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Environmental Lobbying, Innovation, and the Green Transition

Finance Working Paper N° 921/2023
Revised June 2026

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Abstract

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Keywords: environmental lobbying, green innovation, ESG

JEL Classification: D72, O31, G30

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Abstract

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1. Introduction

Corporate responses to climate change have been studied primarily through the lens of green innovation, yet firms possess another powerful tool for managing climate-related pressures: the ability to shape the regulatory environment. Critically, both influence the pace and direction of the green transition. As Zingales (2017) observes, "most firms are actively engaged in protecting their source of competitive advantage through a mixture of innovation, lobbying, or both." The objective of this paper is to examine firms' lobbying on environmental-related issues and the ways in which firms jointly employ innovation and lobbying.

Understanding the direction of firms' environmental lobbying is crucial. On the one hand, firms might rationally lobby to increase demand for their innovations: firms devoting more resources toward green innovation would focus their lobbying in pro-green directions, and the combination of regulatory pressure and innovative developments pushing jointly in the same direction would arguably expedite the green transition. Alternatively, firms might simultaneously lobby in one direction and innovate in the opposite direction. For example, brown firms might innovate green to prepare for a world dominated by green technologies but simultaneously lobby brown to protect sources of current cash flows for as long as possible. While efficient from the standpoint of each individual firm, this scenario has greater social costs. If green innovation is both protected by patents and held within brown firms that actively strive to prolong brown means of operation, then the green transition will be slower. The objective of this paper is to understand the ways in which firms employ environmental lobbying and the informativeness of each of these competitive tools, that is, innovation and lobbying, for firms' environmental strategies and footprints.

Although it is well established that firms engage in political lobbying, relatively little is known about the specific positions they advocate because disclosure of lobbying direction is not

required. We overcome the lack of disclosure by developing a novel approach to capture the direction of environmental lobbying, distinguishing "green" (pro-environment) and "brown" (anti-environment) lobbying. We obtain detailed lobbying data from reports filed with the Senate Office of Public Records (SOPR) and OpenSecrets, and we use textual analysis and machine learning techniques to identify lobbying transactions related to environmental issues, including both climate change topics and broader environmental topics. Within our sample of U.S. public companies, nearly 40% of lobbying firms devote resources to environmental issues. As a first validation of our classification, we find that firms with greater exposure to EPA regulatory activity, as measured by the relatedness of their 10-K business description to EPA regulatory documents, spend a significantly higher fraction of their lobbying dollars on environmental issues. This increases monotonically from under 10% in the lowest quartile of regulatory exposure to nearly 40% in the highest.

To identify the direction of environmental lobbying, we obtain the political contributions of each individual lobbyist and use them to infer whether each lobbying transaction is pro-environment or anti-environment. This identification strategy relies on the fact that, in the U.S., environmental issues are highly polarized along political lines, with Democrats being more pro-environment than Republicans, both among the general population and among members of Congress. Moreover, firms tend to hire not only a lobbying firm but specific individual lobbyists within that firm; lobbyists tend to work with their political allies rather than with their adversaries; and they tend to make personal contributions to their preferred party. Importantly, a strength of our approach is that we measure the direction of firms' lobbying using the political affiliations of each individual lobbyist in each individual transaction, as opposed to the overall political stance of management.

With this measure in hand, we focus on three questions. First, we analyze the determinants

of firms' pro-environmental versus anti-environmental lobbying, and we examine whether the direction of firms' environmental lobbying predicts their actual environmental footprints. Second, we investigate the ways in which firms jointly employ green innovation and environmental lobbying, and we contrast the informativeness of each as signals of firms' environmental trajectory. Third, we examine the extent to which market participants recognize the informativeness of each of these signals.

Turning to our first question, we predict that firms' lobbying tendencies are related to their current sources of cash flows, that is, firms employ lobbying to influence regulatory policies in ways that benefit current business models. In the environmental setting, this suggests that firms will be more likely to engage in green lobbying if they receive a greater portion of their cash flows from green sources. We find strong support for this prediction. Moreover, our results on the determinants of lobbying hold under both Democratic and Republican political regimes, confirming that our measure captures firms' environmental strategy rather than political opportunism.

If lobbying direction is a genuine signal of firms' environmental strategy, we conjecture that it will be informative regarding their future environmental footprints. We focus on toxic emissions, as reported in the EPA's Toxic Release Inventory (TRI) dataset.[1] This is a mandatory regulatory disclosure that provides a reliable and granular measure of firms' actual environmental footprint, and precisely the type of outcome that environmental lobbying targets. Consistent with predictions, we find that brown lobbying is a strong and economically significant predictor of toxic emissions over the following three years: firms that lobby brown today emit significantly more. A placebo test confirms that this predictive power is specific to the environmental direction of

[1] This contrasts with literature that focuses more narrowly on climate, and therefore analyzes carbon emissions.

lobbying, and not merely a proxy for a firm's general political leaning: Republican-leaning lobbying on non-environmental issues carries no predictive power for emissions.

In the second part of the paper, we examine the ways in which firms jointly use lobbying and innovation as competitive tools, as suggested by Zingales (2017). Following prior literature (Hall et al., 2005; Kogan et al., 2017; Hirshleifer et al., 2013), we rely on patents as a measure of firms' innovation strategy. To characterize firms' green innovation, we determine whether a patent granted to a U.S. firm relates to green technologies based on OECD classifications.[2] We employ several alternative measures of green innovation, including the number of green patents, their quality as measured by citations, and their market value.

We find that firms engaged in environmental lobbying also tend to have active environmental innovation programs, as measured by patents. However, we find no evidence that firms, on average, employ these two competitive tools in the same direction. Green innovators are equally likely to lobby brown as to lobby green, and they spend substantially more in absolute dollars on brown lobbying than firms without green patents.

When we examine the informativeness of lobbying versus innovation as signals of firms' future environmental footprints, we find that brown lobbying is associated with approximately 20-24% higher toxic emissions in each of the following three years, whereas green innovation has no significant predictive power across any of our specifications or innovation measures. This result builds on Bolton et al. (2024), who show that green innovation is unrelated to future carbon emissions; we extend this finding by showing that it is lobbying – not innovation – that carries the informative signal about firms' near-term environmental trajectory.

In the third and final part of the paper, we examine whether market participants recognize

[2] In additional analyses, we employ the method of Dechezlepretre et al. (2020) to classify patents into clean versus dirty technologies.

and respond to firms' lobbying behavior. We find that they do not. First, we find that firms' lobbying is not recognized by ratings agencies: the fraction of lobbying expenditures directed towards brown directions is not significantly related to MSCI's environmental ratings, the ESG rating provider with the most comprehensive coverage. Second, institutional investors as a whole similarly ignore firms' lobbying behavior in their portfolio decisions. Even UN PRI signatories – investors who have publicly committed to responsible investment principles – show no systematic tendency to avoid brown lobbyers, with only weak and marginal evidence that they reward green lobbying.

These results point to a potential misallocation of pro-environmental capital: ESG investment flows are directed toward firms on the basis of their innovation activity, which carries limited information about near-term environmental outcomes, while the more informative signal contained in lobbying behavior remains hidden.

Our paper contributes to three strands of literature. First, we contribute to the literature on corporate lobbying. Prior work examines the implications of lobbying for resource misallocation (Huneeus and Kim, 2020), firm value (Borisov, Goldman, and Gupta, 2016; Grotteria, 2024), and political connections (Blanes i Vidal, Draca, and Fons-Rosen, 2012; Bertrand, Bombardini, and Trebbi, 2014). We are the first to characterize the direction of corporate environmental lobbying, and to show that this direction has measurable real consequences. Prior literature focusing on environmental lobbying studies a specific bill (Meng and Rode, 2019), or measures lobbying without characterizing its direction (Brulle, 2018; Hassan et al., 2019).[3] Relative to these prior studies, we are the first to develop a new approach to infer the direction of firms' lobbying efforts across a broad set of environmental issues. Leippold et al. (2026) follow our identification strategy

[3] Recent work on lobbying and innovation studies these activities as tools for political risk mitigation (Rahman et al., 2022) or as responses to natural disasters within the automotive industry (Cutinelli Rendina et al., 2023).

to define green and brown lobbying on climate-related issues and examine the association with firm returns. As shown by Kang (2016), lobbying influences legislative outcomes, and regulatory actions represent a key factor in the green transition (Acemoglu et al., 2016; IMF, 2021, 2023).

Second, we contribute to the literature on green innovation. Our findings build upon Cohen et al. (2026), who show that green innovators are concentrated within traditionally brown industries such as oil and energy. Our evidence also builds upon Bolton et al. (2024), who find that firms with a larger stock of brown patents or with higher emissions are reluctant to switch to green technologies because of the potentially negative effects on their competitiveness. We show that brown firms do engage in green innovation, but simultaneously strive to preserve their brown cash flows through lobbying – and that it is this lobbying, not their innovation, that predicts their near-term environmental footprint. These findings are relevant for policies aimed at expediting the green transition by subsidizing green innovation, as they suggest that innovation alone may be insufficient if firms simultaneously lobby to slow the regulatory conditions that would make those innovations necessary.

Third, we contribute to the growing literature on ESG ratings and sustainable investment (Berg et al., 2021; Pástor, Stambaugh, and Taylor, 2022; Baker, Egan, and Sarkar, 2023). We highlight how both rating agencies and institutional investors fail to incorporate one of the most informationally relevant dimensions of firms' environmental conduct.

2. Data

We construct a dataset that includes firm financial information, firms' lobbying transactions, individual lobbyists' political contributions, patent data, and various other firm characteristics that are used in our empirical analysis. We define each data source below.

2.1. Sample of firms

Our initial sample consists of all publicly traded firms with CRSP and Compustat data from 1999 to 2020, where the starting year of 1999 is dictated by publicly available machine-readable lobbying reports. We exclude firms with less than $10 million in assets and firms with non-positive sales, and we winsorize financial ratios (Book leverage, EBIT/Assets, Cash/Assets) at the 1% and 99% levels annually. In our main analysis, we further restrict the sample to firm-years with lobbying. As shown in Panel A of Table 1, firms in our sample have average assets of $16.4 billion, book leverage of 27%, EBIT/Assets of 4%, and Cash/Assets of 17%.

Our innovation data is based on patents granted to public firms using the extended KPSS data, which covers patents granted between 1926 and 2020, and PatentsView.[4] Using the CPC (Cooperative Patent Classification) and IPC (International Patent Classification) codes, we employ two approaches to identify patents with an environmental focus.[5] First, we identify patents that pertain to green technology (i.e., *green* patents) using the OECD classifications.[6] Green patents include issues such as environmental management, water-related adaptation technologies, and climate change mitigation technologies. Second, we identify *clean* patents and *dirty* patents, following Dechezlepretre et al. (2020).[7] Patents that are classified as both clean and dirty (this may occur when a patent includes multiple technology classes) are classified as neither clean nor dirty. To measure a firm's stock of current innovation, we focus on patents granted over a five-year period, *t*-4 through *t*.

[4] PatentsView is a patent data visualization and analysis platform supported by the Office of the Chief Economists in the USPTO. Following prior literature, we focus on utility patents (thus excluding design patents and plant patents).
[5] The CPC-IPC concordance table is available at https://www.cooperativepatentclassification.org/cpcConcordances
[6] https://www.oecd.org/environment/consumption-innovation/ENV-tech%20search%20strategies,%20version%20for%20OECDstat%20(2016).pdf
[7] Examples of clean patents include energy generation from renewable and non-fossil sources, combustion technologies with mitigation potential, and other technologies with potential contribution to emissions mitigation. Examples of dirty patents include steam engine plants, gas turbine plants, and combustion engines.

We measure the environmental impact for each firm-year using the Environmental Protection Agency (EPA) Toxic Release Inventory (TRI) dataset (see, e.g., Naaraayanan et al., 2021; Kim et al., 2019; Lyu et al., 2022). We focus on onsite emissions, which include emissions into the air, surface water, and ground. These data are self-reported at the plant level, and we aggregate these data up to the firm-year level for years 2012-2020. As shown in Panel A of Table 1, the mean emissions equal 2.4 million pounds.

To capture market perceptions of each firm's environmental profile, we use the MSCI environmental ratings. MSCI's ratings are more comprehensive than other data providers, and less noisy (Eccles and Stroehle, 2020; Berg et al., 2021). MSCI ranks each firm-year on a range of e-factors relative to other firms in its industry, and it gives each firm-year a score between zero and ten. Firms in our sample have a mean e-score of 5.0, with an interquartile range of 3.6 to 6.4. We additionally obtain data on each investor who signed the UN Principles of Responsible Investing (PRI) and the first year of their signing, which are available for the years 2006-2020.

2.2. Lobbying transactions

We identify firms' lobbying activities from the reports filed with the Senate Office of Public Records (SOPR). Under the Lobbying Disclosure Act of 1995, every lobbyist and every corporation with in-house lobbying is required to disclose their lobbying activity. As discussed by Huneeus and Kim (2020), lobbyists who fail to comply with these requirements face potential monetary fines and imprisonment.[8] First, lobbyists file an LD-1 form for each of their clients, which contains the names and addresses of the client, as well as the starting date of the lobbying-client relationship. Second, an LD-2 form is filed for each lobbying transaction, containing: the date, the

[8] See https://www.gao.gov/products/GAO-20-449. In 2014 the Carmen Group paid $125,000 in fines to the federal government for not disclosing its political contributions (https://www.washingtonpost.com/local/crime/carmen-group-to-pay-125000-to-resolve-lobbying-disclosure-violations/2015/08/28/2d46c1b2-4d9d-11e5-84df-923b3ef1a64b_story.html).

amount lobbied, the issue and where applicable the bill number to which the transaction relates, the lobbyist name, and whether a lobbying transaction concerns the Senate, the House of Representatives, or any other US government branch. We parse and extract information from these forms (which represent the primary data source) and from OpenSecrets. Internet Appendix A shows an LD-2 form, covering lobbying by ExxonMobil for the second half of 2007.

We match client names in lobbying reports with firm names in CRSP-Compustat. We use a search engine-based matching algorithm proposed by Autor et al. (2020) to verify whether these pairs share the same URLs, and we manually verify the matching quality. We remove duplicate filings and keep the latest report when there are multiple amendments to the same filing. As shown in Table 1, firms in our sample spend an average of $1.1 million per year on lobbying.

3. Green and brown environmental lobbying

One of the biggest challenges towards understanding firms' lobbying behavior is the lack of data on the direction of firms' lobbying efforts: firms do not provide information on whether they are lobbying for or against a particular issue. Our paper is the first to develop a unique approach towards overcoming this challenge, across a broad set of environment-related issues. We first construct a measure of lobbying expenditures that are related to environmental issues and then identify their direction, defining "green" (pro-environment) and "brown" (anti-environment) lobbying.

3.1. Environmental lobbying

Our empirical tests focus on lobbying related to environmental issues (which we refer to as e-lobbying). To identify these transactions, we rely on information found on lines 15 and 16 of each LD-2. Among LD-2s containing multiple lobbying transactions, each transaction lists the relevant subject (on line 15) and supplemental description (line 16). For example, the Exxon-Mobil

LD-2 shown in Internet Appendix A contains five transactions. We define a transaction within an LD-2 to be e-related if one or more of the following criteria is satisfied.

Our first criterion relies on the standardized subject codes in LD-2 line 15. Amongst the 79 unique codes, we define the transaction to be e-related if one or more of the following five categories is listed: *Energy/Nuclear (ENG), Environment/Superfund (ENV), Fuel/Gas/Oil (FUE), Clean air and water (CAW), and Waste (hazardous/solid/interstate/nuclear) (WAS).* Thus, three of the five transactions in the sample LD-2 of ExxonMobil in Internet Appendix A are classified as e-related based on this criterion.

