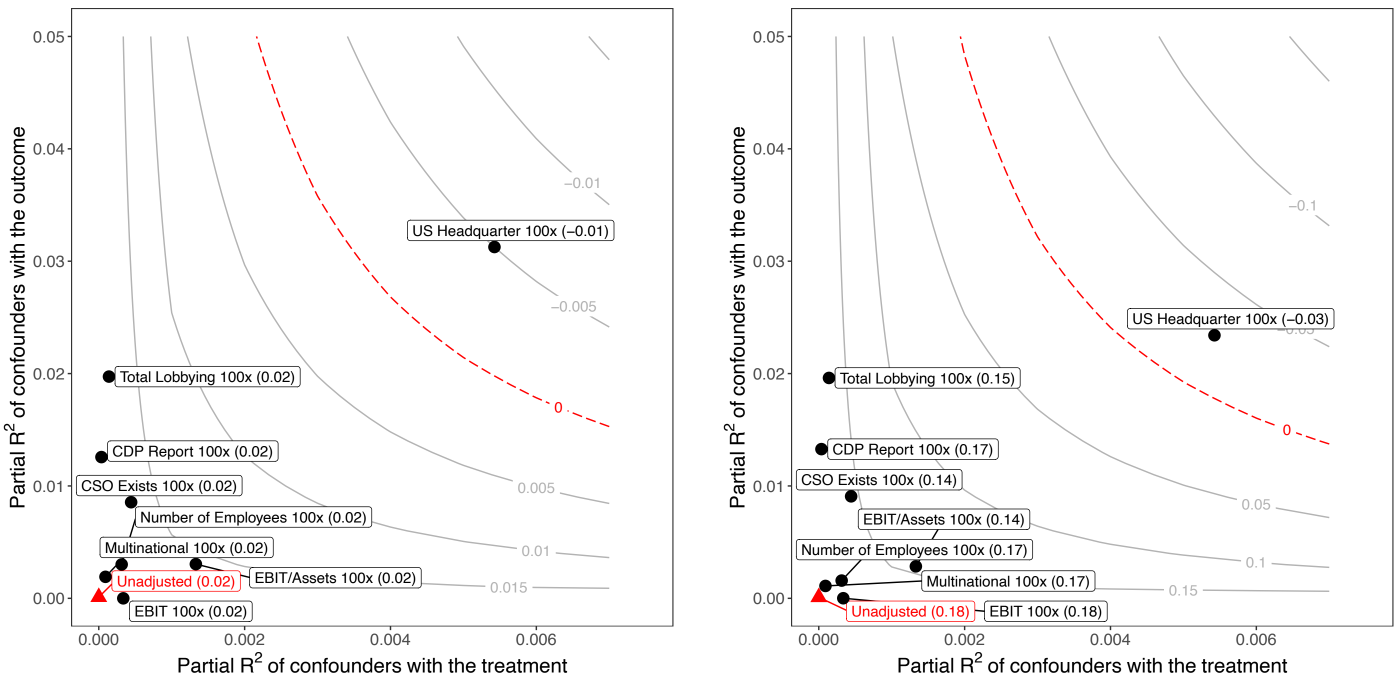
Specifically, $R^2_{D\sim Z\mid\mathbf{X}}$ shows the partial R^2 of the US headquarters variable with the treatment (after partialing out other covariates), and $R^2_{Y\sim Z\mid\mathbf{X},D}$ shows its partial R^2 with the outcome. For Opportunity exposure, even a confounder 50 times as strong as the US headquarters covariate would only explain about 0.047% of the residual variance in the treatment and 0.5% of the residual variance in the outcome. These values are notably smaller than the robustness values needed to invalidate our findings (1.1% for $RV_{q=1}$ and 0.8% for $RV_{q=1,\alpha=0.05}$), suggesting that our results are robust to confounders substantially stronger than an important observed covariate like US headquarters status.

Benchmarks: Next, we perform a benchmarking exercise to investigate how difficult it is to find a confounder strong enough to overturn the results. We estimate model specifications with an augmented set of control variables (see E.1). In terms of underlying data-generating structure, these augmented controls capture a wide range of firm-level variation plausibly correlated with both our treatment (the climate-exposure variables) and our outcomes (climate lobbying). For instance, EBIT or EBIT/Assets measure financial resources that could boost both lobbying capacity and a firm's vulnerability or response to climate policies, while a US headquarters might reflect distinct regulatory environments or socio-political norms. We also add variables from Orbis and Lerner and Osgood (2023) such as the existence of a Chief

Sustainability Officer, CO_2 emissions reporting, and multinational status. Including these variables further diminishes the likelihood that an unobserved driver remains both highly correlated with climate exposure and highly predictive of lobbying while also being orthogonal to all included covariates. By artificially "inflating" these observed covariates (in partial R^2 terms), we demonstrate the difficulty of identifying such a confounder that would exceed the explanatory power of this enriched set of controls and thereby nullify our findings. Of course, we cannot fully exclude the existence of some unprecedented, unmeasured factor. However, these expanded specifications and inflated benchmarks show that such a factor would have to be extraordinarily large and unlike anything we observe among real-world firm characteristics.

