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Abstract

The competitive challenges and regulatory uncertainty associated with the green transition incentivize firms to both innovate and influence environmental policy. While much attention has focused on green innovation, we examine firms' lobbying choices. We develop a method to identify "green" and "brown" environmental lobbying. We find that firms' lobbying is not aligned with their innovation efforts: many green innovators engage in significant brown lobbying. The direction of environmental lobbying is an informative signal of firms' true environmental stances and predicts real actions, such as emissions. Despite the informativeness of lobbying, neither environmental ratings nor UNPRI signatories' investments incorporate this signal.

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Abstract

The competitive challenges and regulatory uncertainty associated with the green transition incentivize firms to both innovate and influence environmental policy. While much attention has focused on green innovation, we examine firms' lobbying choices. We develop a method to identify "green" and "brown" environmental lobbying. We find that firms' lobbying is not aligned with their innovation efforts: many green innovators engage in significant brown lobbying. The direction of environmental lobbying is an informative signal of firms' true environmental stances and predicts real actions, such as emissions. Despite the informativeness of lobbying, neither environmental ratings nor UNPRI signatories' investments incorporate this signal.

1. Introduction

Over the last few decades, increasing attention to climate change has led companies to invest in green innovation, developing new technologies that enable a transition to cleaner modes of production and consumption – with the number of green patents doubling over the period 1999-2020. International agencies, academics, and the media all highlight the importance of innovation for the green transition. According to the International Energy Agency, "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." (IEA, 2021).[1] While firms engaging in green innovation benefit from new growth opportunities, they also face strong competitive challenges, related to the costs of switching into new technologies, regulatory compliance costs, and regulatory uncertainty. Lobbying is one tool that firms can use in the face of such challenges.

We find that firms that engage in green innovation are also heavily engaged in lobbying. Green innovators spend more than twice as much on lobbying than non-green innovators. Moreover, they spend almost four times as much on environmental lobbying. These findings are potentially worrisome. Zingales (2017) states that "Most firms are actively engaged in protecting their source of competitive advantage through a mixture of innovation, lobbying, or both. As long as most of the effort is along the first dimension, there is little to worry about. (…) What is more problematic is when a lot of effort is put into lobbying."

The concerns regarding the total dollars spent on lobbying are intrinsically related to the *direction* of firms' lobbying. Strikingly, we find that green innovators are equally likely to lobby green or brown: among green innovators, the proportion of firms with green lobbying is

[1] "*Net Zero by 2050, A Roadmap for the Global Energy Sector*", International Energy Agency, 2021. See also: "*Fighting climate change with innovation*", Finance & Development, The International Monetary Fund, September 2021; "*Innovation is an essential part of dealing with climate change"*, The Economist, October 31, 2020; "*Is green growth possible?*", An interview with Philippe Aghion, July 19, 2023, CEPR.

approximately equal to the proportion with brown lobbying. Prior literature documents that lobbying activities can influence both legislative outcomes and firm outcomes.[2] Thus, if green innovation is held within firms that are simultaneously lobbying in anti-green directions, then such innovation is arguably less likely to be implemented and less likely to contribute to the green transition. More generally, policies that subsidize green innovation may have little effect in speeding the transition to a greener future. This concern is particularly salient if lobbying represents a stronger signal of firms' actual environmental actions, an issue that we directly examine.

We start our analysis by obtaining detailed lobbying data to characterize firms' environmental lobbying activities. From lobbying reports filed with the Senate Office of Public Records (SOPR) and from OpenSecrets.org (OpenSecrets), we extract the timing, amount, and subjects ("issues") of lobbying. Using textual analysis and machine learning techniques, we identify the lobbying transactions that relate to environmental issues, such as energy, nuclear, fuel/gas/oil, clean air, water resources, waste, environmental protection, and public lands. The environmental issues we identify include climate change topics as well as broader environmental topics.