Our second criterion relies on Congressional bill numbers. On LD-2 line 16, filers must list the precise lobbying issues, including specific bills before Congress. In our sample, 34.7% of LD-2s contain specific bill numbers. We define the transaction to be e-related if at least one of the listed bills is categorized by Congress.Gov (the official website for U.S. federal legislative information) as belonging to one of the four categories of environment-related issues: *Energy, Environmental protection, Public lands and natural resources,* and *Water resources development*. Looking again at the sample LD-2 of Exxon Mobil, we can infer that the transaction with line 15 code TAX also relates to environmental lobbying, based on the listing of bill numbers such as '*H.R. 6, Clean Energy Act of 2007'* and *'H.R. 2776 Renewable Energy and Energy Conservation Tax Act of 2007*'.

Our third criterion strives to capture transactions that are missed by the prior two filters, for example because a specific bill was not mentioned or the line 15 category is more tangentially related to the environment (e.g., *Chemicals/Chemical Industry*). Following Engle et al. (2020), we develop an environment-related vocabulary. In our setting, this vocabulary comes from the textual description of the lobbying transaction provided in line 16, across those LD-2s identified in steps one and two as representing e-lobbying. Across each LD-2 lobbying transaction, we first apply the Term Frequency-Inverse Document Frequency (*tf-idf*) algorithm to identify meaningful words

contained in line 16 text (i.e., tokenization). Then, we calculate the cosine similarity between the tokenized line 16 text and the environment-related vocabulary. We define an LD-2 lobbying transaction as e-related (among those not previously identified in steps one and two) if the cosine similarity is greater than the average cosine similarity of e-related LD-2 transactions identified using the prior two criteria.[9] For example, the remaining transaction in Exxon-Mobil's LD-2, which has line 15 code *Budget (BUD)*, includes 'energy policy' in the line 16 text, and this text leads it to be classified as environmental.

We identify any LD-2 with at least one environmental transaction as e-related. When calculating e-related lobbying expenditures, we assume that total LD-2 expenditures are equally allocated to each transaction within the LD-2.[10] In the Exxon-Mobil LD-2 example, all five lobbying issues are e-related, hence we allocate the total LD-2 expenditures to e-related lobbying expenditures. Across e-related LD-2s in our sample, 38.8% include only e-related transactions.

Internet Appendix Figure A2 shows the overlap among our classification methods—approximately 82% of e-related LD-2s are identified by line 15 code, and the remaining 18% are further identified through line 16 bill numbers and the textual analysis.

Panel A of Figure 1 shows the time series of lobbying transactions across publicly traded US firms. The solid white bars show the number of lobbying transactions each year, and the gray bars show the number of e-lobbying transactions. Both series exhibit a similar pattern, with a discrete jump between 2007 and 2008. The approximate doubling in the number of LD-2s in 2008 is driven by the 2007 Honest Leadership and Open Government Act, which switched the filing

[9] The mean cosine similarity between the Line 16 text and the environmental vocabulary is 0.20 (0.08) for lobbying transactions that are classified as being environmental-related (not environmental-related) in steps 1 and 2. Panels A and B of Internet Appendix Figure A1 show the environment vocabulary in the form of a word cloud and the distribution of cosine similarities, respectively.

[10] Within LD-2s, expenditures are not separately attributed to each transaction.

requirement of LD-2s from semi-annually to quarterly.[11] The solid lines show lobbying dollars spent each year, and the dashed line shows e-lobbying expenditures. Both increased through approximately 2008 and have leveled off since then.

Panel B of Figure 1 provides evidence on the types of firms that lobby more intensely on environmental issues. For each firm-year in our sample, we compute the cosine similarity between the business description in the 10K and the text of Federal Register documents written by the EPA over years *t*-5 to *t*-1.[12] We put firms into quartiles based on this measure of relatedness between their business activities and environmental regulation, and we track their e-lobbying intensity, i.e., their expenditures on environmental lobbying as a fraction of total lobbying. There is a positive monotonic relation between firms' relatedness to EPA regulatory activities and their intensity of environmental lobbying. Firms in the top quartile of relatedness spend nearly 40% of their lobbying dollars on environmental issues, compared to less than 10% for firms in the lowest quartile. Higher exposure to environmental regulation is associated with a higher involvement in environmental lobbying activities.

3.2. The direction of environmental lobbying: green vs brown

Our approach toward identifying green and brown lobbying is based on the following premises. First, in the U.S., environmental issues are highly polarized along political lines, with Democrats being more pro-environment than Republicans, both among the general public and among members of Congress. For example, a 2020 Pew Research Study finds that while 85% of Democrats would agree with the statement "The environment should be a top priority for President

[11] In addition to instituting a quarterly filing requirement, the 2007 Act and associated policies put in place by President Obama instituted other changes that likely contributed to a leveling out of expenditures. For example, these policies made it more difficult for registered lobbyists to get jobs working for the administration, increased reporting requirements, and restricted people from lobbying the body they used to serve for a designated period of time. OpenSecrets shows a similar time-series pattern: https://www.opensecrets.org/federal-lobbying.

[12] The Federal Register documents include rules, proposed rules, notices, and presidential orders, as described in Kalmenovitz et al (2025), and we focus on the first three categories. Each document lists the agency(ies) that wrote it.

and Congress", only 39% of Republicans agree with this same statement. During the 117th Congress, the majority of elected officials identified as climate deniers were Republicans, whereas no serving Democratic officials engaged in explicit climate denial.[13] Second, when a firm lobbies on a particular issue, it hires not only a lobbying firm but specific individual lobbyists within that firm (Hirsch et al., 2023). Third, as shown in the political science literature (Koger and Viktor, 2009), lobbyists tend to make personal contributions to their preferred party, that is, they do not donate to the opposite party for strategic reasons. Moreover, in many cases lobbyists have prior experience working for their preferred party, as a congressperson or a staff member (Blanes I Vidal et al, 2012).[14] Fourth, a wide body of political science literature shows that lobbyists focus their lobbying efforts on their allies and avoid their political adversaries (see, e.g., Hojnacki and Kimball, 1998, 1999; Hirsch et al., 2023). In fact, lobbyists are often involved in shaping the content of proposals and bills during the committee stage. Thus, a company looking to lobby for pro-environment policies would tend to hire a Democratic lobbyist, as this person would tend to have connections with Democratic senators and representatives.

Given these four factors, our proxy for the direction of each firm-year's e-lobbying is based on the political stance of the lobbyists hired by the firm, as measured by these lobbyists' individual political contributions. House and Senate committees report contributions received from individuals to the Federal Election Commission (FEC), which are itemized on Schedule A of FEC

[13] Statistics on Congress come from the Center for American Progress ,https://www.americanprogress.org/article/climate-deniers-117th-congress/. The Pew Research Study shows that, in a similar vein, 78% of Democrats agree with the statement "Climate change should be a top priority for President Trump and Congress", compared to only 21% of Republicans. In contrast, there is substantially less disagreement on issues such as crime and social security, where the analogous percentages democrats and republican agreement with the respective issue are 53% vs 57% and 59% vs 65% (https://www.pewresearch.org/politics/2020/02/13/as-economic-concerns-recede-environmental-protection-rises-on-the-publics-policy-agenda/).

[14] Bertrand et al. (2014) argue that lobbyists, on average, tend to be connected to a given politician; they show that lobbyists switch the issues they work on in a predictable way as the legislators they are connected to through campaign donations switch committee assignments.

Form 3 when the amount exceeds $200.[15] OpenSecrets processes these data and provides information on contributor name, contribution date, contribution amount, and details regarding the recipient.[16] We name-match contributor names with lobbyist names in lobbying reports.

Among 2,951,544 individual contributions made by 29,171 unique lobbyists between 1990-2020, we restrict our focus to 1,256,534 individual contributions associated with 10,658 lobbyists who lobbied for public firms. For these lobbyists, we calculate the sum of lifetime individual contributions to Democrats (D), Republicans (R), and other (O). Panel A of Figure 2 shows the distribution of lobbyist-level political contributions, which is defined by R/(R+D).[17] Approximately 78 percent of lobbyists make over 75% of their contributions to a single party, and the largest mass lies near the extreme cases of 0 or 100%. This distribution provides support for using this measure as a proxy for political leaning.

We define a lobbyist to be Democratic (Republican) leaning if more than 75% of the lobbyist's contributions to these parties are allocated to the Democratic (Republican) party.[18] As shown in Internet Appendix Figure A3, under this scheme, 41.6% (36.4%) of lobbyists are defined to be Democratic (Republican) party-leaning. The remaining 22.0% of lobbyists are classified as neutral. We find that lobbyists' political orientations are very sticky: as shown in Internet Appendix Table A1, when we classify lobbyists' political orientation annually, the probability of being classified as a Democratic (Republican) party-leaning in year t+1 conditional on being classified as a Democratic (Republican) party-leaning in year t is 96 - 97%.

Our final step is to classify each e-related LD-2 as green or brown. We classify an LD-2 as

[15] https://www.fec.gov/help-candidates-and-committees/filing-reports/individual-contributions/
[16] These data are provided for each two-year federal election cycle. We thank OpenSecrets (https://www.opensecrets.org/) for providing research access.
[17] We exclude contributions to the other parties since we cannot infer the direction of the lobbying.
[18] Our classification is similar in spirit to Di Giuli and Kostovetsky (2014), who use campaign contributions to define the political affiliations of CEOs, directors, and founders of the firms.

green if at least one of the following conditions hold: (1) more than 75% of lobbyists listed on the LD-2 are Democratic-leaning; (2) more than 50% of lobbyists listed on the LD-2 are classified as having a political orientation (either Democratic- or Republican) AND more than 75% of classified lobbyists are Democratic-leaning. An analogous procedure is employed to identify LD-2s as brown. Among the 15,120 e-related LD-2s that we classify, 43% are Green and the remaining 57% are Brown.[19] Our relatively stringent approach toward classifying the direction of lobbying transactions increases confidence in the assigned direction of each transaction. For our empirical tests, we aggregate these LD-2 level statistics up to the firm-year level. The distribution is shown in Panel B of Figure 2. Similar to statistics at the lobbyist level, firm-years tend to focus their environmental lobbying efforts in one direction or the other.[20]

A strength of our approach is that we measure the direction of firms' lobbying using the political affiliations of each individual lobbyist in each individual transaction, as opposed to the overall political stance of the management team. This allows for the possibility that some firms opportunistically lobby brown sometimes and green other times.[21] Figure 3 provides an illustration of the advantage of our approach: among the 25 firms that spend the most dollars lobbying brown (green), many also spend money lobbying green (brown).

4. Firms' environmental lobbying choices and the informativeness of these choices

In this section, we focus on our first main question regarding firms' choices to direct money toward green and brown lobbying. We begin with descriptive statistics on the determinants of this

[19] Unclassified LD-2s reflect instances in which (1) we lack data on a lobbyist's political contributions, for example because the lobbyist made no political contributions or because we cannot perfectly match names due to variations/typos, or (2) the political leaning of lobbyists within an LD-2 did not meet the above criteria.
[20] The distribution is similar among firm-years with two or more e-lobbying transactions and also among firm-years with five or more e-lobbying transactions.
[21] An alternative approach of identifying firms' lobbying using the political affiliations of firms' executives, as employed by Leippold et al. (2024) has less power to identify such variation.

lobbying, and we then conduct a series of regressions. We then analyze whether these lobbying choices are informativeness regarding firms' environmental policies and thus their future environmental footprints.

4.1. Determinants of environmental lobbying

Panel A of Table 1 shows dollars spent on lobbying, across all types of lobbying and limited to e-lobbying. While firms spend on average just over one million dollars on lobbying, there is considerable cross-sectional variability in lobbying expenditures, as indicated by the large standard deviation. Across the full sample of firm-years, 21.9% engage in lobbying. Because lobbying tends to be concentrated among larger firms (Borisov et al, 2016), we focus our main analyses on firm-years with positive lobbying expenditures. Panel B of Table 1 shows that, among firm-years with positive lobbying expenditures, 10.7% engage in green lobbying and 12.9% in brown lobbying. when focusing on the direction of environmental lobbying, we find that both green and brown lobbying represent approximately 3% of total lobbying dollars, across all lobbying firms in our sample. On average, brown lobbying as a fraction of environmental (brown + green) lobbying is 56.3%.

A natural question is what determines the direction of firms' environmental lobbying choices in the first place. We propose that firms lobby to protect and extend the sources of their current cash flows: firms whose revenues derive primarily from green operations have a natural interest in lobbying for stricter environmental regulation, which raises the value of their existing assets and disadvantages brown competitors. Conversely, firms whose cash flows remain tied to brown operations face incentives to lobby against such regulation, preserving the profitability of their incumbent business model. This cash-flow protection motive generates a clear testable prediction: the greener a firm's current operations, the more it should direct its lobbying dollars toward green issues.

To test this prediction, we construct a firm-level measure of current green operations using textual analysis of firms' 10-K Business Description section, as this contains useful information on firms' product markets (Hoberg and Phillips (2010, 2016)). We search through this section for industry-specific bigrams that indicate pro-environment business practices (and not greenwashing). We identify these bigrams using the Large Language Model ChatGPT, and we list these 12 sets of bigrams in Internet Appendix Table A2.[22] A growing body of literature demonstrates that ChatGPT can extract relevant information (see, e.g., Bhaskar et al., 2023; Goyal et al., 2022; Kim et al., 2023). Using the *tf-idf* algorithm, we decompose each firm-year 10-K Business Description section into bigrams and apply weights to each of these bigrams based on the entire corpus of 10-Ks. Finally, we calculate the cosine similarity between the ChatGPT bigrams and the *tf-idf* weighted 10-K bigrams. This cosine similarity measure represents our proxy for *Current green operations*. In robustness analyses described later, we employ alternative proxies.

The results of our analysis are presented in Table 2. The dependent variable is green lobbying intensity, defined as the fraction of green lobbying expenditures to total lobbying. In column 1, we include only firm financial characteristics, industry and year fixed effects, and in column 2 we add our proxy for current green operations. We find strong evidence that current green operations are a main driver of firms' lobbying choices. Looking at column 2, the coefficient on current green operations is positive and highly significant in explaining green lobbying intensity, with a *t*-statistic over 5. In economic terms, a one standard deviation increase in current green operations is associated with a 72% increase in green lobbying.[23] Moreover, the R-squared

[22] Specifically, we employ the ChatGPT API, setting the temperature to zero to ensure replicability. We use the following prompt: "Please provide 25 business sustainability bigrams that indicate true pro-environment practices, not greenwashing, in the 'Consumer Nondurables' industry." We repeat this for each Fama French 12 industry. For the 12th Fama French industry 'Other', we simply ask 'Please provide 25 business sustainability bigrams that indicate true pro-environment practices, not green washing.'

[23] The mean of *Green lobbying intensity* is 0.028, and the standard deviation of *Current green operations* is 0.00096. Note that 20.944x0.00096/0.028 = 0.72, or 72%

increases by 34%, from 7.7% in column 1 to 10.3% in column 2.

Conclusions are similar when we employ alternative measures of current green operations. First, we measure current green operations based on the cosine similarity between the text of the firm's 10K and the patent summary text for all green patents granted to public firms. While this measure is limited to a more technology-based vocabulary, it mitigates any concerns that our main measure may be sensitive to greenwashing. Second, we measure current green operations as the fraction of a firm's total revenues that is generated by green products, services, and economic activities. These data are provided by FTSE Russell, an LSEG Business, and the coverage becomes reliable after 2008. Columns 3 and 4 show that the results are qualitatively similar using either of these measures. Even in specifications with lower power due to the relatively small sample size (column 4), green lobbying is significantly positively related to firms' green operations.

4.2. Potential measurement error in green and brown lobbying

Since our lobbying identification methodology is based on the political stance of the lobbyists hired by firms, one concern is that firms' choices may be driven by variations in political cycles rather than by genuine environmental preferences. This would be problematic for our interpretation: if firms simply hire whoever is in power – Democratic lobbyists under Democratic administrations and Republican lobbyists under Republican ones – then our measure would capture political opportunism rather than the direction of firms' environmental agenda. In this case, the link between lobbying direction and future emissions would reflect political access rather than deliberate environmental strategy.