Figure G.1: Sensitivity analysis: Opportunity

(a) Occurrence (b) Amount



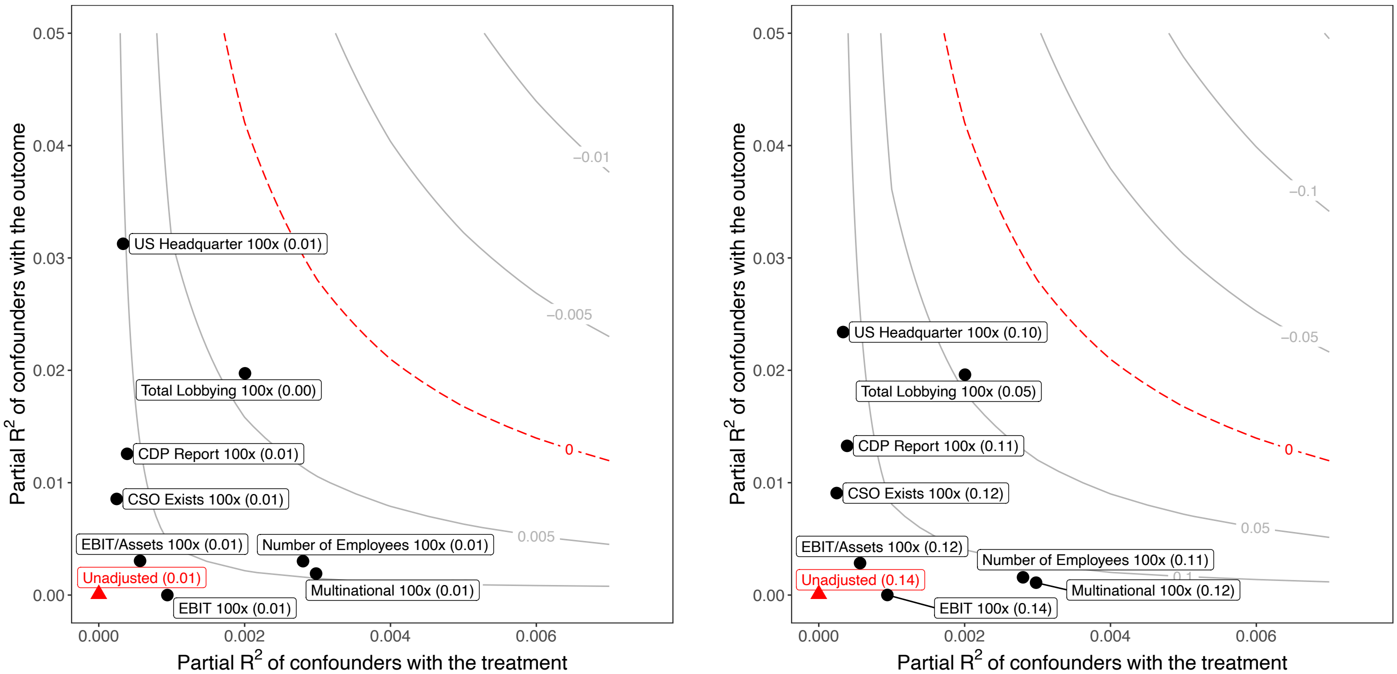
Notes: Results of the sensitivity analysis for *Opportunity* exposure. The contour plots show how the estimated effect of climate opportunity exposure on climate lobbying occurrence and amount would change under different degrees of confounding. The red dashed line indicates where the effect becomes zero. Benchmark points show how strong an unobserved confounder would need to be (relative to observed covariates) to nullify the estimated effect. Values in parentheses show the adjusted treatment effect estimate for each benchmark. The red diamond depicts the unadjusted treatment effect. Estimates come from a model specification with an augmented set of controls. Standard errors are clustered by firm and year.

Figures G.1 and G.2 plot the possible influence of an unobserved confounder on our estimated climate exposure coefficients for both occurrence and amount. Each figure shows a contour map of how the adjusted estimate of our treatment (e.g. "Opportunity") would vary, depending on the partial R^2 of a hypothetical confounder with (a) the treatment (horizontal axis) and (b) the outcome (vertical axis) (while being orthogonal to all other covariates in the model). The solid gray contours represent constant levels of the adjusted coefficient, and the red dashed line indicates the boundary where the adjusted coefficient equals zero. Diamonds labeled "*Unadjusted*" indicate our main estimate (partial $R^2 = 0$ for an unobserved confounder), whereas the labeled points for the covariates show how large a confounder would need to be – relative to each observed covariate – if multiplied by a factor of 100. Note that we do not report these plots for "physical" exposure to climate change given that we find insignificant results across in our main models as well as in most alternative specifications for this explanatory variable.

From these plots, we see that for lobbying occurrence, the only instance in which the coefficient flips sign (i.e. crosses the zero contour) is when the "US Headquarter" covariate is inflated by a factor of 100.

Figure G.2: Sensitivity analysis: Regulatory

(a) Occurrence (b) Amount



Notes: Results of the sensitivity analysis for *Regulatory* exposure. The contour plots show how the estimated effect of climate regulatory exposure on climate lobbying occurrence and amount would change under different degrees of confounding. The red dashed line indicates where the effect becomes zero. Benchmark points show how strong an unobserved confounder would need to be (relative to observed covariates) to nullify the estimated effect. Values in parentheses show the adjusted treatment effect estimate for each benchmark. The red diamond depicts the unadjusted treatment effect. Estimates come from a model specification with an augmented set of controls. Standard errors are clustered by firm and year.

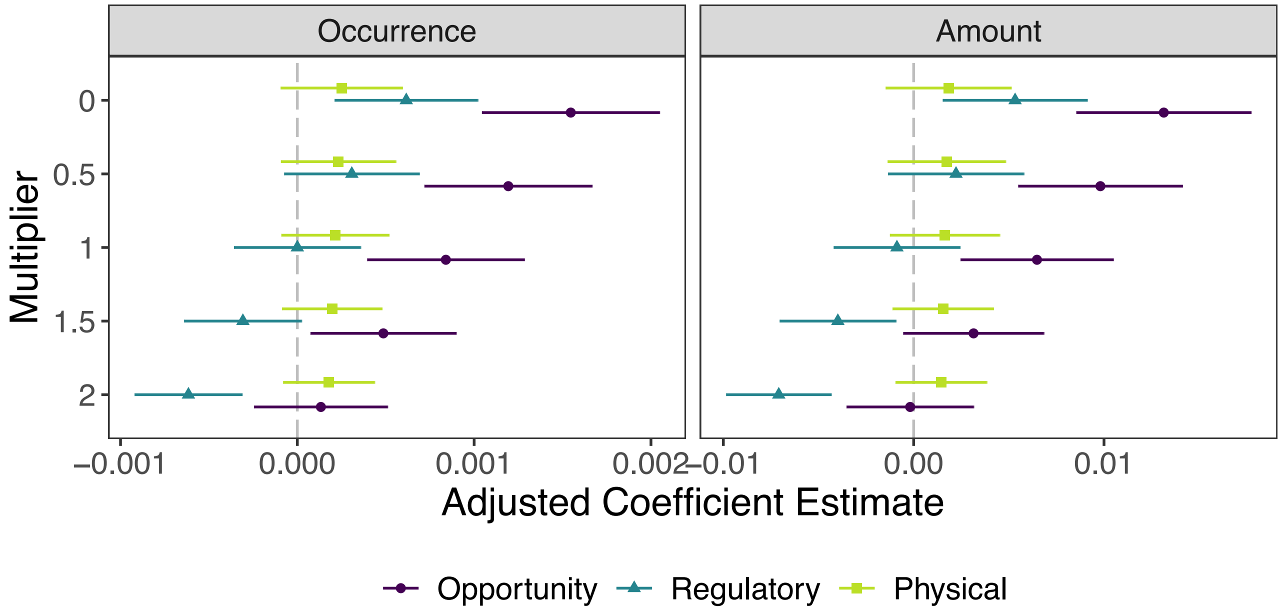
This suggests that only an extremely powerful confounder – one far stronger than any observed control – could eliminate the positive coefficients we find for Opportunity or Regulatory exposure. By contrast, for lobbying amount, no potential confounder tested (even scaled up to 100 times its observed strength) manages to drive the coefficient below zero. In short, none of the plausible benchmark variables come close to invalidating the results, reinforcing that one would need a confounder substantially larger than any we actually observe.