The fact that firms are not required to disclose the direction of their lobbying activities has hindered research in this area. We overcome this limitation by developing a novel measure to identify green and brown lobbying. We obtain the political contributions of each individual lobbyist and use them to infer whether each lobbying transaction is pro-environment (which we refer to as "green") or anti-environment (which we refer to as "brown"). This identification

[2] For evidence that lobbying influences equilibrium policy outcomes, see Kang (2016). For evidence that lobbying influences firm outcomes, see, for example, Bertrand, Bombardini, and Trebbi (2014), Borisov, Goldman, and Gupta (2016), Grotteria (2024), and Lowry and Volkova (2025).

strategy relies on the fact that, in the U.S., environmental issues are highly polarized along political lines; moreover, lobbyists tend to work with their political allies rather than with their adversaries, and they tend to make personal contributions to their preferred party.

In the first portion of the paper, we provide evidence on the extent of environmental lobbying, and the dispersion of this activity across different types of firms. Within our sample of U.S public companies, nearly 40% of firms that engage in lobbying devote attention to environmental issues. The firms with the highest environmental lobbying expenditures are those with greater exposure to environmental regulation, as measured by the relatedness of their business description to EPA regulatory activities. The utilities industry and the oil and gas industry each spend approximately 60% of their total lobbying dollars on environmental issues. Other industries with high levels of environmental lobbying include chemicals, manufacturing, and consumer durables.

Next, we turn to our main research question, in which we examine the direction of firms' lobbying activities vis-à-vis their innovation efforts. To characterize firms' green innovation, we determine whether a patent granted to a U.S. firm relates to green technologies based on OECD classifications.[3] We employ several alternative measures of green innovation, including the number of green patents, their quality as measured by citations, and their market value. Across all measures, and controlling for firm characteristics and industry fixed effects, we find no evidence that firms investing more in green innovation are also devoting lobbying dollars toward pro-green policies. In fact, our findings indicate that many green innovators are simultaneously devoting resources to sway legislation in anti-environment directions.

We find that the most significant determinant of the direction of firms' lobbying is their

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

sources of current cash flows. In a model with industry and year fixed-effects and a broad array of firm characteristics, firm innovation explains at most 3% of lobbying, whereas green current cash flows explain over 70%. Findings are again similar across multiple definitions of green innovation: the number of patents, the quality of patents, and the market value of patents. These results are consistent with a scenario in which, rather than representing a proxy for firms' transition plans, patents may represent a hedge or a real option to employ only if necessary, allowing firms to delay green investments somewhat indefinitely (Bloom and Van Reenen, 2002).

Multiple robustness tests confirm that firms' lobbying choices do not align with their innovation efforts. Our results hold when we exploit an exogenous shock to green innovation, when we use alternative measures of green innovation and current cash flows, and when we perform our analysis on a sample of single-segment firms. Moreover, to ensure that the direction of firms' environmental lobbying is not determined by variations in political regimes, we show that our main results hold during both Democratic and Republican political cycles.

In the next part of the paper, we analyze real outcomes. Specifically, we contrast the informativeness of lobbying versus innovation as signals of firms' future environmental footprints, which we measure by emissions. We obtain data on each firm's releases of toxic chemicals from the Environmental Protection Agency (EPA)'s Toxic Release Inventory (TRI) dataset. We find that firms' lobbying significantly predicts firms' emissions up to three years in the future: a one standard deviation increase in brown lobbying is associated with approximately 20% higher emissions per year, over the subsequent three years. In contrast, innovation has no significant predictive power. We conduct a placebo test to show that these results are not driven by a firm's overall political leaning. In summary, while academics, industry leaders, and regulators all emphasize the role of green innovation, our results indicate that it is firms' lobbying behavior that

provides a more informative measure of firms' progress toward a green transition.