Table 3 addresses this concern directly by repeating our analysis of the determinants of green lobbying intensity separately across Democratic and Republican regimes, defined as years in which a party controls at least two of the three key positions: president, Senate, and House.

Columns 1 and 2 show the average green lobbying intensity across the two regimes, while columns 3 and 4 add all control variables. The results are strikingly consistent: the coefficient on current green operations is positive and highly significant under both regimes, with similar magnitudes. This cross-cycle stability is economically meaningful and indicates that firms' lobbying direction is anchored to the nature of their operations rather than to whoever happens to be in power. Green firms lobby green regardless of the political environment, and the measure we construct captures something fundamental about firms' environmental strategy rather than an artifact of the political cycle.

4.3. Is firm environmental lobbying an informative signal of firm environmental policies?

Do firms' lobbying choices predict their environmental footprints? To shed light on the extent to which firms' lobbying represents an informative signal regarding firms' environmental actions, we examine the relation between firm lobbying and subsequent toxic emissions. Toxic emissions are a particularly relevant outcome in this context because they are directly regulated at the federal and state level, making them precisely the type of legislation that firms target through environmental lobbying. Moreover, they are measured through mandatory regulatory disclosure, making them a reliable and granular measure of firms' actual environmental footprint.

We estimate regressions in which the dependent variable is toxic chemical releases, by each firm each year. As described in section 2.1, these data are provided by the EPA's TRI dataset. The data include on-site toxic releases into the air, surface water, land, and underground. We measure toxic emissions over years t+1, t+2, and t+3, respectively. Lobbying is measured by green lobbying intensity and brown lobbying intensity, and we control for total lobbying expenditures. We additionally include firm-level controls used in prior tables, industry fixed effects, and year fixed effects. Results are shown in Table 4.

If the direction of lobbying expenditures is a genuine signal of firms' true environmental trajectory, we would expect brown lobbying to be a meaningful predictor of actual emissions outcomes. Column 1 confirms this: brown lobbying expenditures in year t are strongly and significantly associated with toxic emissions in t+1, with a one standard deviation increase in lobbying translating into a 23% rise in future emissions.[24] In columns 2 and 3, we examine the explanatory power of innovation and lobbying regarding emissions further in the future, years *t*+2 and *t*+3, respectively. The coefficient on brown lobbying continues to be significantly positive, while the coefficient on innovation is close to zero and statistically insignificant. Moreover, the economic magnitudes are similar to those in year *t*+1: a one standard deviation increase in brown lobbying intensity is associated with 21% (18%) higher emissions in year t+2 (t+3). Taken together, our findings indicate that the direction of firms' environmental lobbying expenditures is a powerful and informationally rich signal of their actual environmental trajectory: firms that lobby brown today emit more tomorrow.

4.4. Placebo test

Our results so far suggest that the portion of a firm's environmental lobbying dollars directed in brown directions represents an informative signal regarding the firm's emissions in subsequent years. A natural question is whether this relation reflects firms' deliberate efforts to influence the environmental agenda specifically, or whether it simply proxies for their general political leanings. The distinction between these two interpretations carries significant implications. If brown lobbying merely proxies for a firm's general Republican-leaning political orientation, then it carries no specific information about environmental intent: it would simply reflect a firm's broader ideological alignment, which happens to correlate with weaker

[24] Looking at column 2, a one standard deviation increase in brown lobbing (0.168) corresponds to a exp(1.234*0.168) – 1 = 23% increase in future emissions.

environmental policies. If, on the other hand, it is the environmental direction of lobbying that drives our results, this implies that firms are making deliberate targeted choices to influence environmental regulation, thus shaping their emissions trajectory.

A potential concern is that our lobbying measure is not sufficiently precise to capture each firm's efforts to influence the environmental agenda. For example, brown lobbying might be correlated with a firm's overall political leaning, which, in turn, could be related to both the firm's overall lobbying choices and its environmental policies. In this correlated omitted variable scenario, it is not clear what represents a negative signal regarding future emissions: the firm's specific efforts to influence the environmental agenda by lobbying brown, or more general characteristics of the firm. We address this concern through a placebo test.

We begin by forming a sample of lobbying transactions that are unrelated to the environment. Across our entire sample of 177,931 LD-2s, there are on average 2.4 lobbying issues per LD-2, yielding 426,271 LD-2 × lobbying issue observations. The steps outlined in Section 3.1 lead us to identify 64,157 lobbying issues as environment-related. For the placebo analysis, we focus on the remaining 362,114 transactions, which we label as non-environment-related. The second step is to define the political leaning of each of these transactions. Following the approach employed in our main sample (as described in Section 3.2), we define a lobbying transaction as Democratic- or Republican-leaning based on the political contributions of the individual lobbyists involved in these transactions.

In our placebo test, presented in Table 5, the independent variables of interest include the fraction of lobbying dollars directed in Republican directions and the fraction directed in Democratic directions. Specifically, we define *Dem lobbying intensity* as (Democratic-leaning non-environmental lobbying expenditures / Total lobbying expenditures). We define *Rep lobbying intensity* analogously. The dependent variable is emissions in years t+1, t+2, and t+3.

If the positive relation between brown lobbying and future emissions is driven by the overall political leanings of the firm, then we will find a significantly positive coefficient on this non-environmental Republican lobbying variable as well. Alternatively, if it is brown lobbying on environmental issues per se that drives results, then we will not find significance in this placebo analysis. The results show that the coefficient on *Rep lobbing intensity* is insignificant in all specifications. The coefficient on *Dem lobbying intensity* is also insignificant. In sum, our findings indicate that it is the direction of environmental lobbying, not general political stances, that represents an informative signal regarding firms' environmental policies.

5. Environmental lobbying and green innovation

In this section, we turn to our second question regarding firms' joint use of lobbying and innovation as competitive tools. The transition to a greener economy has emerged as one of the defining policy challenges of our time. There is wide consensus among policymakers, international institutions, and the business community that green innovation is the primary vehicle for this transition: firms should develop and scale new clean technologies if economies are to decarbonize at the speed and depth required. As Philippe Aghion argued, "innovation is really key to the challenge of fighting climate change" (Vox, 2023). Many in the business community echo this view, calling for new technologies and business models to drive the global economy to net zero by 2050. International institutions reinforce this consensus: the 2021 report by the International Energy Agency (Net Zero by 2050) states that "Reaching net zero by 2050 requires further rapid deployment of available technologies as well as widespread use of technologies that are not on the market yet. Major innovation efforts must occur over this decade in order to bring these new technologies to market in time".

In addition to technological change, the regulatory environment is arguably the other key

determinant of firms' environmental policies. Lobbying represents a key tool to influence these policies. In fact, lobbying represents a dominant form of corporate political expenditure, significantly greater for example than campaign contributions (Ansolabehere, de Figueiredo, and Snyder, 2003; Milyo, Primo, and Groseclose, 2000).

To understand whether firms use both innovation and lobbying as competitive tools to transition to green, we begin by examining the direction of firms' lobbying vis-a-vis their innovation efforts.

5.1 Green lobbying and green innovation

As shown in Figure 4, all types of innovation have grown throughout our sample period, with the number of green, clean, and dirty patents growing by an average of 4.7%, 6.2%, and 4.2% per year. However, each year, the number of green and clean patents greatly exceeds the number of dirty patents. On average, there are approximately 2,500 more clean patents per year than dirty patents.

We measure a firm's stock of current innovation using patents granted over a five-year period, *t*-4 through *t*. As shown in Panel A of Table 1, the average firm in our sample has 209 patent grants, of which 12 represent green patents. We additionally use two alternative measures of innovation in our empirical analyses. First, we examine innovation quality, measured as the citations of each patent grant. For each firm- year, across all patents granted over the past 5 years, we calculate the average forward citations up to early 2022, and we adjust citations by technology class-year.[25] Second, we examine the market value of a firm's portfolio of patents, as the average value of all patents granted over the previous five years. We use the measure computed by Kogan et al (2017), which is based on the market reaction to news about patents.

[25] The number of forward citations of each patent is scaled by the average number of forward citations received in the same year-technology class to address the truncation bias in patent data (Hall et al., 2001).

Figure 5 describes both e-lobbying and green innovation, across industries. The light-gray bars depict the fraction of firm-years with environmental lobbying, within each Fama-French industry group. Almost all firm-years in the utilities industry and the oil and gas industry lobby on environmental-related issues. The next highest industries are chemicals with 65%, manufacturing with 52%, and consumer durables with 43% firm-years. Strikingly, many of the industries characterized by substantial environmental lobbying activity also tend to be among the most active in green innovation, as measured by the percentage of firm-years with one or more green patents over the last five years. The three industries with the highest green innovation also fall within the top five industries in terms of e-lobbying.

This overlap between innovation and lobbying extends to the firm-level. As shown in Table 6, we partition the sample according to whether the firm-year has at least one green patent (column 2), whether it has at least one patent but no green patents (column 3), and whether it has no patents (column 4).[26] We find that firms engaged in green patenting are also more likely to be engaged in environmental lobbying. Green innovators (defined as firms with one or more green patents) spend nearly four times more than non-green innovators (defined as firms with one or more patents but no green patents) on environmental lobbying.

Strikingly, conditional on lobbying, firms with green patents are nearly equally likely to lobby in green (18.7%) or brown (21.2%) directions. In fact, the portion of environmental lobbying directed in brown directions is close to 50% for each of these subsamples. Moreover, among green innovators, average lobbying expenditures are greater for brown lobbying than for green lobbying. The last two columns of Table 6 focus on firm-years with clean and dirty patents, respectively, and they yield similar conclusions. Firms with clean (dirty) patents spend 53.7% (55.0%) of their

[26] The number of patents is measured in a five-year window from t-4 to t.

environmental lobbying in brown directions.

This marked and perhaps counterintuitive pattern in firms' lobbying behavior is illustrated in Figure 6. Panel A shows that green innovators lobby brown at almost exactly the same rate as they lobby green. Moreover, in absolute terms, they are substantially more active in brown lobbying than firms without green patents, reflecting their overall greater tendency to lobby. Similarly, non-green innovators also split their lobbying efforts nearly evenly across green and brown directions. Panel B reinforces this picture at the intensive margin: looking at the share of total lobbying dollars, firms with green patents devote a roughly equal fraction of their expenditures to green and brown lobbying. This behavior is remarkably consistent across the innovation divide. As shown in Figure 7, these patterns persist across industries.

These patterns suggest that green innovation and lobbying are complementary tools that firms deploy simultaneously to navigate the uncertainty and competitive pressures of the green transition. This descriptive evidence is consistent with at least two reinforcing motivations. Firms may engage in green innovation to maintain strategic flexibility, positioning themselves to benefit in case clean technologies gain value because of stricter environmental regulation or shifts in the competitive landscape. At the same time, firms whose current cash flows remain tied to brown operations have clear incentives to lobby on near-term regulatory outcomes, managing downside risk while their exposure to brown assets persists.

5.2. Environmental lobbying, innovation, and real outcomes

In this section, we examine the informativeness of innovation versus lobbying regarding firms' environmental footprints. This matters because innovation and lobbying may send conflicting signals about a firm's true environmental trajectory: a firm that patents green technologies while lobbying against environmental regulation may be greenwashing rather than genuinely transitioning. Alternatively, their innovation could represent the most precise signal of

firms' business strategies.

We re-estimate the impact of environmental lobbying on future toxic emissions and additionally account for the impact of green innovation activities. Results are shown in Table 7. Our findings generally indicate that a firm's brown lobbying expenditures are significantly positively related to emissions in subsequent years, whereas green innovation activities do not predict emissions. In columns 1 to 3 we measure green innovation using the number of green patents. A one standard deviation increase in brown lobbying is associated with a 24% increase in future emissions in the following year.[27] For subsequent years, the coefficient on brown lobbying continues to be significantly positive, while the coefficient on innovation is close to zero and statistically insignificant. Moreover, the economic magnitudes are similar to those in year *t*+1: a one standard deviation increase in brown lobbying intensity is associated with 22% (20%) higher emissions in year t+2 (t+3). It is striking that a firm's lobbying efforts but not its innovation predict its environmental footprint up to three years in the future.

This result builds on the contemporaneous paper by Bolton et al. (2024), which shows that green innovation is unrelated to future carbon emissions for a global sample of firms. Importantly, our results show that the coefficient on brown lobbying remains positive and statistically significant. While innovation is frequently highlighted as a key factor of progress toward the green transition, our findings indicate that the direction of firms' environmental lobbying expenditures is a stronger signal about firms' actual actions and near-term trajectory toward green.

We further examine the robustness of these conclusions to alternative measures of innovation. In columns 4 – 6 of Table 7 we employ the quality of green patents, and in columns 7 – 9 we employ the market value of green patents. Results are robust across both these alternative

[27] Looking at column 2, a one standard deviation increase in brown lobbing (0.168) corresponds to a exp(1.274*0.168) – 1 = 24% increase in future emissions.

measures. Brown lobbying continues to predict a firm's emissions up to three years in the future, whereas innovation has no significant explanatory power.

While higher-quality green patents should position firms to adopt technologies that lessen their environmental footprint, we find no evidence that such innovation predicts lower future emissions. Our findings are consistent with a scenario in which green innovation represents a real option, which firms only exercise if necessary, for example if incentivized by regulatory or competitive forces. As discussed by Bloom and Van Reenen (2002), patents provide firms with the option to delay their investments, which is particularly valuable in times of high uncertainty. Environment-related innovation and the associated investments are characterized by both high technological and high regulatory uncertainty. Importantly, under this scenario, green innovation may contain little information regarding firms' current strategy regarding the transition to green. As such, our findings have relevance for policies aimed at expediting the green transition by subsidizing green innovation (World Bank, 2024).

6. Does the market recognize firms' environmental lobbying activities?

Finally, we turn to our final question, regarding whether the market recognizes informative signals. The growing inflows into ESG funds suggest that investors care about environmental impact. Baker et al. (2023) conclude that over their 2019-2022 sample period investors are willing to pay 20 basis points in higher fees per annum for pro-ESG funds, compared to otherwise similar funds without an ESG mandate. If investors are willing to pay a premium to invest in firms with pro-environmental policies, then this raises the question: are they getting what they are paying for? Investors who value pro-environmental policies arguably would not want to pay a premium for firms that direct lobbying dollars in brown directions.

We take two approaches toward examining this question. Our first approach toward

assessing investors' attention to firms' lobbying behavior is to analyze the ratings of the largest ESG ratings provider, MSCI.[28] Our second approach focuses on a broad measure of institutional ownership, as well as on the investment decisions of UN PRI signatories.

6.1. ESG ratings

MSCI ESG ratings are widely followed by asset managers around the world, and they influence a large amount of investment dollars. MSCI provides annual ratings on environmental categories such as carbon emissions, waste management, biodiversity, product carbon footprint, etc. As described in Section 2.1, each firm-year is assigned an industry-adjusted score ranging from zero to ten. This score represents the firm's e-rating.

Results are shown in Table 8. We regress the e-rating of each firm-year on measures of firm lobbying, firm innovation, and control variables used in prior tables, all of which are defined in year t. We also include industry and year fixed effects. The dependent variable is the e-rating in year t+1. Our measures of lobbying include green lobbying intensity, brown lobbying intensity, and the natural log of total lobbying expenditures. We measure green innovation as either the number of green patents (column 1), the quality of green patents (column 2), or the market value of green patents (column 3).

We find little evidence that firms' environmental ratings are significantly related to their lobbying activities, despite firms' lobbying expenditures containing significant information regarding their environmental strategy (as shown in Table 7). In contrast, we find that green innovation is significantly related to firms' E-ratings, despite evidence that such innovation is uninformative regarding firms' near-term transition toward green.