Policy feedback confounding: Last, we assess the sensitivity of our results to dynamics of policy feedback. In SI section F.1, we present results of model specifications that incorporate a lagged dependent variable into the model. We find that including prior lobbying behavior reduces the effect size for opportunity and regulatory exposure while it increases the estimate for physical exposure.

Therefore, we also assess the sensitivity of our findings to the possibility of confounding of the strength of (or larger than) prior lobbying behavior. We re-estimate both our lobbying-occurrence and lobbying-amount models adding a lag of the dependent variable as an additional regressor. We then examine how our main effect estimates change when we include a confounder stronger than the lagged dependent variable.

As shown in SI figure G.3, the effect estimates of opportunity and regulatory exposure are sensitive to an unobserved confounder of the size of (or stronger than) prior climate lobbying behavior. Opportunity exposure is indistinguishable from 0 if we were to include an additional confounder 150-200% of the strength of the lagged dependent variable. Regulatory exposure is more sensitive and becomes indistinguishable from 0 if there existed a confounder 50% of the size of prior climate lobbying. While the adjusted coefficient for regulatory exposure becomes negative and statistically significant under strong hypothetical confounding

Figure G.3: Sensitivity analysis based on lagged dependent variable



Notes: This figure shows how the estimated effects of the climate-exposure variables (Opportunity, Regulatory, Physical) change under varying degrees of potential confounding, relative to the magnitude of the lagged DV. The multiplier (y-axis) indicates how many times stronger the unobserved confounding would need to be compared to the observed lagged dependent variable. Points show the adjusted coefficient estimates, and horizontal lines represent 95% confidence intervals. A multiplier of 0 shows the unadjusted estimates, while higher multipliers show how the estimates would change if unobserved confounding was up to 50% to 200% times as strong as the observed temporal dependence in lobbying behavior. The persistence of statistical significance even under extreme confounding scenarios suggests the robustness of the temporal dependency in climate lobbying.

(1.5–2x the strength of the lagged dependent variable), we interpret this cautiously. Such sign reversals can occur in sensitivity analyses when the assumed bias is large, and may not reflect meaningful negative effects. The effect sizes of physical exposure are not sensitive to the inclusion of such confounding.

Interpreting this analysis, we find it unlikely to discover an unobserved confounder (or a combination of multiple confounders) in practice that is both stronger than the lagged dependent variable (one of the single most predictive variables in our model) that is also orthogonal to this lagged DV. In other words, for a confounder to drive both future lobbying behavior and exposure to climate risk – and do so independently of past lobbying and the other included baseline controls – would require a very specific and powerful omitted factor. While not impossible, such a scenario is considerably less plausible given the many firm-level and contextual variables already controlled for in our main model. Thus, our findings remain reasonably robust to more realistic levels of time-dependent confounding.

In addition, we interpret these findings as further indications for the existence of policy feedback dynamics in the relationship between firms' exposure to climate change and their subsequent lobbying behavior given that physical risk is likely to be most orthogonal to prior lobbying while climate-induced opportunities and especially regulatory risk are more directly affected by policymaking processes.

H Placebo Tests

We further test our central claim – that climate change exposure increases climate-specific lobbying – by conducting a series of placebo tests. The idea is that if heightened climate exposure also causes lobbying in areas unrelated to climate change, this would indicate a different cause of political activity. Conversely, if exposure only correlates with climate (and climate-adjacent) issue lobbying, it supports our argument that firms' political activities are specifically targeted at climate policy.

To implement these placebo tests, we proceed as follows. First, we identify whether certain issues outside our main set of climate-related issue codes (Clean Air & Water, Energy/Nuclear, Environment, and Fuel/Gas/Oil) still appear correlated with climate lobbying. We do this by investigating the co-occurrence of climate issues and other policy issues in three ways. (1) We analyze a separate "out-of-sample" period (1999 and 2000), which does not enter our main estimations, so as to avoid "look-ahead" bias in identifying which issues coincide with climate lobbying. (2) As a robustness check, we repeat this exercise on the full 1999–2023 period for which lobbying data exists. (3) We employ an alternative measure of climate lobbying – namely, whether the lobbying report text contains climate-related keywords – and examine which other issues tend to appear alongside these references to climate change.

From these three approaches, we find that several issues – such as Taxation, Budget/Appropriations, Transportation, Natural Resources, Health, Labor, Agriculture, Homeland Security, Defense, and Utilities – consistently co-occur with climate-related lobbying (see Figure H.1). We therefore conclude that these issues are not "clean" placebos. They may well be indirectly affected by climate exposure (e.g., changes in energy inputs or supply-chain risks) and thus plausibly linked to climate lobbying. By contrast, issues such as "BAN = Banking" or "IMM = Immigration" do not appear to be connected to climate lobbying and thus represent our "clean" placebos.

Figures H.2 and H.3 show that across the range of placebo outcomes, we do not find any systematic evidence that climate exposure drives lobbying on irrelevant issues in a way that would challenge our main conclusions.[24] More precisely, the estimated relationships between climate exposure and lobbying on "clean" placebo issues (i.e., issues deemed unrelated to climate policy) are near zero and statistically insignificant – or occasionally negative – on both the extensive and intensive margins. Note that for opportunity, we find two issues among the clean placebo issues that are positively related to climate exposure – the Automotive industry (AUT) and Telecommunications (TEC). This may be acceptable, as both are sectors that could be indirectly affected by climate-related technologies, making some overlap with climate lobbying plausible despite not being core climate issues.

One possible interpretation of the negative effects is that firms more exposed to climate change might prioritize climate-related and climate-adjacent issues over these other topics, devoting finite lobbying resources to the former at the expense of the latter. However, because these negative relationships are neither systematic nor always precisely estimated, we refrain from drawing strong conclusions on this score.

By contrast, we do observe positive effects for issues that are plausibly climate-adjacent or otherwise affected by climate policy, though these patterns differ across the three dimensions of exposure. Specifically, we find that exposure to opportunities from climate change is associated with increased lobbying on Taxation, Budget, Defense, Trade, Utilities, and Agriculture. Similarly, regulatory risk is associated with increased lobbying on Taxation, Utilities, Trade, and Natural Resources. Physical exposure, by contrast, does not exhibit any positive effect on lobbying for these issues.