In the final part of the paper, we find that key market participants fail to account for the informativeness of lobbying. First, we find that firms' lobbying efforts are not recognized by ratings agencies: the fraction of lobbying spent in brown directions is not significantly related to environmental ratings issued by MSCI, the ESG rating provider with the most comprehensive coverage. Second, we find that UNPRI signatories do not take into account firms' brown lobbying when making their investment decisions. A failure to understand firms' lobbying efforts could result in distortionary economic effects. For example, if ratings agencies do not adequately factor in lobbying as well as innovation, then pro-green investment dollars may not get invested in the intended types of firms.

We make contributions to both the lobbying literature and the innovation literature. Our paper is the first to examine corporate pro- and anti-environmental lobbying. We show that these lobbying activities provide valuable information on firms' true environmental stance. Substantial investment dollars and subsidies are directed toward firms that innovate in clean technologies, and both academics and regulators have highlighted green innovation as a critical tool toward mitigating climate change (Acemoglu et al., 2016; IMF, 2021, 2023). However, there remains a lack of clarity regarding which firms are actively transitioning toward green; our analysis of the direction of firms' lobbying activities sheds light on this question. 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).[4] Relative to these prior studies on environmental lobbying, 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. (2024) follow

[4] 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).

our identification strategy to define green and brown lobbying on climate-related issues and examine their association with firm returns.

More generally, we contribute to the broader literature on lobbying. While previous work focuses mostly on potential misallocations of resources (Huneeus and Kim, 2020), the implications for firm value and risk premia (Borisov, Goldman, and Gupta, 2016; Grotteria, 2024), and the role of political connections (Blanes I Vidal, Draca, and Fons-Rosen, 2012; Bertrand, Bombardini, and Trebbi, 2014), our analysis focuses on the distortionary effects of lobbying that can arise when firms innovate in one direction but lobby to impede progress in that direction. Such behavior can negatively impact the development of new technologies and economic growth. In an analysis of the energy sector, Kang (2016) concludes that lobbying influences legislative outcomes. Our examination of a broad set of firms and identification of the direction of their lobbying expenditures suggest that lobbying can slow the transition to cleaner modes of consumption and production. While the U.S. and governments around the world are increasingly subsidizing green innovation as a way to expedite the green transition, our findings cast doubt on these strategies (World Bank, 2024).[5]

We also contribute to the growing literature on green innovation. While theoretical and empirical research examines the technical changes and the optimal policies that can enable the transition from dirty technologies to clean technologies (Acemoglu et al., 2016; Aghion et al., 2016), our findings cast doubt on the possibility that green innovators are, on average, actively transitioning to green. Our evidence that green innovation is not an informative signal about firms'

[5] Related to lobbying, but distinct from it, is the literature on political connections (for example, Fisman (2001), Faccio (2006), Cohen et al. (2013)) and on political donations. In particular, donations through political action committees (PACs) are payments to individual politicians aimed at obtaining political influence, but not at affecting a specific issues or legislative outcome. A recent paper by Fich and Xu (2023) relates these political donations to firms' environmental scores.

commitment to the green transition builds upon Cohen et al (2025), 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 show that firms' green innovation efforts do not translate into lower future carbon emissions. We contribute to this body of work by identifying an informative signal of firms' commitment to green – their efforts to shape the regulatory agenda through environmental lobbying.

2. Data

We construct a dataset that includes firm financial information, firms' lobbying transactions, individual lobbyists' political contributions, and patent data. 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 analyses, we further restrict the sample to firm-years with lobbying. As shown in 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%.

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 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. Patent data

We identify patents granted to public firms using the extended KPSS data, which covers patents granted between 1926 and 2020, and PatentsView.[6] Using the CPC (Cooperative Patent Classification) and IPC (International Patent Classification) codes, we employ two approaches to identify patents with an environmental focus.[7] First, we identify patents that pertain to green technology (i.e., *green* patents) using the OECD classifications.[8] 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).[9] Patents that are classified as both clean and dirty (this may occur

[6] 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).
[7] The CPC-IPC concordance table is available at https://www.cooperativepatentclassification.org/cpcConcordances
[8] https://www.oecd.org/environment/consumption-innovation/ENV-tech%20search%20strategies,%20version%20for%20OECDstat%20(2016).pdf
[9] 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.

when a patent includes multiple technology classes) are classified as neither clean nor dirty.