[28] In 2007, over two thirds of institutional money managers around the world were using KLD (the predecessor to MSCI) to incorporate ESG factors into investment decisions, and it has become the world's biggest ESG rating agency (Eccles and Stroehle, 2020). Moreover, ESG ratings influence flows into stocks; Pástor et al. (2022) conclude that ESG-related flows affected stock returns over the 2012 – 2018 period.

6.2. Institutional ownership

We first examine whether institutional investors broadly incorporate firms' lobbying behavior and green innovation into their portfolio allocation decisions. In Columns 1-3 of table 9, the dependent variable is institutional ownership, defined as the fraction of shares of a stock held by all institutions filing Form 13-F with the SEC. Consistent with our findings on ESG ratings, the results show that institutional investors do not factor firms' environmental lobbying activities into their portfolio choices in any meaningful way. If anything, institutional ownership is significantly negatively related to firms' green innovation, suggesting that the average institutional investor discounts firms engaged in green patenting activity.

We next turn to examining UN PRI signatories – investors who have publicly committed to responsible investment principles and who therefore face explicit reputational and normative pressure to align their portfolios with firms' environmental conduct. Columns 4 – 6 of Table 9 examine if these signatories are indeed less likely to invest in firms that devote resources toward brown lobbying. The dependent variable is green institutional ownership, defined as shares owned by UN PRI signatories as a fraction of shares owned by all institutional investors. We begin the sample in 2006, the first year of the UN PRI.

Coefficients on brown lobbying intensity are insignificant in all specifications, indicating that even self-declared responsible investors do not systematically avoid brown lobbyers. We find weak evidence that PRI signatories respond to green lobbying: the coefficient on green lobbying intensity is positive and marginally significant (10% level), with a one standard deviation increase in green lobbying associated with a 0.32 percentage point increase in green institutional ownership.[29] PRI signatories also show some preference for green innovators. However, the overall

[29] In column 4, the standard deviation of green lobbying intensity is 0.14, and the mean of green institutional ownership is 0.26. Note that 0.023*0.14 = 0.00322, or 0.32 percentage points.

picture is one of limited responsiveness: even the most committed class of institutional investor appears to pay little attention to the political activities that, as we have shown, are among the most informative signals of firms' actual environmental trajectory.

Taken together, these results reveal a significant gap between the informational content of lobbying and its incorporation into investors' expectations and investment decisions. Firms' lobbying expenditures carry substantial predictive power for future emissions, yet neither broad institutional investors nor UN PRI signatories appear to act on this signal in any substantial way. This failure to account for lobbying behavior risks producing both biased ESG assessments and misallocated capital, directing investment dollars toward firms that project a green image through innovation while preserving their brown operations through political engagement.

7. Conclusions

How do firms manage the technological and regulatory pressures of the green transition? While policymakers, international institutions, and investors have focused overwhelmingly on green innovation as the primary signal of firms' environmental commitment, we show that a less scrutinized activity, environmental lobbying, is equally important to understand and more revealing of relevant information.

We introduce a novel method to identify the direction of corporate environmental lobbying by analyzing the political contributions of each individual lobbyist involved in each transaction. This approach allows us to move beyond aggregate lobbying expenditures and characterize, across a broad set of environmental issues, whether firms are pushing for or against pro-environmental regulation.

We show that green innovators are equally likely to lobby in favor of green or brown legislative agendas. Firms' lobbying direction is driven by their current operations. This pattern is

consistent with firms using these two tools to manage uncertainty associated with the green transition, investing in green technologies to preserve strategic flexibility while lobbying to protect current cash flows for as long as possible. Whether this reflects a deliberate hedging strategy or not, the aggregate consequence is the same: green innovation does not guarantee a genuine commitment to the green transition.

We find that the direction of environmental lobbying is a powerful predictor of firms' actual environmental footprints: a one standard deviation increase in brown lobbying is associated with 20–24% higher toxic emissions in each of the following three years. Green innovation, by contrast, has no significant predictive power.

Despite its informational content, lobbying behavior is largely ignored by market participants. MSCI's environmental ratings reward green innovation but are insensitive to the direction of lobbying. Institutional investors show no meaningful tendency to underweight brown lobbyers, and even UN PRI signatories show only marginal responsiveness to the direction of firms' lobbying expenditures. The result is a significant misallocation of pro-environmental capital toward firms that project a green image through innovation while preserving their brown operations through political engagement.

Our findings have direct implications for policy and for sustainable investment. Subsidies and investment flows directed at green innovators may have limited impact on near-term emissions if recipient firms simultaneously lobby to weaken the regulatory conditions that would make those innovations necessary. A more complete assessment of firms' environmental trajectory, accounting for the direction of lobbying alongside innovation, would produce better-targeted policy interventions and more effective ESG investment strategies.

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Appendix A
Variable definitions

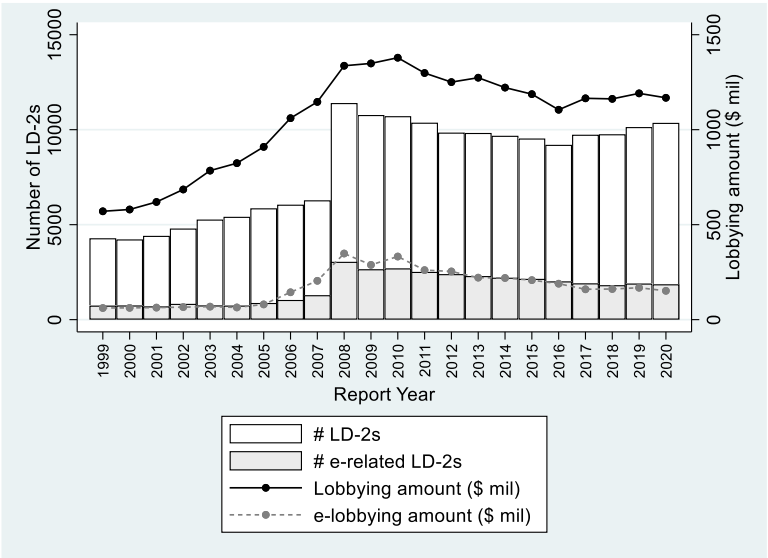
Variable	Definition
Innovation measures	
# Patents	The natural log of one plus the number of patents granted to the firm in the last five years. Green patents are defined based on the OECD classification. Clean and dirty patents are defined based on Dechezlepretre, Muckley, and Neelakantan (2020). Pure green and fuel efficiency patents are defined based on Bolton, Kacperczyk, and Wiedemann (2024). Source: USPTO PatentsView, extended KPSS patent data, OECD, Dechezlepretre, Muckley, and Neelakantan (2020), and Bolton, Kacperczyk, and Wiedemann (2024).
Q(Patents)	The natural log of one plus the average forward citations of patents granted to the firm in the last five years. If a firm does not have a patent, this variable is set to zero. Green patents are defined based on the OECD classification. Source: USPTO PatentsView, extended KPSS patent data, and OECD.
MV(Patents)	The natural log of one plus the average market value of patents granted to the firm in the last five years. If a firms does not have a green patent, this variable is set to zero. Green patents are defined based on the OECD classification. The market value of patent is from Kogan et al (2017). Source: USPTO PatentsView, extended KPSS patent data, and OECD.
Lobbying measures	
Green lobbying intensity	The amount spent on green lobbying deflated by the total lobbying expenditures, measured at the firm-year level. An e-related LD-2 is defined as green lobbying if at least one of the following conditions hold: (1) more than 75% of lobbyists listed on the LD-2 are Democratic-leaning; (2) more than 50% of lobbyists listed on the LD-2 are classified as having a political orientation (either Democratic- or Republican) AND more than 75% of classified lobbyists are Democratic-leaning. Source: SOPR and OpenSecrets.
Brown lobbying intensity	The amount spent on brown lobbying deflated by the total lobbying expenditures, measured at the firm-year level. An e-related LD-2 is defined as brown lobbying if at least one of the following conditions hold: (1) more than 75% of lobbyists listed on the LD-2 are Republican-leaning; (2) more than 50% of lobbyists listed on the LD-2 are classified as having a political orientation (either Democratic- or Republican) AND more than 75% of classified lobbyists are Republican-leaning. Source: SOPR and OpenSecrets.
Dem lobbying intensity	The amount spent on Democratic lobbying deflated by the total lobbying expenditures, measured at the firm-year level. A non-e-related LD-2 is defined as Dem lobbying if at least one of the following conditions hold: (1) more than 75% of lobbyists listed on the LD-2 are Democratic-leaning; (2) more than 50% of lobbyists listed on the LD-2 are classified as having a political orientation (either Democratic- or Republican) AND more than 75% of classified lobbyists are Democratic-leaning. Source: SOPR and OpenSecrets.
Rep lobbying intensity	The amount spent on Republican lobbying deflated by the total lobbying expenditures, measured at the firm-year level. An e-related LD-2 is defined as Rep lobbying if at least one of the following conditions hold: (1) more than 75% of lobbyists listed on the LD-2 are Republican-leaning; (2) more than 50% of lobbyists listed on the LD-2 are classified as having a political orientation (either Democratic- or Republican) AND more than 75% of classified lobbyists are Republican-leaning. Source: SOPR and OpenSecrets.
Total lobbying expenditures	The natural log of one plus the dollar amount spent on lobbying (in $ mil). Source: SOPR and OpenSecrets.

Other variables	
Current green operations	The cosine similarity between the business description section of firms' 10Ks and 25 industry-specific sustainability-related bigrams obtained from ChatGPT. Source: ChatGPT, EDGAR
Current green operations (green patent text)	The cosine similarity between the business description section of firms' 10Ks and the patent summary text for the all green patents granted to public firms in the last five years. Source: USPTO PatentView, extended KPSS data, OECD, EDGAR
% Green revenue	The fraction of a firm's total revenues that is generated by green products, services, and economic activities. We exclude cases if the green revenue is missing or reported as zero. Source: FTSE Russell
ln(Emissions)	The natural log of one plus the toxic on-site emissions, measured in pounds. Source: Toxic Release Inventory (TRI) dataset, provided by the Environmental Protection Agency (EPA).
E-score	MSCI environmental rating, which is on a scale of zero to ten, with higher numbers being more favorable ratings. Source: MSCI
IO	Institutional ownership (fraction of shares owned by institutional investors). Source: Thomson Reuters
IO^G	Shares owned by UN PRI signatories as a fraction of shares owned by all institutional investors. Source: UNPRI.org, Thomson Reuters
Firm-level variables	
ln(Assets)	ln(AT + 1). Source: Compustat.
Book leverage	(DLTT + DLC) / AT. Source: Compustat.
EBIT/Assets	EBIT/AT. Source: Compustat.
Cash/Assets	CHE/AT. Source: Compustat.

Figure 1: Lobbying and environmental lobbying

Panel A shows the total number of lobbying transactions and the amount of lobbying expenditures. The sample consists of 177,931 (37,171) LD-2s (e-related LD-2s) filed by 3,373 (1,130) public firms in the US between 1999-2020. In Panel A, white bars (gray bars) denote the total number of LD-2s (number of e-related LD-2s) filed each year, as labeled on the left axis. The solid line (dashed line) shows the total (e-related) lobbying expenditures each year, as labeled on the right axis. Details regarding the classification of e-related lobbying are provided in the text. In Panel B, we place firms into quartiles based on relatedness, measured as the cosine similarity between the firm's 10K business description in year *t* and FR documents written by the EPA in years *t*-1 to *t*-5. The sample is based on 12,009 firm-years between 2004 – 2019. The left (right) axis represents the values for relatedness (e-lobbying intensity).

Panel A: Time-series of lobbying



Panel B: Environmental lobbying and Relatedness to e-regulation

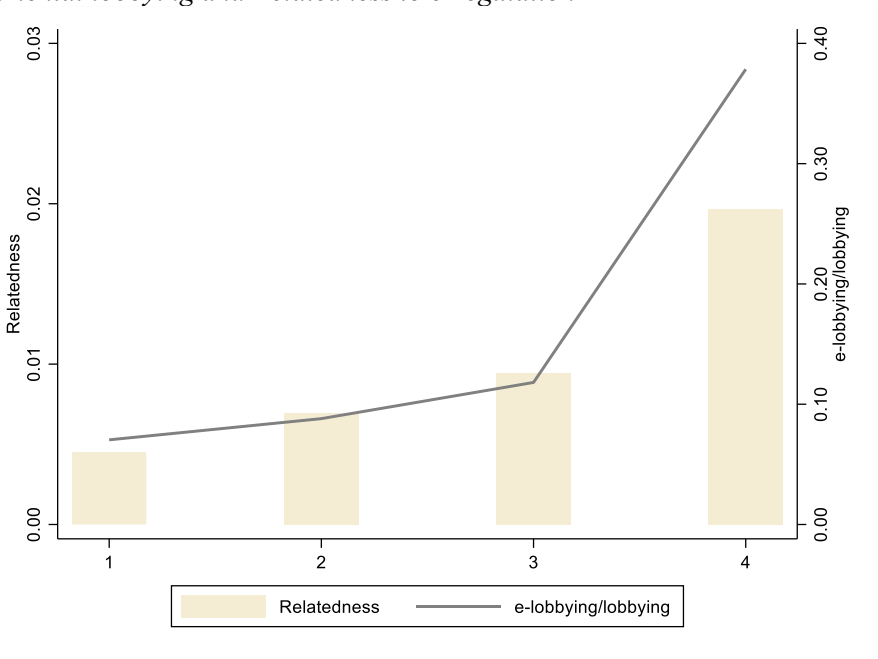
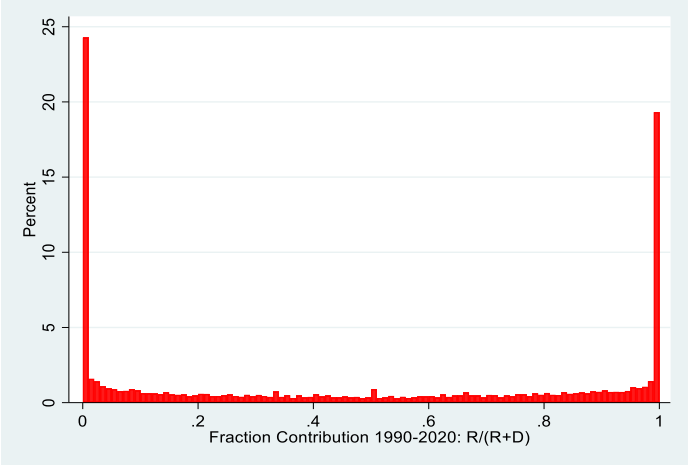


Figure 2: Political orientation of lobbying

Panel A shows the distribution of political contributions across individual lobbyists. The sample is based on 1,256,534 individual contributions made between 1990 and 2020 associated with 10,658 lobbyists who lobbied for public firms in our sample. For these 10,658 lobbyists, we calculate the sum of individual contributions to the Democratic party (D), the Republican party (R), and the rest (O). To be included in the sample, we require the sum of contributions to the Democratic party and the Republican party to be positive, and the sum of contributions to each category to be nonnegative (i.e., D ≥ 0; R ≥ 0). Panel B shows the direction of e-lobbying at the firm-year level. The figure shows the amount of Brown lobbying expenditures divided by the sum of Green and Brown lobbying expenditures. By definition, this measure is available only for firm-years with non-missing Green or Brown lobbying. The amount of Green (Brown) lobbying expenditures at the firm-year level is defined by the sum of lobbying dollars allocated to Green (Brown) issues.