Overall, the absence of any consistent positive relationship between climate exposure and truly "clean" placebo issues – together with significant positive effects on a handful of topics likely to be influenced by climate change – lends further support to our argument that climate exposure shapes firms' political engagement in climate-relevant domains.

Equivalence tests: Standard hypothesis tests often use

$$H_0 : \beta_j = 0 \quad \text{versus} \quad H_1 : \beta_j \neq 0 \,.$$

[24] The models were not estimated for lobbying on religion (REL) due to absence of variation in the outcome.

As discussed by Hartman and Hidalgo (2018), a more principled way to demonstrate "no meaningful effect" for placebo tests is a Two One-Sided Tests (TOST) procedure, with

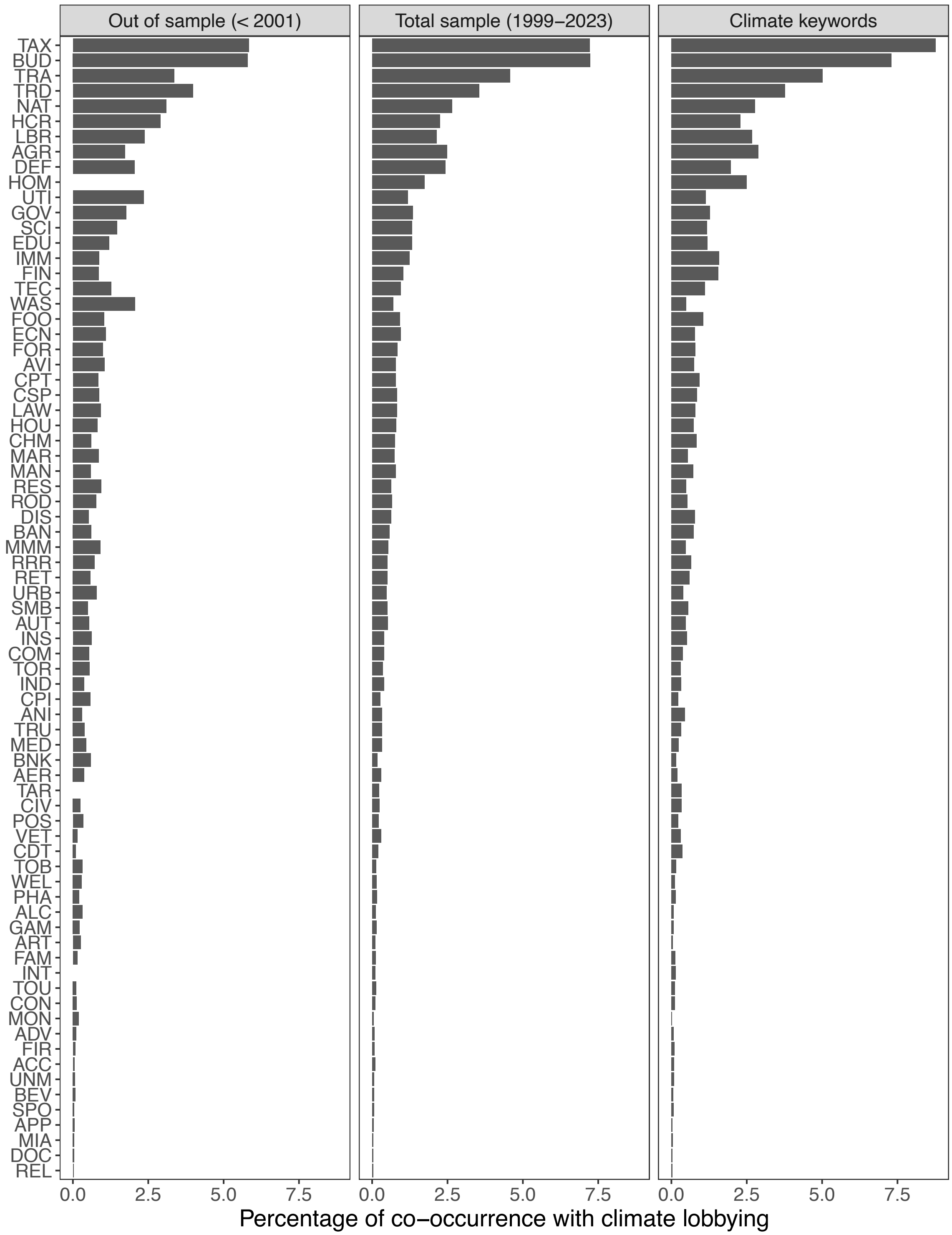
$$H_0: \ \beta_j \leq \epsilon_L \ \text{ or } \ \beta_j \geq \epsilon_U \quad \text{versus} \quad H_1: \ \epsilon_L < \beta_j < \epsilon_U \, ,$$

where β_j refers to the observed standardized estimate of interest and the terms ϵ_U and ϵ_L refer to the pre–specified upper and lower bounds of "substantive equivalence." Rejecting this null means β_j is statistically distinguishable from magnitudes larger than ϵ. In our application, we set ϵ to ± 0.36 standard deviations of the dependent variable, following the guidelines in Hartman and Hidalgo (2018).

In Figures H.4-H.5, we find that none of the estimated climate–exposure coefficients $\hat{\beta}_j$ violate the equivalence region. Hence, the TOST procedure rejects the null of "large" effects for all opportunity, regulatory, and physical exposures. Substantively, these results indicate no evidence that climate exposure drives lobbying on unrelated issues. Hence, in line with Hartman and Hidalgo (2018), these equivalence tests strengthen the conclusion that climate exposed firms do not lobby more on non-climate related issues.