Figure 1 shows the total number of patents granted each year, 1999-2020, as well as the number of green, clean, and dirty patents. 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. However, 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.

To measure a firm's stock of current innovation, we focus on patents granted over a five-year period, *t*-4 through *t*. Using this measure, as shown in 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.[10] 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.

2.3. 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

[10] 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).

monetary fines and imprisonment.[11] 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 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.

2.4. 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

[11] 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).

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 on 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.[12] 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.[13] 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 2 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 requirement of LD-2s from semi-annually to quarterly.[14] The solid lines show lobbying dollars

[12] 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.

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

[14] 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

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 2 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.[15] 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.

Figure 3 describes both e-lobbying and green innovation, across industries. The light-gray bars depict average e-lobbying as a fraction of total lobbying expenditures, within each Fama-French industry group. The utilities industry and the oil and gas industry each spend approximately 60% of their total lobbying dollars on environmental-related issues. The next highest industries are chemicals with 32%, manufacturing with 20%, and consumer durables with 18%. Strikingly, Figure 3 shows that many of the industries with the highest levels of environmental lobbying also tend to have the highest levels of green innovation, as measured by the percentage of firm-years

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.

[15] 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.

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.

3. Identifying the direction of 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.

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. 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 and Congress", only 39% of Republicans agree with this same statement.[16] 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).[17] Fourth, a wide body of political science literature

[16] 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/

[17] 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.

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 Form 3 when the amount exceeds $200.[18] OpenSecrets processes these data and provides information on contributor name, contribution date, contribution amount, and details regarding the recipient.[19] 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 4 shows the distribution of lobbyist-level political contributions, which is defined by R/(R+D).[20] 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

[18] https://www.fec.gov/help-candidates-and-committees/filing-reports/individual-contributions/
[19] These data are provided for each two-year federal election cycle. We thank OpenSecrets (https://www.opensecrets.org/) for providing research access.
[20] We exclude contributions to the other parties since we cannot infer the direction of the lobbying.

lobbyist's contributions to these parties are allocated to the Democratic (Republican) party.[21] 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 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.[22] Our relatively stringent approach toward classifying the direction of lobbying transactions increases confidence in the assigned direction of each transaction.

For empirical tests, we aggregate these LD-2 level statistics up to the firm-year level. The distribution is shown in Panel B of Figure 4. Similar to statistics at the lobbyist level, firm-years tend to focus their environmental lobbying efforts in one direction or the other.[23] 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

[21] 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.
[22] 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.
[23] 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.

management team. This allows for the possibility that some firms opportunistically lobby brown sometimes and green other times.[24] In fact, as shown in Internet Appendix Figure A4, among the 25 firms that spend the most dollars lobbying brown (green), many also spend money lobbying green (brown).

4. Distribution of Innovation and Lobbying

In this section, we provide descriptive evidence related to our main research question. Specifically, we examine the direction of firms' lobbying, vis-a-vis their innovation efforts. Environmental issues are increasingly viewed as a major source of risk, and firms must choose how to handle this risk.

In Table 2, we tabulate both firms' propensity to lobby and firms' dollars spent lobbying, across all types of lobbying and limited to e-lobbying. We provide evidence across all firm-years (top portion of table), across firm-years with lobbying (middle portion of table), and across firm-years with green or brown lobbying (bottom portion of table). Across the full sample of firm-years (shown in column 1), 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. Among firm-years with positive lobbying expenditures, 10.7% engage in green lobbying and 12.9% in brown lobbying. While average expenditures are relatively low, the distribution is quite skewed, with some firms spending large amounts. Finally, both green and brown lobbying represent approximately 3% of total lobbying dollars, across all firms in our sample. On average, brown lobbying as a fraction of environmental (brown + green) lobbying is 56.3%.