Panel A: Lobbyist-level political contributions



Panel B: Direction of e-lobbying at the firm-year level

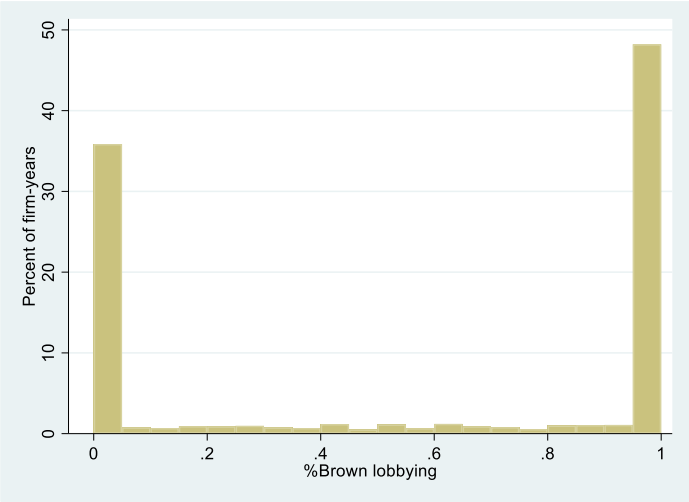
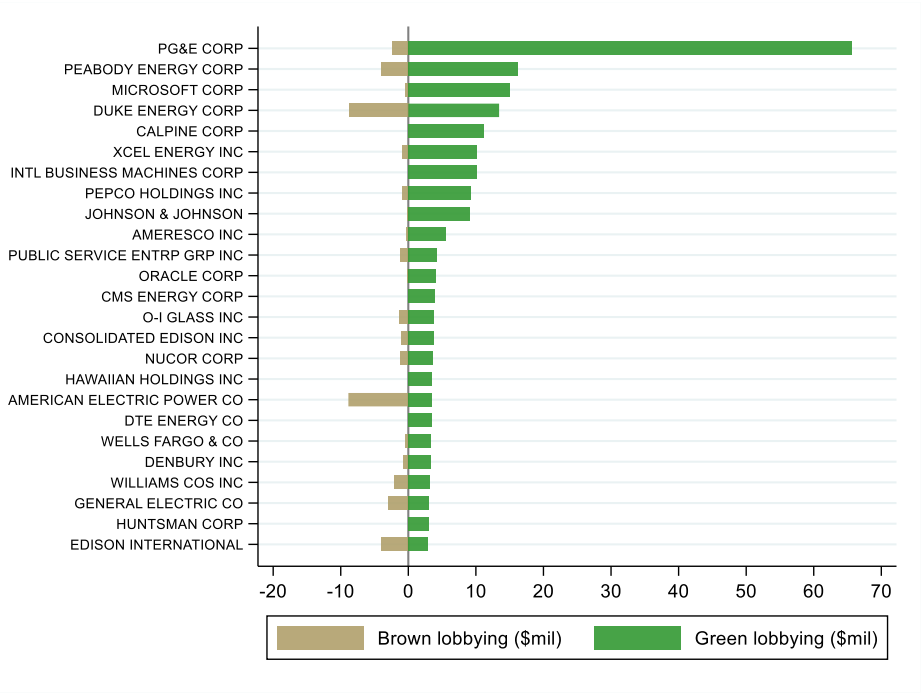


Figure 3: Top 25 firms with green and brown lobbying

This figure shows the dollars spent in green and brown lobbying for the top 25 firms that spent the most dollars lobbying green (Panel A) and brown (Panel B) during our sample period. The sample is based on 19,251 lobbying firm-years between 1999 and 2020, with at least $10 million in assets and positive sales. Across firm-years, we aggregate green lobbying expenditures and brown lobbying expenditures at the firm level.

Panel A: Top 25 green lobbying companies



Panel B: Top 25 brown lobbying companies

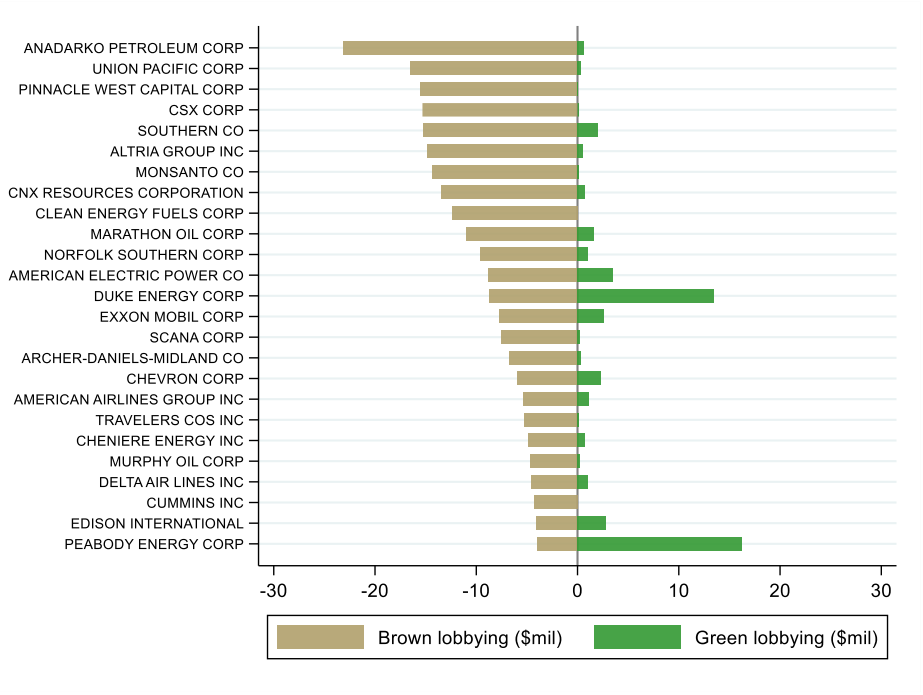


Figure 4: Time series of innovation and green innovation

This figure shows the number of patents granted to US public firms between 1999 and 2020 each year. The primary axis (left-hand side) represents the number of all patents, and the secondary axis (right-hand side) represents the number of green, clean, and dirty patents. Patent data are obtained from PatentsView. We use the extended KPSS (Kogan, Papanikolaou, Seru, and Stoffman) patent database to identify patents granted to public firms. We classify patents as relating to green technologies based on the OECD classification. Clean and dirty patent classifications are from Dechezlepretre, Muckley, and Neelakantan (2020).

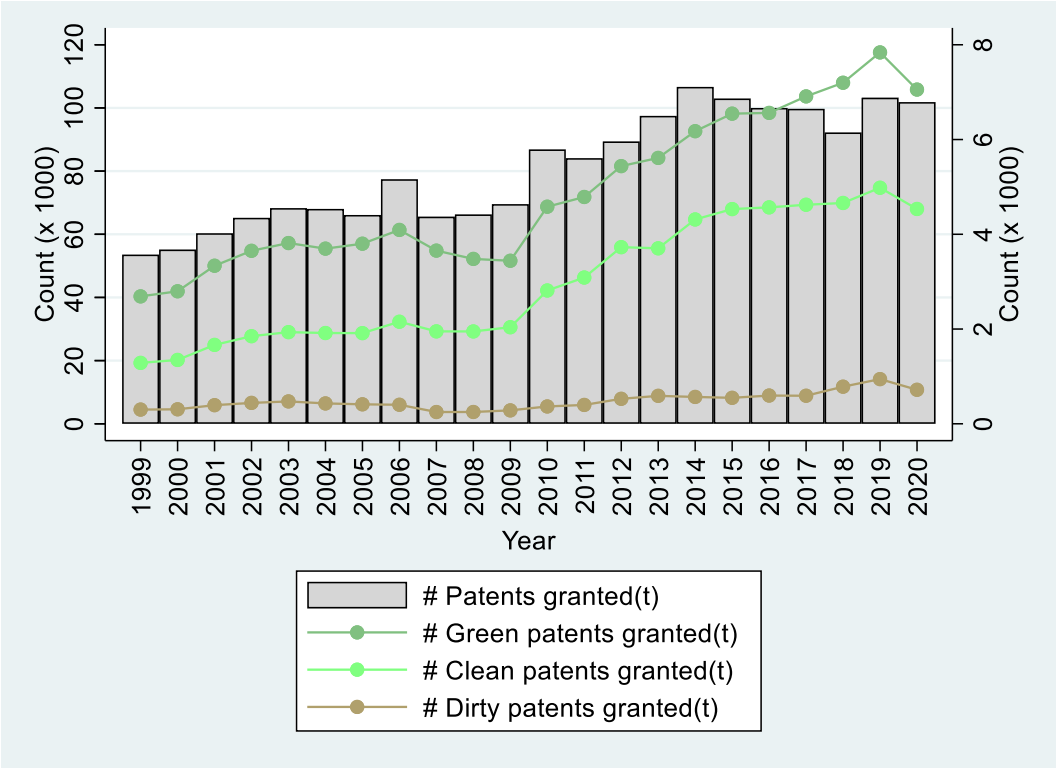


Figure 5: E-lobbying and green innovation, by industry
This figure shows the fraction of firm-years with environmental lobbying expenditures (colored in gray) and the fraction of firm-years with green patents (colored in green), for each Fama-French 12 industry group, on average through the sample period. The sample is based on 19,251 lobbying firm-years between 1999 and 2020, with at least $10 million in assets and positive sales.

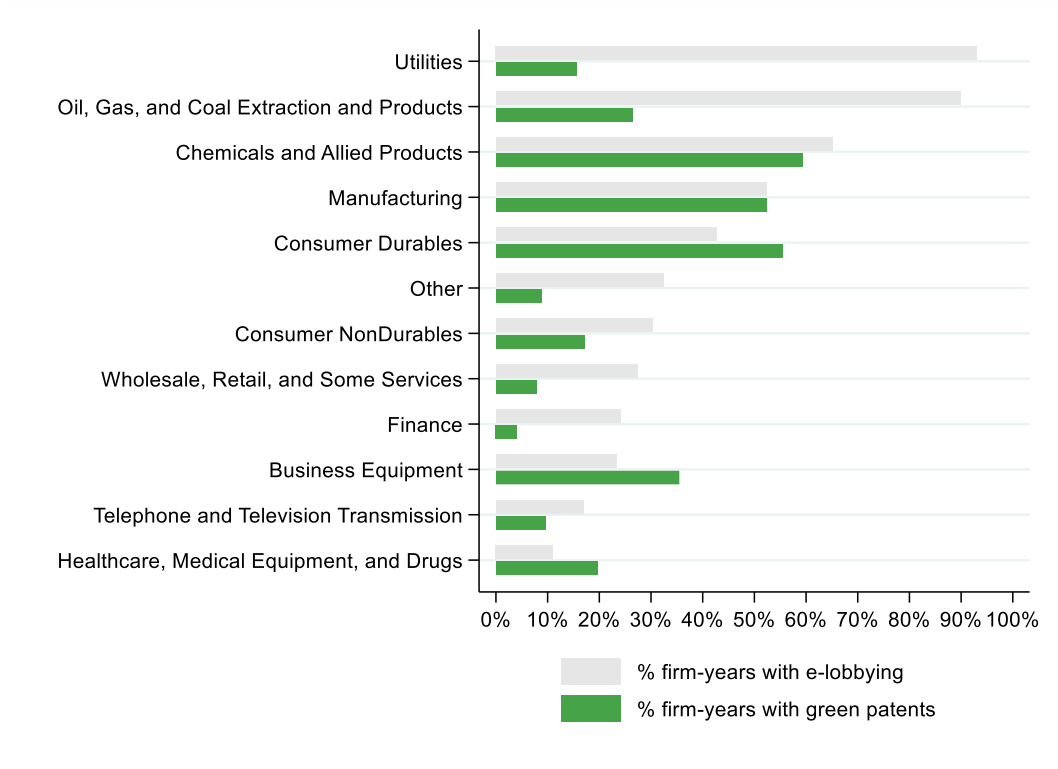
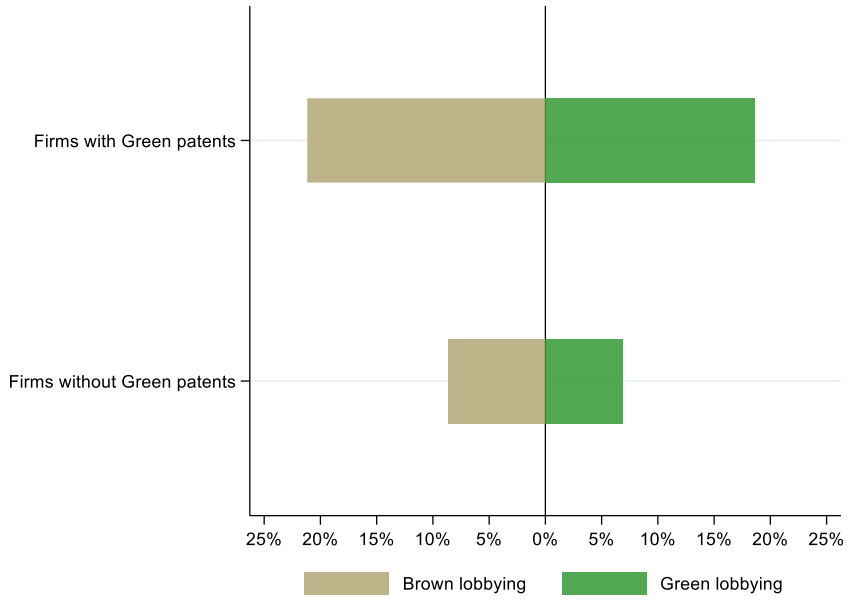


Figure 6: Green and brown lobbying among green innovators and non-green innovators
Across panels, the sample is based on firm-years between 1999 and 2020, with lobbying transactions and at least one patent (granted in the last five years). We limit the sample to firm-years with at least $10 million in assets and positive sales. Panel A shows the fraction of firm-years that lobby green vs. brown. Panel B shows the % of lobbying dollars devoted to green vs. brown.

Panel A: Fraction of firm-years with brown vs. green lobbying



Panel B: % of lobbying dollars devoted to brown vs. green

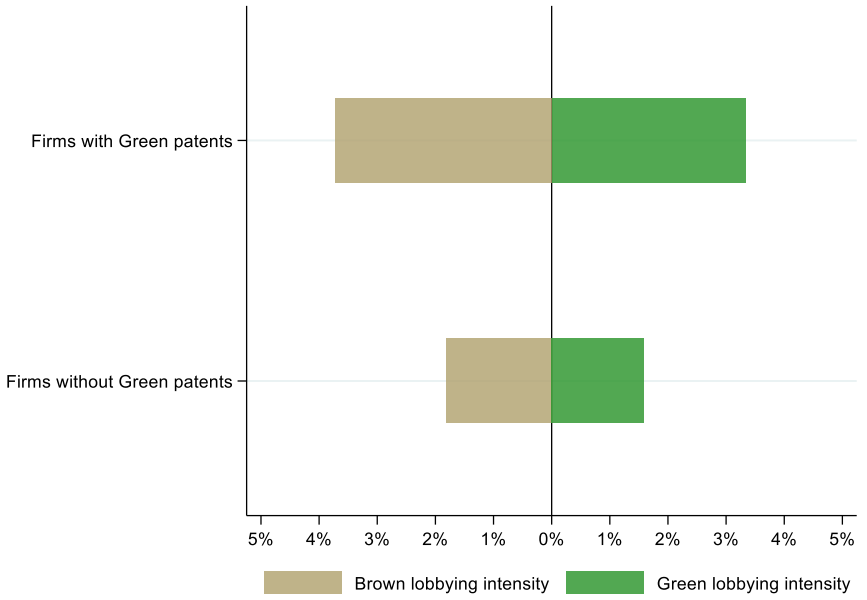
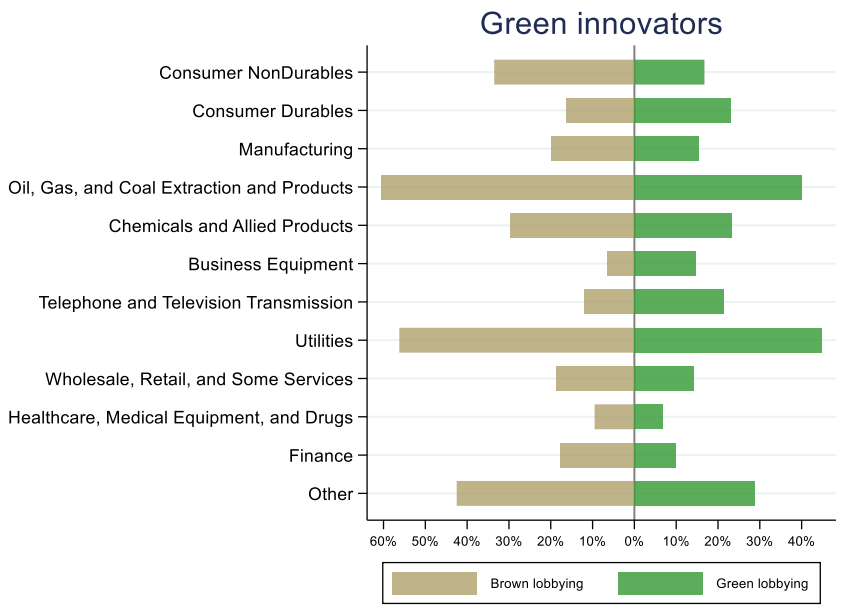


Figure 7: Green and brown lobbying among green and non-green innovators, by industry
Across panels, the sample is based on firm-years between 1999 and 2020, with lobbying transactions and at least one patent (granted in the last five years). We limit the sample to firm-years with at least $10 million in assets and positive sales. Panel A shows the fraction of firm-years that lobby green vs. brown by Green innovators (i.e., firms with green patents). Panel B shows the fraction of firm-years that lobby green vs. brown by non-green innovators (i.e., firms without green patents).