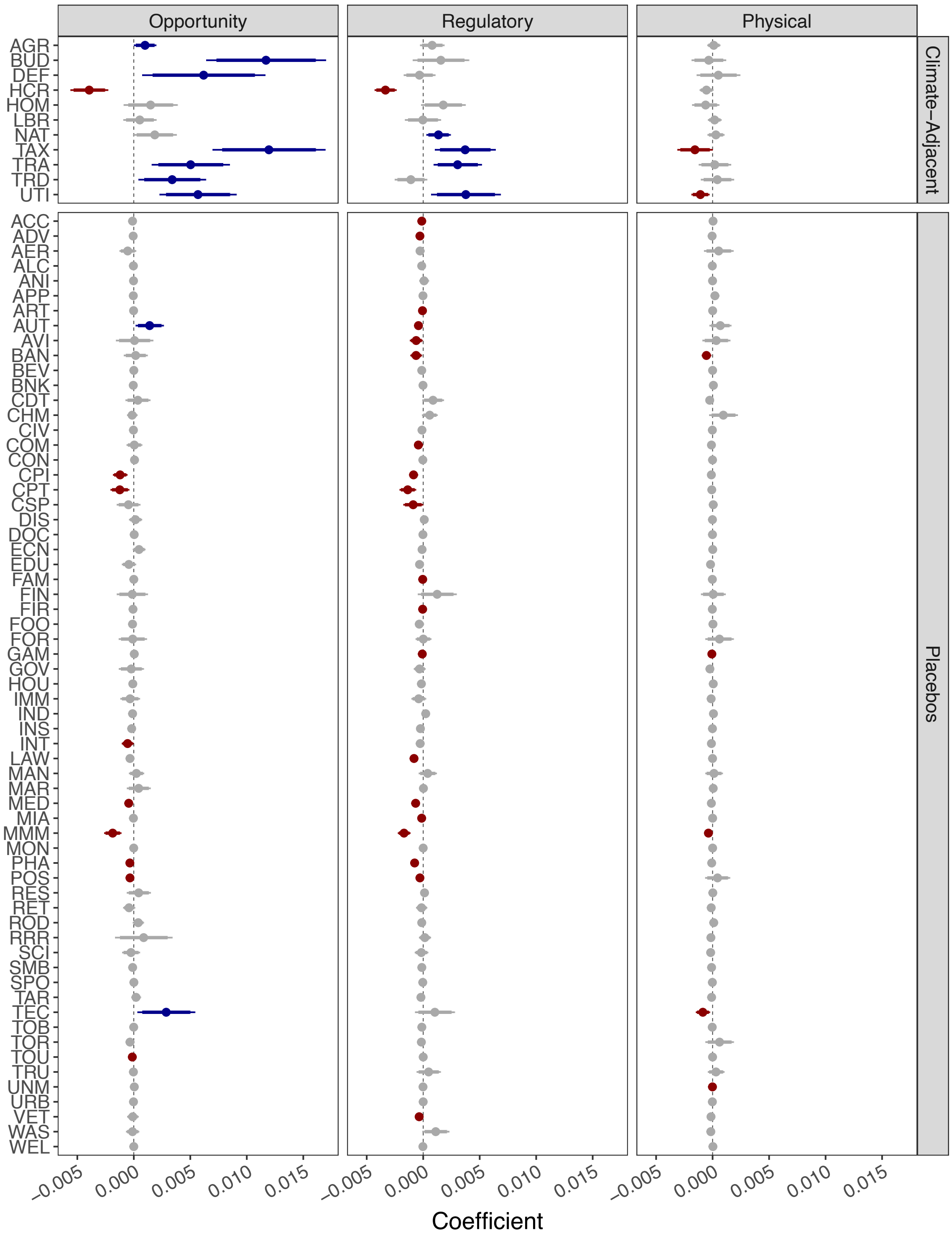
Issue codes: ACC = Accounting, ADV = Advertising, AER = Aerospace, <u>AGR = Agriculture</u>, ALC = Alcohol & Drug Abuse, ANI = Animals, APP = Apparel / Clothing Industry / Textiles, ART = Arts / Entertainment, AUT = Automotive Industry, AVI = Aviation / Aircraft / Airlines, BAN = Banking, BNK = Bankruptcy, BEV = Beverage Industry, <u>BUD = Budget / Appropriations</u>, <u>**CAW = Clean Air & Water (Quality)**</u>, 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, <u>DEF = Defense</u>, DOC = District of Columbia, DIS = Disaster Planning / Emergencies, ECN = Economics / Economic Development, EDU = Education, <u>**ENG = Energy / Nuclear**</u>, <u>**ENV = Environmental / Superfund**</u>, FAM = Family Issues / Abortion / Adoption, FIR = Firearms / Guns / Ammunition, FIN = Financial Institutions / Investments / Securities, FOO = Food Industry (Safety, Labeling, etc.), FOR = Foreign Relations, <u>**FUE = Fuel / Gas / Oil**</u>, GAM = Gaming / Gambling / Casino, GOV = Government Issues, <u>HCR = Health Issues</u>, <u>HOM = Homeland Security</u>, HOU = Housing, IMM = Immigration, IND = Indian / Native American Affairs, INS = Insurance, <u>LBR = Labor Issues / Antitrust / Workplace</u>, 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, <u>NAT = Natural Resources</u>, 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, <u>TAX = Taxation / Internal Revenue Code</u>, TEC = Telecommunications, TOB = Tobacco, TOR = Torts, <u>TRD = Trade (Domestic & Foreign)</u>, <u>TRA = Transportation</u>, TOU = Travel / Tourism, TRU = Trucking / Shipping, URB = Urban Development / Municipalities, UNM = Unemployment, <u>UTI = Utilities</u>, VET = Veterans, WAS = Waste (hazardous / solid / interstate / nuclear), WEL = Welfare.