[24] 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.

Turning to the relation between lobbying and innovation, next 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).[25] The first striking observation is 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 an average $437,728 on environmental lobbying, compared to only $110,417 among non-green innovators (defined as firms with one or more patents but no green patents).

Univariate statistics in Table 2 also provide initial evidence on our first main research question. 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. Even more surprising, among green innovators, average lobbying expenditures are greater for brown lobbying than for green lobbying.

Figure 5 provides an illustration of these patterns of environmental lobbying. Panel A shows that green innovators are equally likely to lobby in green and in brown directions; non-green innovators exhibit a smaller propensity to lobby, but they are similarly nearly equally likely to lobby green versus brown. Panel B of Figure 5 illustrates the fraction of total lobbying expenditures devoted to green and brown lobbying; again, companies devote a similar fraction of their lobbying expenditures to green and brown issues, irrespective of their green innovation efforts.

The last two columns of Table 2 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 environmental lobbying in brown directions.

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

The univariate statistics presented in Table 2 combined with Figure 5 are striking. They indicate that many green innovators are simultaneously devoting resources toward lobbying against these innovations. We examine this issue in more detail in regressions, in the next section.

5. Green innovation and the direction of environmental lobbying

To robustly test our research question, how firms' lobbying behavior aligns with their innovation efforts, we now turn to regression analyses.

5.1. Do firms lobby green or brown?

We begin in Table 3, by examining how firms' green innovation efforts relate to their lobbying behavior. We measure green innovation in three alternative ways. In columns 1 and 2, we measure innovation based on the stock of patents, measured as the natural logarithm of one plus the number of patents granted over the past five years (years t-4 through t). This captures the quantity of environment-related innovation. In column 3, we focus on the quality of innovation, which we measure in terms of citations, and in column 4 we focus on the market value of patents, as described in section 2.2. The dependent variable is green lobbying intensity, defined as the ratio of green lobbying expenditures to total lobbying expenditures.

Consistent with univariate patterns shown in Table 2 and Figure 5, we find that green innovators are no more likely than other firms to lobby in green directions. In fact, the coefficient on # *Green patents* is negative, albeit only significant at the 10% level. Moreover, we also find that green innovators are no less likely than other firms to lobby brown, as shown in Internet Appendix Table A2.

Our finding that the direction of firms' environmental lobbying is unrelated to their innovation efforts is striking. Given prior literature showing that lobbying significantly affects

regulatory outcomes in ways that benefit firms (Kang (2016), Bertrand, Bombardini, and Trebbi (2014), Borisov, Goldman, and Gupta (2016), Grotteria (2024), Lowry and Volkova (2025)), our evidence suggests that firms' green innovation efforts do not reflect their true environmental stance. Green innovators that lobby in brown directions are arguably not on the path toward the green transition (a point that we examine directly in Section 6).

Given that firms do not lobby to increase demand for their innovative discoveries, we posit that they lobby to protect the status quo. Specifically, we conjecture that firms' current operations – as opposed to their innovative efforts – predict their lobbying behavior. To examine this conjecture, we require a measure of the greenness of current operations. We employ text in 10-K forms, as this contains useful information on firms' product markets (Hoberg and Phillips (2010, 2016)). We search through the Business Description section of 10-Ks 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 A3.[26] 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.

[26] 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.'

Looking at column 2 of Table 3, 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 74.8% increase in green lobbying.[27] Findings are similar in columns 3 and 4, where we use alternative measures of green innovation, either the quality-based measure or the market value-based measure. In each case, the direction of firms' environmental lobbying is unrelated to green innovation. Rather, it is explained by firms' sources of current cash flows.