Panel A: Green innovators



Panel B: Non-green innovators

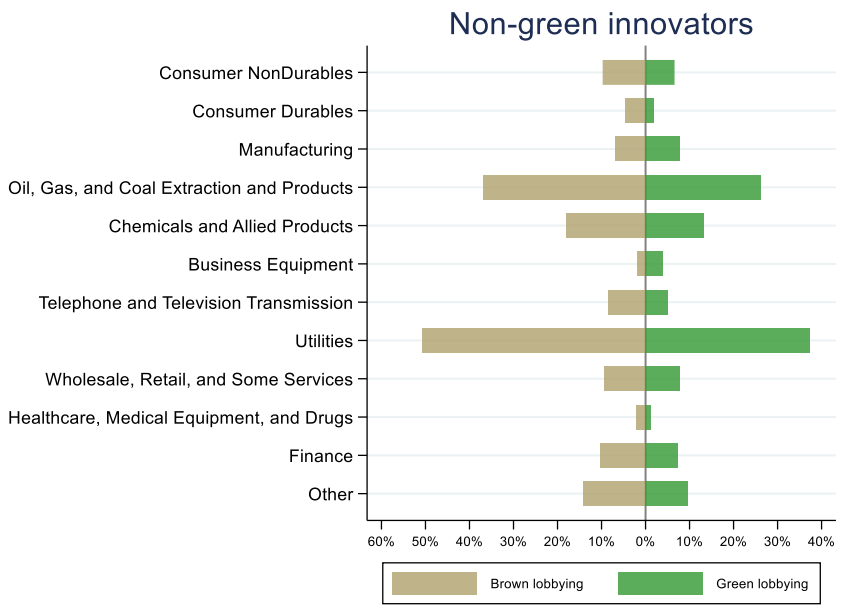


Table 1: Summary statistics

Panel A shows summary statistics on the baseline sample. The sample consists of 19,251 lobbying firm-years between 1999 and 2020, with at least $10 million in assets and positive sales. Firm-years with missing values on firm-level controls are excluded. The number of observations for *Other variables* (the last set of rows) differs depending on data availability on each specific variable. All variables except innovation-related variables are measured as of year *t*. Variable definitions are in Appendix A. Panel B shows lobbying statistics. The first set of rows is based on 19,251 firm-years with lobbying activities, and the second set of rows is based on 3,845 firm-years with green or brown lobbying activities.

Panel A: Baseline sample

VARIABLES	(1) N	(2) mean	(3) sd
Firm-level controls			
Total assets ($mil)	19,251	16,442	32,962
Book leverage	19,251	0.27	0.22
EBIT/Assets	19,251	0.04	0.17
Cash/Assets	19,251	0.17	0.20
Lobbying			
Lobbying expenditures ($ mil)	19,251	1.08	2.54
e-Lobbying expenditures ($ mil)	6,881	0.55	1.25
Innovation			
# Patents granted [t-4, t]	19,251	208.60	1,212.00
# Green patents granted [t-4, t]	19,251	12.31	103.40
Quality (Patents) [t-4, t]	19,251	0.77	1.99
Quality (Green patents) [t-4, t]	19,251	0.40	2.07
MV (Patents) [t-4, t]	19,251	14.39	42.33
MV (Green patents) [t-4, t]	19,251	6.66	32.57
Other variables			
Relatedness	11,942	0.01	0.01
Current green operations (%)	15,357	0.027	0.095
On-site toxic emission (million pounds)	2,001	2.391	7.205
E-score	9,472	5.02	2.11

Panel B: Lobbying statistics

Firms that lobby: # firm-years	19,251
$ spent Lobbying	$1,079,751
$ spent E-lobbying	$194,899
% Firm-years with: Green lobbying	10.70%
% Firms-years with: Brown lobbying	12.90%
$ Green lobbying	$21,033
Std Dev($ Green lobbying)	$317,219
$ Brown lobbying	$26,500
Std Dev($ Brown lobbying)	$150,514
Green/All lobbying	2.70%
Brown/All lobbying	3.20%
Firms that lobby G or B: # firm-years	3,845
% Brown (=B/(B+G)): $	56.30%

Table 2: Determinants of green lobbying

This table examines the determinants of firms' green lobbying activities. The sample consists of lobbying firm-years between 2000 and 2020, with at least $10 million in assets and positive sales. The dependent variable is the fraction of green lobbying dollars scaled by total lobbying expenditures. In column 2, we measure current green operations using the cosine similarity between the business description section of firms' 10Ks and 25 industry-specific sustainability-related bigrams obtained from ChatGPT. In column 3, we measure current green operations using the cosine similarity between the text of a firm's 10K and the patent summary text for all green patents granted to public firms. In column 4, we measure current green operation using the fraction of a firm's total revenues that is derived from green activities (using the FTSE Russell's Green Revenues Classification System). Industry fixed effects are defined at the Fama-French 48 industry level. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1%, respectively. Variable definitions are in Appendix A.

	Dep't Variable = Green lobbying intensity$_{t+1}$			
	(1)	(2)	(3)	(4)
Current green operations		20.944***		
		(4.130)		
Current green operations (green patent text)			0.306***	
			(0.105)	
% Green revenue				0.061*
				(0.036)
ln(Assets)	-0.002*	-0.003**	-0.003**	-0.010
	(0.001)	(0.001)	(0.001)	(0.008)
Book leverage	0.009	0.007	0.005	-0.052
	(0.008)	(0.009)	(0.009)	(0.071)
EBIT/Assets	-0.024**	-0.021	-0.019	-0.099
	(0.011)	(0.013)	(0.013)	(0.094)
Cash/Assets	-0.008	-0.005	-0.009	-0.071
	(0.010)	(0.010)	(0.011)	(0.066)
Constant	0.047***	0.049***	0.036**	0.159*
	(0.014)	(0.015)	(0.016)	(0.090)
Observations	17,930	14,772	14,772	1,699
R-squared	0.077	0.103	0.087	0.119
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 3: Lobbying across political regimes

This table examines the determinants of firms' green lobbying activities across political regimes. The sample consists of lobbying firm-years between 2000 and 2020, with at least $10 million in assets and positive sales. The dependent variable is the fraction of green lobbying dollars scaled by total lobbying expenditures. In columns 1 and 3 (2 and 4), we estimate the regression separately for Democratic (Republican) political regimes, defined as years in which the Democratic (Republican) party controls two or more of the following positions: President, Senate, and the House. We measure current green operations using the cosine similarity between the business description section of firms' 10Ks and 25 industry-specific sustainability-related bigrams obtained from ChatGPT. Industry fixed effects are defined at the Fama-French 48 industry level. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1%, respectively. Variable definitions are in Appendix A.

	Dep't Variable = Green lobbying intensity$_{t+1}$			
	(1)	(2)	(3)	(4)
	Democratic	Republican	Democratic	Republican
Current green operations			23.894***	16.567**
			(4.354)	(7.002)
ln(Assets)			-0.004*	-0.003*
			(0.002)	(0.001)
Book leverage			0.015	0.003
			(0.014)	(0.010)
EBIT/Assets			-0.057**	-0.004
			(0.028)	(0.012)
Cash/Assets			-0.001	-0.006
			(0.017)	(0.010)
Constant	0.038***	0.021***	0.060***	0.041***
	(0.004)	(0.002)	(0.021)	(0.015)
Observations	6,888	11,042	5,837	8,935
R-squared	0.000	0.000	0.128	0.085
Year FE	No	No	Yes	Yes
Industry FE	No	No	Yes	Yes

Table 4: Lobbying and future emissions

This table shows the relation between environmental lobbying and firms' toxic emissions. The sample is as described in prior tables, with the added requirement that firms have available data on toxic emissions. The dependent variable is toxic emissions, as reported by firms to the EPA, in years *t*+1, *t*+2, and *t*+3. The direction of firms' environmental lobbying is measured as the fraction of lobbying dollars spent on brown and green lobbying, respectively. We additionally control for total lobbying expenditures. Industry fixed effects are defined at the Fama-French 48 industry level. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1%, respectively. Variable definitions are in Appendix A.

	Dep't Variable = ln(Emissions) at time:		
	t+1	*t*+2	*t*+3
Green lobbying intensity	-0.012	-0.042	0.097
	(1.009)	(1.002)	(0.967)
Brown lobbying intensity	1.234**	1.131*	1.013*
	(0.598)	(0.591)	(0.593)
Total lobbying expenditures	0.040	-0.092	-0.227
	(0.461)	(0.459)	(0.455)
ln(Assets)	0.947***	0.981***	0.998***
	(0.190)	(0.190)	(0.190)
Book leverage	-0.284	-0.302	-0.198
	(1.240)	(1.274)	(1.288)
EBIT/Assets	-1.470	-2.695	-1.847
	(2.260)	(2.248)	(2.177)
Cash/Assets	-1.806	-2.002	-2.314
	(1.974)	(2.050)	(2.031)
Constant	2.160	2.151	2.092
	(1.560)	(1.559)	(1.548)
Observations	1,995	1,981	1,966
R-squared	0.469	0.465	0.462
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Table 5: Lobbying and future emissions, placebo test

This table shows the relation between non-environmental lobbying and firms' toxic emissions. The sample is as described in prior tables, with the added requirement that firms have available data on toxic emissions. The dependent variable is toxic emissions, as reported by firms to the EPA, in years *t*+1, *t*+2, and *t*+3. The direction of firms' non-environmental lobbying is measured as the fraction of non-environmental lobbying dollars spent towards Democratic or Republican directions, as described in further detail in the text. We additionally control for total lobbying expenditures. Industry fixed effects are defined at the Fama-French 48 industry level. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1%, respectively. Variable definitions are in Appendix A.

	Dep't Variable = ln(Emissions) at time:		
	t+1	*t*+2	*t*+3
Dem lobbying intensity	-1.020	-1.010	-1.200
	(0.742)	(0.765)	(0.805)
Rep lobbying intensity	-0.149	-0.342	-0.758
	(0.524)	(0.503)	(0.519)
Total lobbying expenditures	-0.042	-0.185	-0.337
	(0.459)	(0.456)	(0.450)
ln(Assets)	0.945***	0.982***	0.993***
	(0.189)	(0.189)	(0.190)
Book leverage	-0.314	-0.354	-0.283
	(1.240)	(1.273)	(1.282)
EBIT/Assets	-1.431	-2.618	-1.709
	(2.242)	(2.248)	(2.176)
Cash/Assets	-1.713	-2.000	-2.515
	(1.989)	(2.064)	(2.037)
Constant	2.412	2.401	2.496
	(1.570)	(1.579)	(1.591)
Observations	1,995	1,981	1,966
R-squared	0.470	0.466	0.465
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Table 6: Descriptive statistics on lobbying and innovation

The sample includes firm-years between 1999 and 2020, with at least $10 million in assets and positive sales. Firm-years with missing values on firm-level controls are excluded. In columns 1 – 3, the sample is divided into firm-years with at least one green patent, with at least one patent but no green patents, and with no patents, respectively. In columns 4 – 5, the sample consists of firm-years with at least one clean patent and with at least one dirty patent, respectively. The number of patents is measured in a 5-year window (i.e., *t*-4 to *t*). We classify patents relating to green technologies based on the OECD classification. Clean and dirty patent definitions are from Dechezlepretre, Muckley, and Neelakantan (2020). The green patent sample consists of 1,031 unique firms, the clean patent sample of 645 unique firms, and the dirty patent sample of 297 unique firms. The classification of green versus brown lobbying is described in the text.

	The distribution of environmental lobbying across				
	Firm-years with				
	Green patents	Patents other than Green	No patents	Clean patents	Dirty patents
All firms: # firm-years	8,797	20,982	57,943	5,567	2,350
% Firm-yrs with: Any lobbying	50.6%	26.3%	16.0%	56.5%	67.7%
% Firm-yrs with: E-lobbying	29.2%	6.7%	5.0%	34.8%	49.4%
Firms that lobby: # firm-years	4,450	5,519	9,282	3,146	1,590
$ spent Lobbying	$2,329,872	$845,359	$619,781	$2,576,416	$3,141,150
$ spent E-lobbying	$437,728	$110,417	$128,713	$502,895	$763,285
% Firm-yrs with: Green lobbying	18.7%	6.8%	9.1%	20.1%	25.2%
% Firms-yrs with: Brown lobbying	21.2%	8.6%	11.6%	22.2%	28.4%
$ Green lobbying	$32,068	$9,632	$22,521	$33,925	$43,985
Std Dev($ Green lobbying)	$163,916	$66,926	$439,357	$172,347	$177,940
$ Brown lobbying	$49,569	$18,251	$20,344	$54,071	$68,092
Std Dev($ Brown lobbying)	$213,193	$127,763	$123,134	$228,190	$222,651
Green/All lobbying	3.3%	1.6%	3.0%	3.4%	3.3%
Brown/All lobbying	3.7%	1.8%	3.8%	3.7%	4.6%
Firms that lobby G or B: # firm-yrs	1,458	725	1,662	1,095	698
% Brown (=B/(B+G)): $	54.8%	57.8%	57.0%	53.7%	55.0%

Table 7: Future emissions: lobbying and innovation

This table shows the relation between environmental lobbying and firms' toxic emissions. The sample is as described in prior tables, with the added requirement that firms have available data on toxic emissions. The dependent variable is toxic emissions, as reported by firms to the EPA, in years *t*+1, *t*+2, and *t*+3. The direction of firms' environmental lobbying is measured as the fraction of lobbying dollars spent on brown and green lobbying, respectively. We additionally control for total lobbying expenditures. We measure green innovation as the number of green patents (columns 1 – 3), the average forward citations (columns 4 – 6), and the market value of green patents (columns 7 – 9). Industry fixed effects are defined at the Fama-French 48 industry level. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1%, respectively. Variable definitions are in Appendix A.