Figure H.1: Co-occurrence of Policy Issues in Climate-Related Lobbying Reports



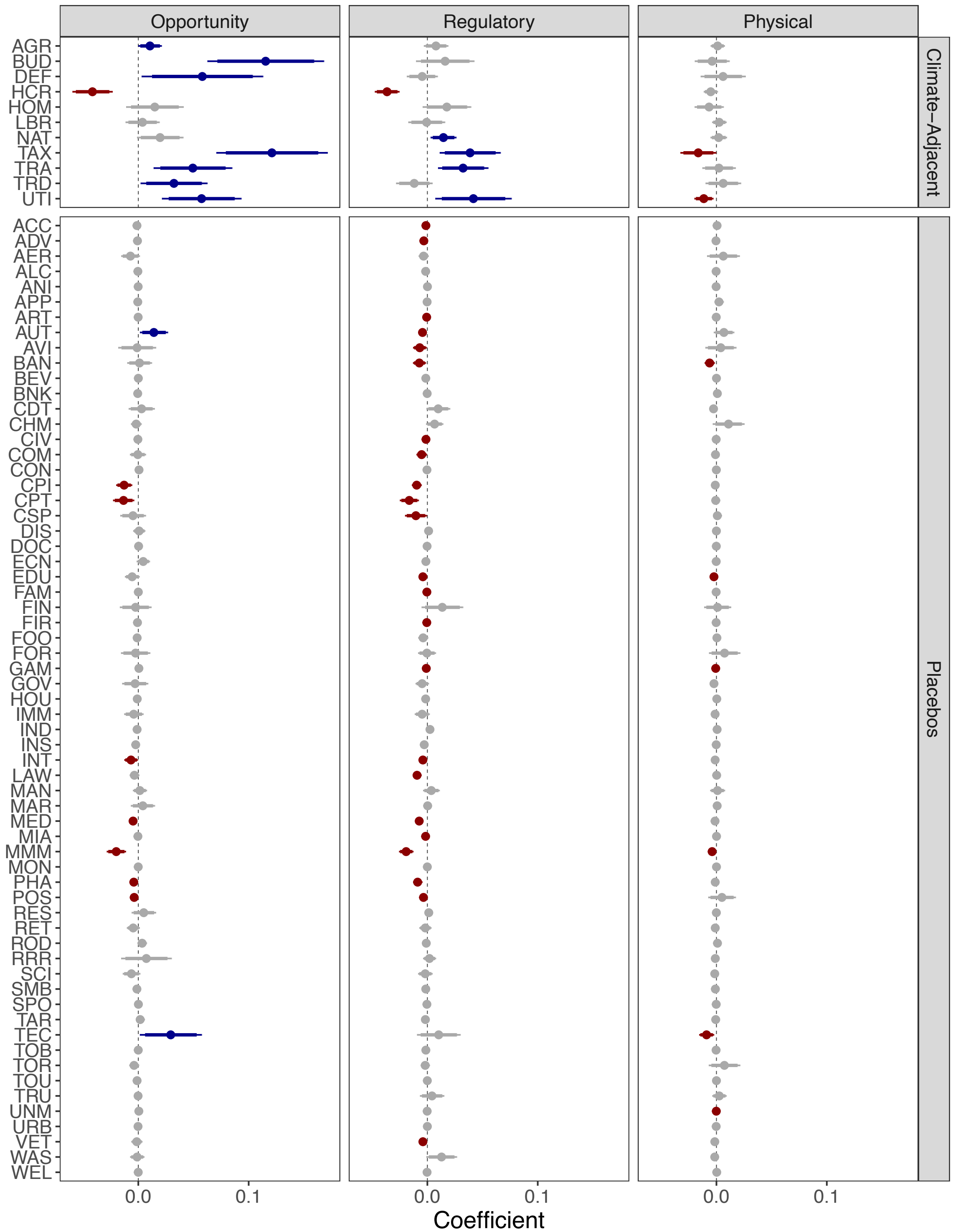
Notes: This figure shows the percentage of times different policy issues appear alongside climate-related lobbying activities. Issue codes are sorted by their average co-occurrence rate across all three methods.

Figure H.2: Placebo Tests: Occurrence



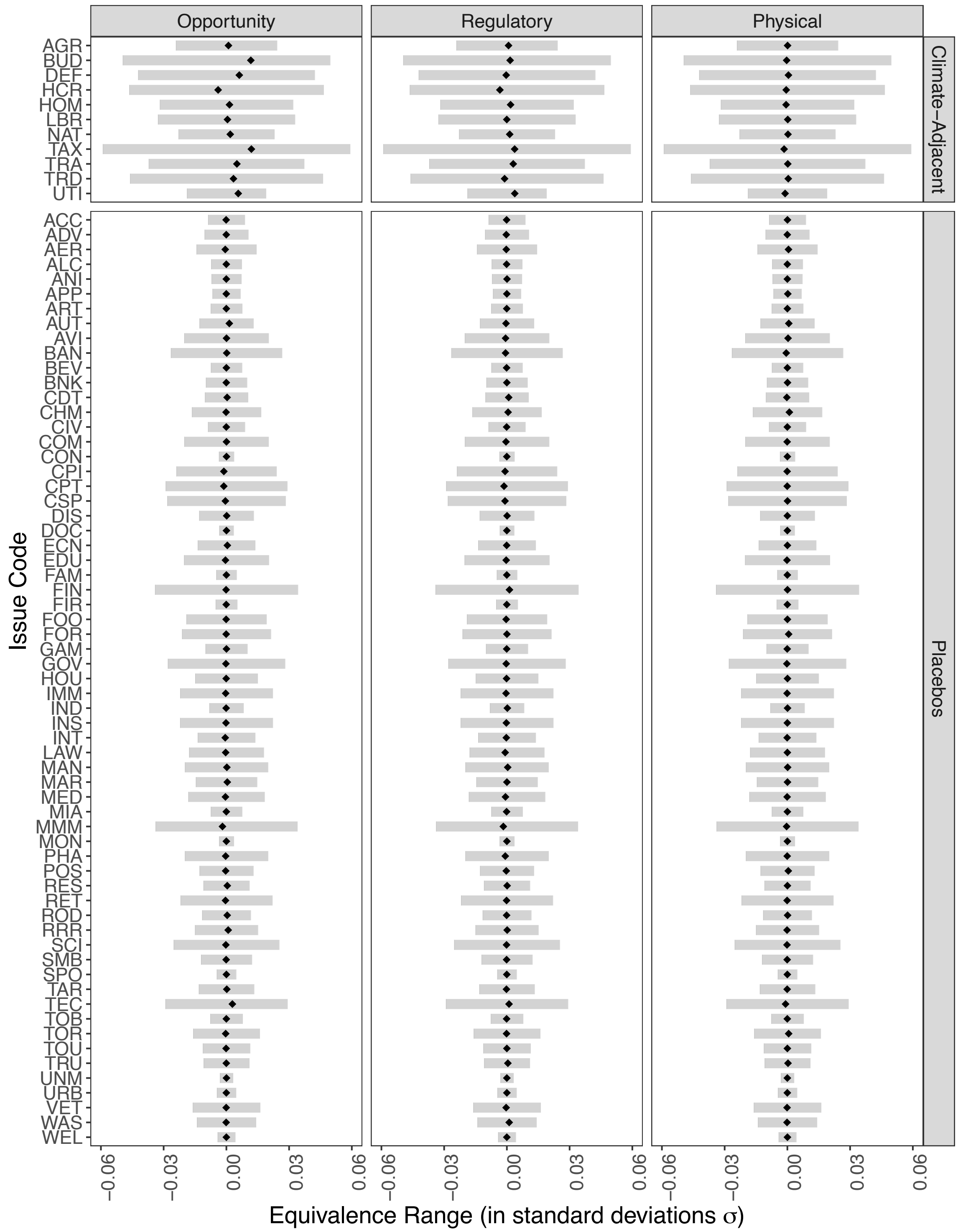
Notes: This figure shows regression coefficients and confidence intervals for the relationship between firms' climate risk exposures and their likelihood of lobbying on non-climate issues. Climate-adjacent issues are those with potential indirect connections to climate policy (e.g., transportation, trade). Points show coefficient estimates, thick bars show 90% confidence intervals, and thin bars show 95% confidence intervals. Blue (red) points indicate positive (negative) coefficients significant at $p < 0.05$. All regressions include industry-year fixed effects and firm-level controls.