In Table 4, we conduct a variance decomposition, to shed further light on the economic magnitude of each determinant of firms' green lobbying efforts. The table contains four columns, each of which corresponds to the analogous column in Table 3. The main takeaway from Table 4 is that current green operations contributes more to total explanatory power than any other variable, by a wide margin. Looking at models (2) to (4), current green operations contributes 72 – 75% of the total explanatory power. This compares to only 13 – 16% for industry fixed effects, 5 – 6% for year fixed effects, and 3% or less for green innovation

In sum, the direction of firms' environmental lobbying is statistically unrelated to their innovation efforts. Much green innovation is held within firms that are lobbying against green initiatives. Given evidence that firms' lobbying sways regulatory policies, our findings suggest that firms' innovative efforts do not represent informative signals regarding their green transition. We test this directly in section 6, where we compare the informativeness of innovation versus lobbying as signals of firms' real actions.

5.2. Additional analyses

In this section, we examine the robustness of our results across various dimensions. We

[27] The mean of *Green lobbying intensity* is 0.027, and the standard deviation of *Current green operations* is 0.00096. Note that 21.039x0.00096/0.027 = 0.748, or 74.8%

first focus on endogeneity concerns. In section 5.2.1, we take advantage of an exogenous shock to green innovation, and in section 5.2.2 we examine other sources of potential measurement error. In section 5.2.3, we examine variation across political regimes.

5.2.1. Exogenous shock to green innovation

In our setting, perhaps the biggest endogeneity concern is measurement error. If we fail to measure green innovation or green lobbying sufficiently precisely, then we may fail to find a relation, even if such a relation does exist. This measurement error concern is mitigated by the robustness of conclusions across many measures of innovation. In this section, we examine an exogenous shock to green innovation to further mitigate endogeneity concerns.

We focus on an exogenous shock that decreased the cost of applying for green patents, the USPTO Green Technology Pilot Program. As discussed by Gao and Li (2021), this program was in effect from December 2009 – March 2012, and it decreased firms' time costs to get green patents approved. Firms could simultaneously file a patent and a petition describing the patent's positive environmental impact. Petitions that were granted were evaluated on a fast track. Thus, among firms that already had infrastructure in place to conduct green innovation, this program should increase the extent of green innovation.

We conduct a difference-in-differences analysis of the relation between green innovation and environmental lobbying in a quasi-experiment setting around the implementation of the Green Technology Pilot Program. Table 5 shows the results from this test. We define *Treated* equal to one for firms that had a green innovation program in place, based on the premise that these firms were positioned to take advantage of this program. Specifically, *Treated* equals one for firms that applied for at least one green patent in the three years leading up to the program, January 1, 2006, through November 30, 2009, zero otherwise. We define *Post* equal to one for the years 2010 –

2012. The sample period is 2007 – 2012.

We define the sample as including all firm-years (column 1) or firm-years with lobbying (columns 2 – 4). Looking first at columns 1 and 2, we find that the number of green patents is significantly higher for treated firms during the Pilot program, as indicated by the coefficient on *Treated* × *Post*. However, consistent with results from OLS regressions, in columns 3 and 4 we find no evidence that environmental lobbying is affected, as indicated by the insignificant coefficients on *Treated* × *Post*. This shock to green innovation increased the number of green patents, but it did not cause firms to engage in more green lobbying or less brown lobbying.

For robustness, we perform two additional tests. First, we estimate the impact of this exogenous shock to green innovation using a 2SLS approach. In Panel A of Internet Appendix Table A4, first-stage regression estimates show that the pilot program achieved its objective of lowering the costs of applying for green patents, and thus significantly increased green patent applications. However, in the second-stage regressions, where the dependent variable is *Green lobbying intensity* or *Brown lobbying intensity*, respectively, the coefficient on green innovation remains insignificant. Second, in Panel B, we employ FOIA data obtained through the USPTO to examine the relation between lobbying and green patents that were given expedited processing, i.e., unexpectedly high levels of green innovation. Consistent with other results, we find no evidence of a significant relation between green innovation and the direction of environmental lobbying.