	Dep't Variable = ln(Emissions)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	t+1	*t*+2	*t*+3	*t*+1	*t*+2	*t*+3	*t*+1	*t*+2	*t*+3
Green lobbying intensity	-0.021	-0.075	0.048	-0.014	-0.042	0.098	-0.019	-0.059	0.074
	(1.031)	(1.029)	(0.987)	(1.006)	(1.001)	(0.966)	(1.021)	(1.017)	(0.979)
Brown lobbying intensity	1.274**	1.188**	1.082*	1.227**	1.129*	1.010*	1.248**	1.163*	1.051*
	(0.604)	(0.601)	(0.608)	(0.601)	(0.597)	(0.598)	(0.599)	(0.592)	(0.594)
Total lobbying expenditures	0.140	0.034	-0.111	0.033	-0.094	-0.229	0.108	-0.007	-0.158
	(0.450)	(0.445)	(0.439)	(0.465)	(0.463)	(0.458)	(0.477)	(0.475)	(0.471)
# Green patents	-0.138	-0.173	-0.160						
	(0.168)	(0.170)	(0.172)						
Q(Green patents)				0.065	0.024	0.020			
				(0.362)	(0.384)	(0.371)			
MV(Green patents)							-0.111	-0.134	-0.109
							(0.131)	(0.133)	(0.131)
ln(Assets)	1.002***	1.048***	1.058***	0.942***	0.979***	0.996***	0.981***	1.022***	1.031***
	(0.205)	(0.206)	(0.205)	(0.191)	(0.191)	(0.190)	(0.196)	(0.195)	(0.193)
Book leverage	-0.340	-0.361	-0.264	-0.274	-0.299	-0.196	-0.338	-0.380	-0.279
	(1.258)	(1.288)	(1.306)	(1.254)	(1.286)	(1.300)	(1.244)	(1.278)	(1.295)
EBIT/Assets	-1.602	-2.863	-2.024	-1.471	-2.698	-1.847	-1.414	-2.625	-1.820
	(2.261)	(2.261)	(2.196)	(2.261)	(2.245)	(2.177)	(2.241)	(2.232)	(2.169)
Cash/Assets	-1.536	-1.679	-2.039	-1.839	-2.015	-2.326	-1.731	-1.920	-2.250
	(1.963)	(2.059)	(2.022)	(1.966)	(2.045)	(2.020)	(2.001)	(2.078)	(2.047)
Constant	1.784	1.692	1.683	2.182	2.160	2.098	1.951	1.899	1.892
	(1.616)	(1.624)	(1.609)	(1.553)	(1.552)	(1.540)	(1.589)	(1.583)	(1.563)
Observations	1,995	1,981	1,966	1,995	1,981	1,966	1,995	1,981	1,966
R-squared	0.470	0.467	0.464	0.469	0.465	0.462	0.470	0.466	0.462
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: E-ratings

This table shows the relation between environmental lobbying and e-ratings. The sample consists of lobbying firm-years between 2000 and 2020, with at least $10 million in assets and positive sales. The dependent variable is the firm's MSCI environmental rating, which is on a scale of zero to ten, with higher numbers being more favorable ratings. The direction of firms' environmental lobbying is measured as the fraction of lobbying dollars spent on brown and green lobbying, respectively. We additionally control for total lobbying expenditures. We measure green innovation as the number of green patents (column 1), the average forward citations (column 2), and the market value of green patents (column 3). Industry fixed effects are defined at the Fama-French 48 industry level. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1%, respectively. Variable definitions are in Appendix A.

	Dep't Var = E-score$_{t+1}$		
Green lobbying intensity	0.308	0.278	0.272
	(0.256)	(0.254)	(0.256)
Brown lobbying intensity	0.136	0.124	0.096
	(0.211)	(0.216)	(0.216)
# Green patents	0.211***		
	(0.039)		
Q(Green patents)		0.286***	
		(0.104)	
MV(Green patents)			0.171***
			(0.034)
Total lobbying expenditures	0.361***	0.432***	0.370***
	(0.081)	(0.081)	(0.082)
ln(Assets)	0.204***	0.240***	0.208***
	(0.041)	(0.041)	(0.041)
Book leverage	0.276	0.276	0.308
	(0.230)	(0.231)	(0.230)
EBIT/Assets	0.532*	0.509	0.411
	(0.306)	(0.311)	(0.309)
Cash/Assets	0.603**	0.680**	0.601**
	(0.305)	(0.308)	(0.306)
Observations	9,218	9,218	9,218
R-squared	0.259	0.251	0.257
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Table 9: UNPRI ownership

This table examines how firms' environmental lobbying activities are perceived by institutional investors. The sample consists of lobbying firm-years between 2000 and 2020, with at least $10 million in assets and positive sales. In columns 1 – 3, the dependent variable (IO) is institutional ownership. In columns 4 – 6, the dependent variable (IO^G) is ownership by green institutions as a fraction of total institutional ownership. Green institutions are defined as institutions that signed up for PRI (Principles for Responsible Investment). The UNPRI signatory directory is available beginning in 2006. The direction of firms' environmental lobbying is measured as the fraction of lobbying dollars spent on brown and green lobbying, respectively. We additionally control for total lobbying expenditures. We measure green innovation as the number of green patents (columns 1 and 4), the average forward citations (columns 2 and 5), and the market value of green patents (columns 3 and 6). Industry fixed effects are defined at the Fama-French 48 industry level. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1%, respectively. Variable definitions are in Appendix A.

VARIABLES	(1) IO	(2) IO	(3) IO	(1) IO^G	(2) IO^G	(3) IO^G
Green lobbying intensity	-0.008	-0.004	-0.006	0.023*	0.022*	0.022*
	(0.025)	(0.025)	(0.025)	(0.012)	(0.012)	(0.012)
Brown lobbying intensity	-0.013	-0.010	-0.010	0.015	0.014	0.014
	(0.025)	(0.025)	(0.025)	(0.011)	(0.011)	(0.011)
# Green patents	-0.023***			0.003*		
	(0.004)			(0.002)		
Q(Green patents)		-0.028***			0.007*	
		(0.009)			(0.004)	
MV(Green patents)			-0.021***			0.001
			(0.003)			(0.001)
Total lobbying expenditures	-0.059***	-0.068***	-0.059***	-0.006*	-0.005*	-0.005
	(0.008)	(0.008)	(0.008)	(0.003)	(0.003)	(0.003)
ln(Assets)	0.050***	0.047***	0.050***	-0.002	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
Book leverage	0.031	0.031	0.027	-0.025**	-0.024**	-0.025**
	(0.020)	(0.021)	(0.021)	(0.010)	(0.010)	(0.010)
EBIT/Assets	0.386***	0.390***	0.395***	0.014	0.013	0.013
	(0.021)	(0.022)	(0.021)	(0.014)	(0.014)	(0.014)
Cash/Assets	0.096***	0.090***	0.095***	-0.017	-0.017	-0.016
	(0.024)	(0.024)	(0.024)	(0.012)	(0.012)	(0.012)
Constant	0.309***	0.328***	0.308***	0.284***	0.282***	0.282***
	(0.026)	(0.027)	(0.027)	(0.012)	(0.012)	(0.012)
Observations	17,332	17,332	17,332	12,558	12,558	12,558
R-squared	0.304	0.298	0.303	0.693	0.693	0.693
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Internet Appendix to

Environmental Lobbying, Innovation, and the Green Transition

Internet Appendix A
LD-2 form example
This appendix shows selected pages from an LD-2 filed by Nickles Group (client = Exxon Mobil). The report can be viewed online here: https://lda.senate.gov/filings/public/filing/10006a62-3189-4bdb-b990-cc2bdc02bd4a/print/ .

Clerk of the House of Representatives	Secretary of the Senate
Legislative Resource Center	Office of Public Records
B-106 Cannon Building	232 Hart Building
Washington, DC 20515	Washington, DC 20510

Secretary of the Senate
Received: Feb 05, 2008

LOBBYING REPORT

Lobbying Disclosure Act of 1995 (Section 5) - **All Filers Are Required To Complete This Page**

1. Registrant Name:

NICKLES GROUP

2. Address:
601 13th St. NW Suite 250 N, Washington, DC 20005

3. Principal place of business (if different from line 2):

4. Contact Name: PAMELA FLEMING
Telephone: 2026370214
E-mail (optional): mail@nicklesgroup.com

Senate ID #: 293335-583
House ID #:

7. Client Name: ☐ Self

EXXON MOBIL CORPORATION

TYPE OF REPORT

8. Year 2007 Midyear (January 1 - June 30): ☐ **OR** Year End (July 1 - December 31): ☒

9. Check if this filing amends a previously filed version of this report: ☐

10. Check if this is a Termination Report: ☐ => Termination Date: 11. No Lobbying Activity: ☐

INCOME OR EXPENSES

Complete Either Line 12 **OR** Line 13

12. Lobbying Firms

INCOME relating to lobbying activities for this reporting period was:

Less than $10,000: ☐

$10,000 or more: ☒ => Income (nearest $20,000): 150,000.00

Provide a good faith estimate, rounded to the nearest $20,000, of all lobbying related income from the client (including all payments to the registrant by any other entity for lobbying activities on behalf of the client).

Registrant Name: NICKLES GROUP Client Name: EXXON MOBIL CORPORATION

LOBBYING ACTIVITY.

Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Attach additional page(s) as needed.

15. General issue area code: BUD (one per page)

16. Specific lobbying issues:

S.Con.Res. 21, budget resolution, issues related to tax and energy policy.

17. House(s) of Congress and Federal agencies contacted:
HOUSE OF REPRESENTATIVES
SENATE

18. Name of each individual who acted as a lobbyist in this issue area:

Name: MARSHALL, HAZEN
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE, STAFF DIRECTOR

19. Interest of each foreign entity in the specific issues listed on line 16 above.**None**

Registrant Name: NICKLES GROUP Client Name: EXXON MOBIL CORPORATION

LOBBYING ACTIVITY.

Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Attach additional page(s) as needed.

15. General issue area code: ENG (one per page)

16. Specific lobbying issues:

H.R. 6, Clean Energy Act of 2007; H.R. 2776, Renewable Energy and Energy Conservation Tax Act of 2007; S.1321, Energy Savings Act; H.R. 2337, Energy Policy Reform and Revitalization Act; H.R. 2643 and S. 1696, Interior and Environment Appropriations for FY08; H.R. 2264 and S. 879, NOPEC; S. 1263, Petroleum Price Gouging Protection Act; issues related to energy taxes, revenue offsets, outer continental shelf leases and user fees, royalties, price gouging, foreign trade, climate change, and refinery issues.

17. House(s) of Congress and Federal agencies contacted:
Executive Office of the President (EOP)
HOUSE OF REPRESENTATIVES
SENATE

18. Name of each individual who acted as a lobbyist in this issue area:

Name: JONES HENSLER, RACHEL
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE, TAX POLICY DIR.
Name: MARSHALL, HAZEN
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE, STAFF DIRECTOR
Name: NICKLES, DON
Covered Official Position (if applicable): U.S. SENATOR
Name: WILD, BRIAN
Covered Official Position (if applicable): EXEC. OFFICE OF THE VP, DPTY ASST. FOR LEG. AFF.

19. Interest of each foreign entity in the specific issues listed on line 16 above.**None**

Registrant Name: NICKLES GROUP Client Name: EXXON MOBIL CORPORATION

LOBBYING ACTIVITY.

Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Attach additional page(s) as needed.

15. General issue area code: ENV (one per page)

16. Specific lobbying issues:

S. 1766, Low Carbon Economy Act; S. 2191, America's Climate Security Act of 2007, issues related to climate change.

17. House(s) of Congress and Federal agencies contacted:
Executive Office of the President (EOP)
HOUSE OF REPRESENTATIVES
SENATE

18. Name of each individual who acted as a lobbyist in this issue area:

Name: MARSHALL, HAZEN
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE, STAFF DIRECTOR
Name: NICKLES, DON
Covered Official Position (if applicable): U.S. SENATOR
Name: WILD, BRIAN
Covered Official Position (if applicable): EXEC. OFFICE OF THE VP, DPTY ASST. FOR LEG. AFF.

19. Interest of each foreign entity in the specific issues listed on line 16 above.**None**

Registrant Name: NICKLES GROUP Client Name: EXXON MOBIL CORPORATION

LOBBYING ACTIVITY.

Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Attach additional page(s) as needed.

15. General issue area code: FUE (one per page)

16. Specific lobbying issues:

H.R. 6, Clean Energy Act of 2007; H.R. 2776, Renewable Energy and Energy Conservation Tax Act of 2007; S.1321, Energy Savings Act; H.R. 2337, Energy Policy Reform and Revitalization Act; H.R. 2643 and S. 1696, Interior and Environment Appropriations for FY08; H.R. 2264 and S. 879, NOPEC; S. 1263, Petroleum Price Gouging Protection Act; issues related to energy taxes, revenue offsets, outer continental shelf leases and user fees, royalties, price gouging, foreign trade, climate change, and refinery issues.

17. House(s) of Congress and Federal agencies contacted:
Executive Office of the President (EOP)
HOUSE OF REPRESENTATIVES
SENATE

18. Name of each individual who acted as a lobbyist in this issue area:

Name: JONES HENSLER, RACHEL
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE, TAX POLICY DIR
Name: MARSHALL, HAZEN
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE, STAFF DIRECTOR
Name: NICKLES, DON
Covered Official Position (if applicable): U.S. SENATOR
Name: WILD, BRIAN
Covered Official Position (if applicable): EXEC. OFFICE OF THE VP, DPTY ASST. FOR LEG. AFF.

19. Interest of each foreign entity in the specific issues listed on line 16 above.**None**

Registrant Name: NICKLES GROUP Client Name: EXXON MOBIL CORPORATION

LOBBYING ACTIVITY.

Select as many codes as necessary to reflect the general issue areas in which the registrant engaged in lobbying on behalf of the client during the reporting period. Using a separate page for each code, provide information as requested. Attach additional page(s) as needed.

15. General issue area code: TAX (one per page)

16. Specific lobbying issues:

H.R. 6, Clean Energy Act of 2007; H.R. 2776, Renewable Energy and Energy Conservation Tax Act of 2007; H.R. 976, Small Business Tax Relief Act of 2007; H.R. 1591 and H.R. 2206, emergency supplemental appropriations for FY07, issues related to energy taxes, revenue offsets, outer continental shelf leases and user fees, royalties, price gouging, foreign trade, climate change, and refinery issues; all matters related to R&D credit oil & gas taxation and taxation of exec. comp.

17. House(s) of Congress and Federal agencies contacted:
Executive Office of the President (EOP)
HOUSE OF REPRESENTATIVES
SENATE

18. Name of each individual who acted as a lobbyist in this issue area:

Name: JONES HENSLER, RACHEL
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE, TAX POLICY DIR.
Name: MARSHALL, HAZEN
Covered Official Position (if applicable): U.S. SENATE BUDGET COMMITTEE STAFF DIRECTOR
Name: NICKLES, DON
Covered Official Position (if applicable): U.S. SENATOR
Name: WILD, BRIAN
Covered Official Position (if applicable): EXEC. OFFICE OF THE VP, DPTY. ASST FOR LEG. AFF

19. Interest of each foreign entity in the specific issues listed on line 16 above.**None**

Signature: ON FILE Date: Feb 05, 2008

Printed Name and Title: PAMELA FLEMING, ADMINISTRATIVE DIRECTOR

Registrant Name: NICKLES GROUP Client Name: EXXON MOBIL CORPORATION

Information Update Page:

Complete ONLY where registration information has changed.