Figure H.3: Placebo Tests: Amount



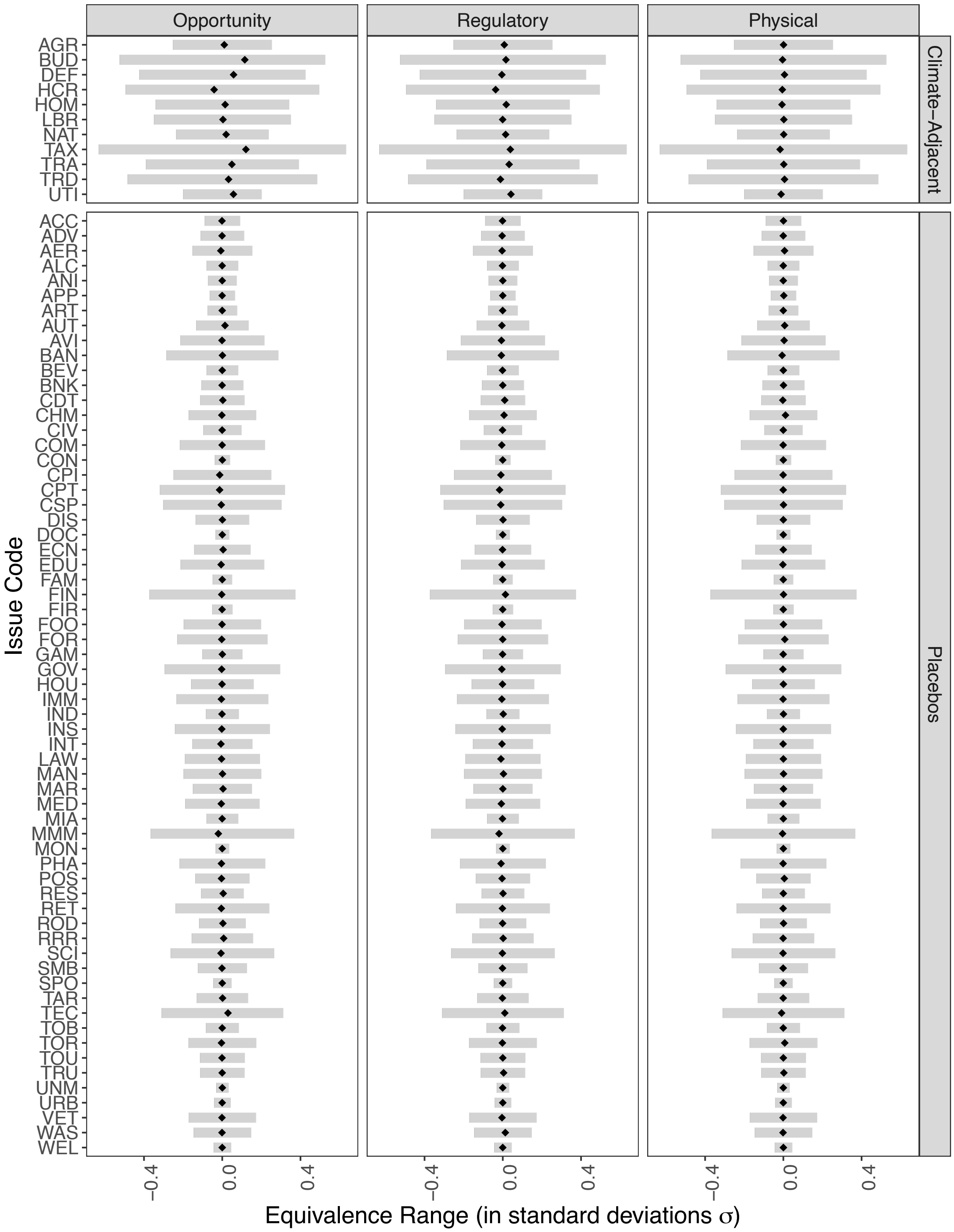
Notes: This figure shows regression coefficients and confidence intervals for the relationship between firms' climate risk exposures and their lobbying amount on non-climate issues. The dependent variable is the log-transformed dollar amount spent for lobbying on a given issue. Climate-adjacent issues are those with potential indirect connections to climate policy (e.g., transportation, trade). Points show coefficient estimates, thick bars show 90% confidence intervals, and thin bars show 95% confidence intervals. Blue (red) points indicate positive (negative) coefficients significant at $p < 0.05$. All regressions include industry-year fixed effects and firm-level controls.

Figure H.4: Equivalence Tests: Occurrence



Notes: This plot visualizes the results of equivalence tests. Gray bars represent the inverted equivalence range supported by the data, presented in standardized differences. The black diamonds represent the observed standardized regression coefficient for the variable of interest.

Figure H.5: Equivalence Tests: Amount



Notes: This plot visualizes the results of equivalence tests. Gray bars represent the inverted equivalence range supported by the data, presented in standardized differences. The black diamonds represent the observed standardized regression coefficient for the variable of interest.

I Additional Information on Case Study

I.1 Keyword Selection

To select the keywords for the descriptive analysis of lobbying content, we refer to relevant bigrams from Sautner et al. (2023, 2024) as a starting point, as we know that these have been tested as relevant to climate opportunity, regulatory, and physical exposure. However, to scrutinize topics related to automotive manufacturing, we further refined the list using key opportunity, regulatory, and physical issues related to climate change raised in the CDP reports. We also drew on our subject matter expertise about political issues for automotive manufacturers, to ensure that each list was mutually exclusive.

I.2 Keyword Analysis

To produce Figure 4, we calculated the within industry median exposure measure for climate opportunity, regulation, and physical impacts. We use the Orbis industry category "transport manufacturing" to best capture the focus firms for the case study. We then calculated the proportion of issue-specific keywords relevant to all other words in the description of "specific lobbying issues" in LobbyView reports that were tagged to climate related issue areas (ENV, ENG, CAW, FUE) for firms above the median compared to those at or below the median.

We use individual keywords (unigrams) because they appear more frequently across texts, capture broader concepts despite variation in phrasing, and are less sensitive to formatting issues – key advantages given the brief and inconsistent language often found in lobbying reports (see table B.1). One drawback is that high-frequency terms like "tax" and "fuel" associated with opportunity exposure are not always accompanied by clarifying terms like "credit" or "alternative," which appear less often. We interpret this pattern as reflecting the broad policy mechanisms – such as tax incentives and fuel-specific subsidies – through which firms pursue climate-related benefits. These terms are more encompassing and strategically salient in lobbying, while narrower terms are used less consistently.