5.2.2. Additional sources of measurement error

In Table 6, we estimate a series of additional regressions that replicate column 2 of Table 3; these regressions collectively address various endogeneity concerns, for example relating to measurement error. First, Bolton et al. (2024) show that some patents, which are commonly

classified as green, represent innovation that improves the efficiency of brown operations. They classify green patents into two subgroups: pure green patents, which focus on environmental technologies, and fuel-efficiency-improving patents, which focus on increasing the efficiency of fossil fuel-based technologies. In column 1 of Table 6, we examine whether our findings regarding green innovators are robust to a narrower definition of green, i.e., whether firms with more pure green patents are more likely to lobby green. Our findings indicate that this is not the case, thus confirming our results in Table 3. Interestingly, we find that the number of fuel efficiency patents is associated with significantly less green lobbying.

In columns 2 and 3, we consider alternative measures of firms' 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.[28] Results are qualitatively similar using either of these measures. Even in specifications with lower power due to the relatively small sample size (column 3), lobbying is significantly positively related to firms' green operations, and we find no evidence that it is positively related to firms' green innovation. In fact, in column 2, results indicate that the number

[28] FTSE Russell's Green Revenues Classification System identifies green products and services, primarily in the post-2008 period. When a company is identified to have green revenues, it is mapped to one or more micro sectors and then aggregated at the company level. The classification method relies on multiple data sources: public disclosures, direct company engagement, and company-specific estimates (from non-revenue data such as production volumes or peer data). One challenge with the data is that zero values may indicate either firm-years with insufficient information to identify green revenues or firm-years with zero green revenues. Thus, we limit the sample to firm-years with non-missing and non-zero observations, which represent 13% of our firm-years. Several recent papers use these data on green revenues (see, for example, Klausmann et al (2024)).

of green patents is *negatively* related to green lobbying.

In column 4, we examine whether companies that sign onto the Science-Based Target initiative (SBTi), which pushes for net-zero targets, are more committed to the green transition, as signaled by their lobbying behavior. We obtain SBTi signatories from the official SBTi website; these data are available from 2016. As shown in column 4, signatories to this initiative are no more likely than other firms to direct a greater portion of their environmental lobbying dollars in green directions. The coefficient on SBTi is insignificant at conventional levels.

Next, we consider the possibility that firms have multiple divisions, some of which may focus on green issues and others on brown. To address this possibility, we examine whether green patenting is positively related to green lobbying within single-segment firms. We re-estimate the regression in column 2 of Table 3, considering only the subsample of single-segment firms. As shown in column 5 of Table 6, results remain unchanged: green innovation does not predict firms' green lobbying intensity, but current green operations does.

5.2.3. Variation across political regimes

Finally, to ensure that firms' choices to lobby in green or brown directions are not merely determined by variations in political regimes, in columns 6 and 7 of Table 6, we re-specify our main regressions separately across years in which the Democratic party was in power and years in which the Republican party was in power. We define a Democratic (Republican) regime equal to one if the Democratic party (Republican party) controls two or more of the following positions: president, Senate, and the House. We find that results are qualitatively similar across these different periods, suggesting that the direction of firms' environmental lobbying is not opportunistically linked to variations in political regimes.

6. Innovation, lobbying, and real outcomes

Our findings to this point show that environmental innovation and lobbying are concentrated within the same set of firms (Table 2), however firms on average do not direct these strategies in the same direction (Tables 3 – 6). In this section, we empirically examine the informativeness of innovation versus lobbying, regarding firms' environmental footprints. We discuss our main results in section 6.1, and we present placebo analyses that address endogeneity concerns in section 6.2.

6.1. Environmental lobbying and subsequent firm emissions

To shed light on the extent to which firms' lobbying represents an informative signal regarding firms' future environmental actions, we examine the relation between firm lobbying and subsequent toxic emissions. 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, brown lobbying intensity, and 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 7.