LOBBYIST UPDATE

23. Name of each previously reported individual who is NO LONGER expected to act as a lobbyist for the client

ISSUE UPDATE

24. General lobbying issues previously reported that NO LONGER pertain

AFFILIATED ORGANIZATIONS

25. Add the following organization(s)

26. Name of each previously reported organization that is NO LONGER affiliated with the registrant or client

FOREIGN ENTITIES

27. Add the following foreign entities

28. Name of each previously reported foreign entity the NO LONGER owns, OR controls, OR is affiliated with the registrant, client or affiliated organization

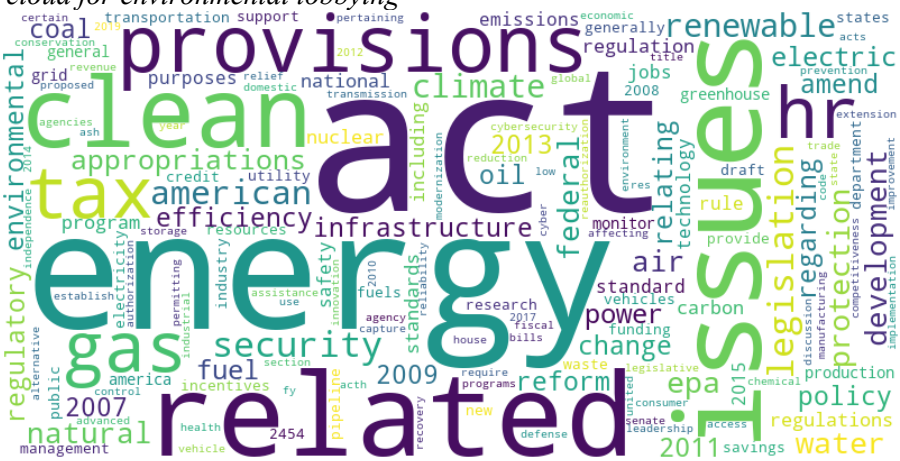
Signature: ON FILE Date: Feb 05, 2008

Printed Name and Title: -

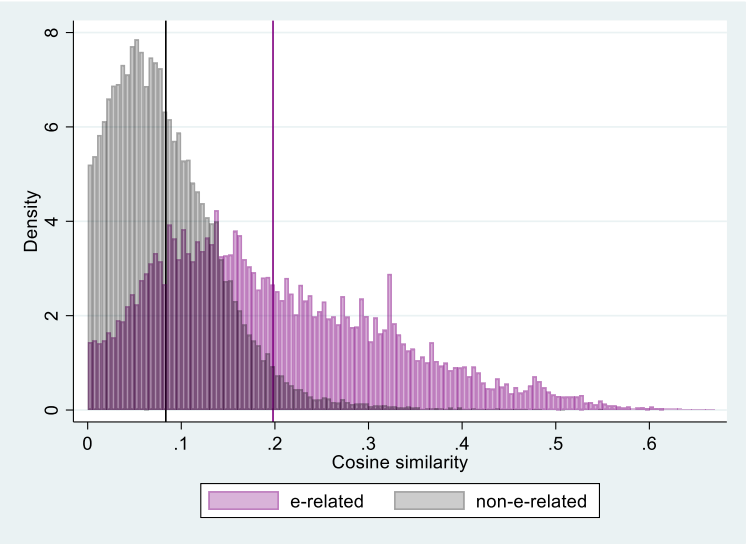
Internet Appendix Figure A1: Classification of environmental lobbying

Panel A depicts the vocabulary that we identify as pertaining to lobbying issues related to the environment. Specifically, a lobbying transaction within an LD-2 is defined to be e-related if 1) the transaction contains issue codes (in Line 15) in ENG, ENV, FUE, CAW, or WAS, or 2) the description of the issue (in Line 16) in the LD-2 contains at least one of the bills associated with Environmental protection, Energy, Public lands and natural resources, or Water resources development, as defined by https://www.congress.gov/. We form a word vector based on the Line 16 descriptions across all these LD-2s. Panel B shows the distribution of cosine similarity between our environment-related vocabulary (as depicted in Panel A) and Line 16 of Form LD-2. Cosine similarity scores for e-related lobbying transactions are colored purple, and cosine similarity scores for non-e-related lobbying transactions are colored gray. Vertical lines represent the means of cosine similarity scores for each category.

Panel A: Word cloud for environmental lobbying

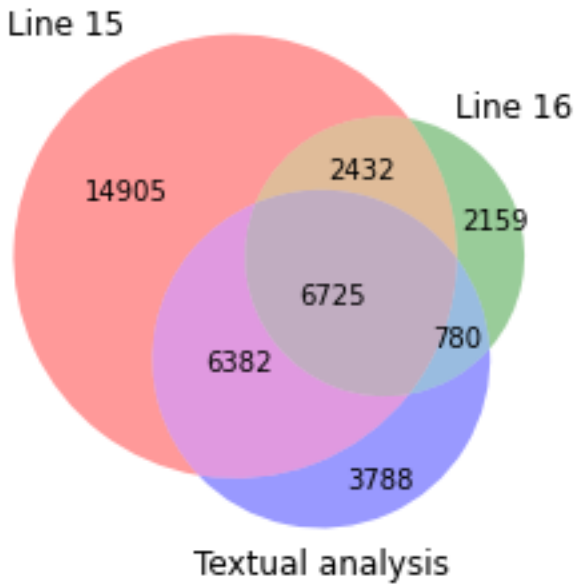


Panel B: Cosine similarity between environment-related vocabulary and alternative sets of lobbying transactions

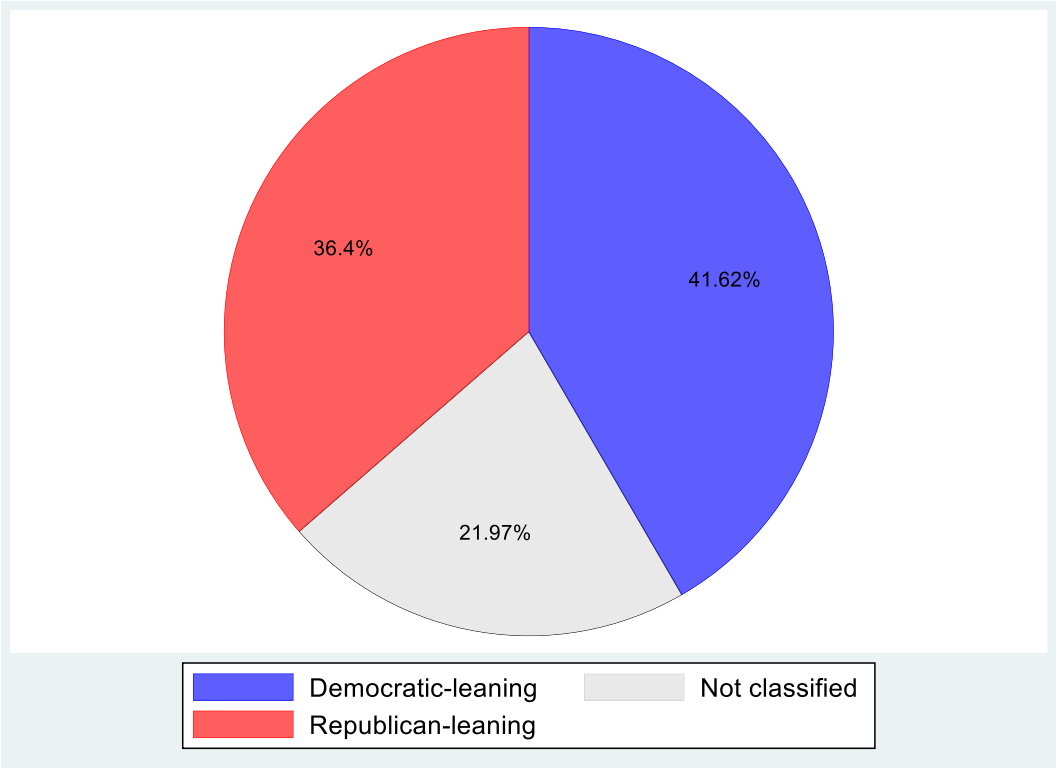


Internet Appendix Figure A2: Classification of LD-2s

This figure shows the universe of LD-2s that are classified as environment-related. Each observation represents an LD-2 form. An LD-2 is defined to be e-related if 1) the LD-2 contains issue codes (in Line 15) in ENG, ENV, FUE, CAW, or WAS, or 2) the description of the issue (in Line 16) in the LD-2 contains at least one of the bills associated with Environmental protection, Energy, Public lands and natural resources, or Water resources development, as defined by https://www.congress.gov/, or 3) the cosine similarity between the e-related vocabulary (as shown in Figure 3) and the description of the issue (in Line 16) is greater than the average cosine similarity of e-related lobbying transactions identified in steps 1) and 2). Lobbying data are obtained from the SOPR (Senate Office of Public Records) and OpenSecrets.



Internet Appendix Figure A3: Classification of lobbyists' political orientation
This figure shows the classification of lobbyists' political orientations in our sample. We define a lobbyist to be Democratic (Republican) party-leaning if more than 75% of the lobbyist's individual contributions are allocated to the Democratic (Republican) party.



Internet Appendix Table A1: Classification of lobbyists' political orientation

This table shows the transition matrix of lobbyists' political orientation: Panel A shows this matrix across all lobbyists, and Panel B is based on the sample of lobbyists who lobbied for public firms. A lobbyist is defined as a Democratic party-leaning lobbyist if more than 75% of his/her political contributions to either of the main political parties (i.e., Democratic or Republican) between 1990-2020 are allocated to the Democratic party. Analogously, lobbyists are defined as Republican party-leaning.

Panel A: All lobbyists

	Democratic(t+1)	Republican(t+1)	Unclassified(t+1)
Democratic(t)	97.1%	0.2%	2.7%
Republican(t)	0.3%	96.0%	3.7%
Unclassified(t)	3.6%	3.0%	93.4%

Panel B: Lobbyists who lobbied for public firms

	Democratic(t+1)	Republican(t+1)	Unclassified(t+1)
Democratic(t)	96.8%	0.2%	3.0%
Republican(t)	0.2%	96.6%	3.2%
Unclassified(t)	3.6%	3.3%	93.1%

Internet Appendix Table A2: Industry-specific bigrams

Our first measure of firms' *Current green operations* is based on industry-specific bigrams within 10Ks. We identify using artificial intelligence. We ask ChatGpt "Please provide 25 bigrams that indicate sustainable business practices, not greenwashing, in the '*Consumer Nondurables*' industry." We repeat this for each of the first 11 Fama-French 12 industry groups. For the 12th Fama French industry '*Other'*, we simply ask 'Please provide 25 business sustainability bigrams that indicate true pro-environment practices, not green washing.' The bigrams for all 12 industries are shown below.

Consumer Nondurable	Consumer Durables	Manu-facturing	Oil, Gas, Coal	Chemicals	Business Equipment	Telephone and TV Trans-mission	Utilities	Wholesale and Retail	Healthcare Medical Equipment Drugs	Finance	General (Other)
Renewable energy	Renewable energy	Renewable energy	Carbon capture	Renewable resources	Renewable energy	Renewable energy	Renewable energy	Renewable energy	Renewable energy	Green bonds	Renewable energy
Sustainable sourcing	Recycled materials	Waste reduction	Emission reduction	Green chemistry	Energy efficiency	Carbon neutral	Carbon neutral	Ethical sourcing	Waste reduction	Impact investing	Carbon neutral
Ethical labor	Energy efficiency	Energy efficiency	Renewable energy	Waste reduction	Waste reduction	Energy efficiency	Energy efficiency	Fair trade	Ethical sourcing	Ethical investing	Ethical sourcing
Carbon neutral	Carbon footprint	Carbon footprint	Energy efficiency	Energy efficiency	Carbon footprint	Waste reduction	Green infrastructure	Carbon neutral	Carbon footprint	Carbon footprint	Waste reduction
Waste reduction	Sustainable sourcing	Sustainable sourcing	Waste management	Carbon footprint	Sustainable sourcing	Sustainable sourcing	Sustainable sourcing	Waste reduction	Green packaging	Renewable energy	Green technology
Eco-friendly packaging	Waste reduction	Green manufacturing	Water conservation	Sustainable sourcing	Recycled materials	Green technology	Emission reduction	Recycled materials	Energy efficiency	Social impact	Sustainable materials
Organic materials	Ethical labor	Circular economy	Biodiversity protection	Eco-friendly processes	Green manufacturing	Eco-friendly materials	Clean technology	Sustainable packaging	Sustainable materials	Sustainable finance	Fair trade
Fair trade	Green manufacturing	Eco-friendly materials	Sustainable sourcing	Biodegradable materials	Eco-friendly packaging	Emission reduction	Waste management	Energy efficiency	Water conservation	ESG criteria	Circular economy
Water conservation	Circular economy	Water conservation	Green technology	Circular economy	Water conservation	Circular economy	Water conservation	Local suppliers	Recycled content	Climate risk	Energy efficiency
Energy efficiency	Water conservation	Emission control	Environmental stewardship	Emission control	Circular economy	Resource conservation	Eco-friendly	Organic products	Eco-friendly	Green finance	Water conservation
Recycled content	Eco-friendly packaging	Resource optimization	Climate action	Water conservation	Ethical labor	Ethical labor	Grid modernization	Water conservation	Circular economy	Responsible investing	Eco-friendly packaging
Green manufacturing	Low emissions	Recycled content	Clean energy	Clean technology	Low emissions	Water conservation	Smart meters	Green logistics	Low emissions	Circular economy	Biodiversity protection
Biodiversity protection	Fair trade	Pollution prevention	Eco-friendly	Pollution prevention	Resource optimization	Green infrastructure	Solar power	Circular economy	Green chemistry	Clean energy	Low emissions
Circular economy	Resource optimization	Ethical labor	Pollution control	Resource optimization	Green certifications	Sustainable packaging	Wind energy	Eco-friendly	Responsible manufacturing	Carbon neutral	Social responsibility
Low emissions	Biodiversity protection	Lifecycle assessment	Resource optimization	Lifecycle assessment	Sustainable innovation	Low emissions	Hydro power	Supply chain	Sustainable sourcing	Green loans	Community engagement
Responsible production	Lifecycle assessment	Clean technology	Sustainable development	Sustainable innovation	Lifecycle assessment	Clean energy	Biomass energy	Social responsibility	Biodegradable products	Sustainable growth	Green buildings
Sustainable agriculture	Sustainable innovation	Sustainable packaging	Low-carbon	Environmental stewardship	Environmental stewardship	Environmental stewardship	Geothermal energy	Community engagement	Clean energy	Ethical banking	Responsible investing
Climate action	Green supply	Biodiversity protection	Green infrastructure	Responsible manufacturing	Pollution control	Responsible sourcing	Energy storage	Employee welfare	Environmental stewardship	Green investments	Climate action

Internet Appendix Table A2 continued

Consumer Nondurable	Consumer Durables	Manu-facturing	Oil, Gas, Coal	Chemicals	Business Equipment	Telephone and TV Trans-mission	Utilities	Wholesale and Retail	Healthcare Medical Equipment Drugs	Finance	General (Other)
Zero waste	Renewable resources	Green supply	Circular economy	Toxicity reduction	Green logistics	Green supply	Demand response	Biodiversity protection	Resource efficiency	Social responsibility	Sustainable agriculture
Biodegradable products	Environmental stewardship	Low-impact	Carbon neutrality	Sustainable packaging	Biodiversity protection	Sustainable innovation	Electric vehicles	Transparent reporting	Sustainable innovation	Environmental stewardship	Clean energy
Social responsibility	Carbon neutral	Zero waste	Renewable integration	Renewable feedstocks	Climate action	Eco-conscious design	Green tariffs	Climate action	Green supply	Sustainable portfolios	Zero waste
Environmental stewardship	Sustainable design	Environmental stewardship	Sustainable innovation	Green solvents	Renewable resources	Renewable resources	Climate action	Zero waste	Sustainable development	Green infrastructure	Green supply
Green supply	Responsible sourcing	Sustainable innovation	Environmental compliance	Eco-efficient production	Sustainable design	Green manufacturing	Environmental stewardship	Green certification	Zero waste	Low-carbon	Environmental stewardship
Clean technology	Green energy	Green certification	Green investment	Sustainable development	Green procurement	Sustainable development	Sustainable development	Responsible sourcing	Climate action	Sustainable development	Sustainable innovation
Sustainable innovation	Zero waste	Responsible production	Community engagement	Climate action	Responsible production	Climate action	Circular economy	Sustainable growth	Sustainable practices	Green initiatives	Resource efficiency

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