I.3 CDP Analysis

Data & Sample: Companies voluntarily disclose information about their environmental impact through the CDP platform to provide investors with standardized data. Such disclosures are questionnaire-based, meaning that companies respond to detailed and specific questions about their climate change/environmental strategies, targets, and metrics. We analyze CDP reports submitted in 2010, 2014, and 2018 to capture longitudinal trends during our analysis period that are available for the top 12 automakers (by 2020 annual sales). These include BMW, Daimler (Mercedes-Benz Group), Fiat Chrysler Automobiles (FCA), Ford, General Motors, Honda, Hyundai, Peugeot S.A., Renault-Nissan, Suzuki, Toyota, and Volkswagen.

Within the reports, we focus on the "Risks and Opportunities" Module which presents a set of standardized questions about whether a company anticipates regulatory risks/opportunities, physical risks/opportunities, or other types of risks/opportunities. This module allows us to understand whether our hypothesized mechanisms of motive, policy good, and time horizon operate differently across the different types of climate exposure.

Coding: To code the responses, we conduct a thorough reading of the Risks and Opportunities Module. We capture the risks and opportunities identified by each firm including: 1) type (regulatory, physical, other); 2) description; 3) time horizon (number of years); 4) likelihood (likely to not likely); and 5) impact (high to low) in response to standardized questions.[25] We also note whether firms mention their position

[25] Note, questions are standardized within years meaning that firms are typically selecting from drop down menus in response to the same questions. While the exact questions and answer options vary some across years, all reports ask about the 5 components we analyze.

relative to industry competitors in their description of why they view something as a risk or opportunity.

Findings: Tables I.1 - I.3 summarize the distribution of the expected time horizon, likelihood, and impact of risks and opportunities. Each is grouped by type, as identified by the company (regulatory, physical, or other). These tables demonstrate that firms are more likely to view opportunities as in the current or short-term, high likelihood, and high impact compared to risks. This provides suggestive evidence in support of our hypothesized mechanisms explaining why firms may prioritize different levels and types of lobbying in response to variation in climate exposure types.

Table I.1: Time Horizon Distribution by Risk/Opportunity and Type

R/O	Type	Current	Short-term	Medium-term	Long-term	Uncertain/Unspecified
Opportunity	Regulatory	17 (47.2%)	10 (27.8%)	6 (16.7%)	2 (5.6%)	1 (2.7%)
Opportunity	Physical	6 (42.9%)	3 (21.4%)	1 (7.1%)	1 (7.1%)	3 (21.4%)
Opportunity	Other	19 (33.3%)	14 (24.6%)	18 (31.6%)	5 (8.8%)	1 (1.8%)
Risk	Regulatory	19 (28.8%)	17 (25.8%)	19 (28.8%)	8 (12.1%)	3 (4.5%)
Risk	Physical	16 (35.6%)	13 (28.9%)	4 (8.9%)	6 (13.3%)	6 (13.3%)
Risk	Other	9 (31%)	9 (31%)	7 (24.1%)	3 (10.3%)	1 (3.5%)

Table I.2: Likelihood Distribution by Risk/Opportunity and Type

R/O	Type	Low	Medium	High	Unspecified
Opportunity	Regulatory	0 (0%)	4 (11.1%)	26 (72.2%)	6 (16.7%)
Opportunity	Physical	1 (7.1%)	4 (28.6%)	7 (50%)	2 (14.3%)
Opportunity	Other	0 (0%)	13 (22.8%)	35 (61.4%)	9 (15.8%)
Risk	Regulatory	8 (12.1%)	9 (13.6%)	36 (54.6%)	13 (19.7%)
Risk	Physical	4 (8.7%)	19 (41.3%)	15 (32.6%)	8 (17.4%)
Risk	Other	1 (3.5%)	6 (20.7%)	17 (58.6%)	5 (17.3%)

Table I.3: Impact Distribution by Risk/Opportunity and Type

R/O	Type	Low Impact	Medium Impact	High Impact	Unspecified
Opportunity	Regulatory	7 (19.4%)	9 (15.8%)	17 (47.2%)	6 (16.7%)
Opportunity	Physical	3 (21.4%)	2 (14.3%)	7 (50%)	2 (14.3%)
Opportunity	Other	11 (19.3%)	9 (15.8%)	28 (49.1%)	9 (15.8%)
Risk	Regulatory	10 (15.2%)	15 (22.7%)	28 (42.4%)	13 (19.7%)
Risk	Physical	11 (24%)	13 (28.3%)	12 (26%)	10 (21.7%)
Risk	Other	2 (6.9%)	10 (34.5%)	11 (37.9%)	6 (20.7%)

References

Amore, Mario Daniele and Samuele Murtinu (2021). Tobit models in strategy research: Critical issues and applications. *Global Strategy Journal 11*, 331–355.

Berkman, Hank , Jonathan Jona, and Naomi Soderstrom (2024). Firm-specific climate risk and market valuation. *Accounting, Organizations and Society 112*.

Bolton, Patrick and Marcin Kacperczyk (2021). Do investors care about carbon risk? *Journal of Financial Economics 142*(2), 517–549.

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

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.

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.

de Figueiredo, John M. and Brian Kelleher Richter (2014). Advancing the Empirical Research on Lobbying. *Annual Review of Political Science 17*(1), 163–185.

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*.

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

Gennaioli, Nicola (2018). *A Crisis of Beliefs : Investor Psychology and Financial Fragility*. Princeton, NJ: Princeton University Press.

Giglio, Stefano , Bryan Kelly, and Johannes Stroebel (2021). Climate Finance. *Annual Review of Financial Economics 13*(Volume 13, 2021), 15–36.

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.

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.

Hsueh, Lily (2019). Opening up the firm: What explains participation and effort in voluntary carbon disclosure by global businesses? An analysis of internal firm factors and dynamics. *Business Strategy and the Environment 28*(7), 1302–1322.

Huang, Qiping and Meimei Lin (2022). Do climate risk beliefs shape corporate social responsibility? *Global Finance Journal 53*, 100739.

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.

Lerner, Michael and Iain Osgood (2023). Across the boards: Explaining firm support for climate policy. *British Journal of Political Science 53*, 934–957.

Li, Qing , Hongyu Shan, Yuehua Tang, and Vincent Yao (2024). Corporate climate risk: Measurements and responses. *The Review of Financial Studies 37*, 1778–1830.

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.

Mummolo, Jonathan and Erik Peterson (2018). Improving the interpretation of fixed effects regression results. *Political Science Research and Methods 6*, 829–835.

Prakash, Aseem (2001). Why do firms adopt 'beyond-compliance' environmental policies? *Business Strategy and the Environment 10*(5), 286–299.

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

Sautner, Zacharias , Laurence Van Lent, Grigory Vilkov, and Ruishen Zhang (2024). Data for 'Firm-level Climate Change Exposure'.

Senate Office of Public Records (2021). Lobbying disclosure act guidance.