Looking first at Panel A, findings in column 1 indicate that a firm's brown lobbying expenditures in year t are significantly positively related to emissions in t+1. In column 2, we additionally include green innovation, measured as the number of green patents. We find that green innovation does not predict future EPA emissions. 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, the results in Table 7 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 trajectory toward green. A one standard deviation increase in brown lobbying is associated with a 23.9% increase in future emissions in the following year.[29]

In columns 3 and 4, 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 21.9% (20.1%) 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.

In Panel B of Table 7, we examine the robustness of these conclusions to alternative measures of innovation. In columns 1 – 3 we employ the quality of green patents, and in columns 4 – 6 we employ the market value of green patents. Results are robust across both these alternative 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

[29] Looking at column 2, a one standard deviation increase in brown lobbing (0.168) corresponds to a exp(1.274*0.168) – 1 = 23.9% increase in future emissions.

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 contains little to no information regarding firms' current strategy regarding the transition to green. As such, our findings cast doubt on policies aimed at expediting the green transition by subsidizing green innovation: our results suggest that such strategies are likely to be less effective than intended. (World Bank, 2024).

6.2. Placebo test

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 2.4 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), we define a lobbying

transaction as Democratic- or Republican-leaning based on the political contributions of the individual lobbyists involved in these transactions.

Our main results in Table 7 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. Here, we examine the extent to which this relation is driven by brown lobbying per se, as opposed to the firm's general political leanings. In Table 8, we estimate regressions similar to those in Table 7, with the exception that 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 in Table 7 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. Looking at Table 8, we find 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.

7. Does the market recognize firms' lobbying activities?

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 is to analyze the ratings of the largest ESG ratings provider, MSCI.[30]

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 columns 1 – 3 of Table 9, in a format similar to that of Table 7. 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. Similar to Table 7, the 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

[30] 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; Pastor et al (2022) conclude that ESG-related flows affected stock returns over the 2012 – 2018 period.

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' transition toward green.

The tendency of ratings agencies to incorporate innovation but not lobbying is arguably problematic. Findings throughout the paper indicate that firms tend to use these two competitive strategies jointly, and they are often not focused in the same direction. Green innovators often lobby brown, and lobbying is more informative regarding firms' environmental behaviors.

Our second approach toward assessing investors' attention to firms' lobbying behavior focuses on UN PRI signatories. Investors who sign onto these principles publicly commit to investing responsibly. In columns 4 – 6 of Table 9, we examine if these signatories are less likely to invest in firms that devote resources toward brown lobbying. The dependent variable represents 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.

Evidence regarding UNPRI signatories is broadly consistent with evidence regarding ESG ratings agencies. Coefficients on brown lobbying intensity are insignificant in all specifications, indicating that UN PRI signatories are no less likely to invest in brown lobbyers than in other firms. Moreover, the coefficient on brown lobbying intensity is positive rather than negative as one would expect. We find only weak evidence that UNPRI signatories consider any dimension of firms' lobbying activities: the coefficients on green lobbying intensity are positive and significant at the 10% level. In economic terms, a one standard deviation increase in green

lobbying is associated with only 0.32 percentage points higher green institutional ownership.[31]

In aggregate, our results indicate that lobbying expenditures contain significant information regarding firms' environmental policies and their associated environmental footprints over the subsequent one to three years. However, MSCI does not appear to incorporate firms' lobbying behavior into their decision-making process, and there is only weak evidence that UN PRI signatories consider such information. A failure to adequately consider lobbying can contribute to biased ratings and misguided investment decisions. Our findings call into question the extent to which these investors actually direct their investment dollars to firms that are actively transitioning toward green.

8. Conclusion

How do firms manage the technological and regulatory risks associated with the transition to a greener economy? We study how firms use innovation and lobbying as competitive tools in an economic environment characterized by rapid technological change and great uncertainty. We define corporate environmental lobbying and introduce a novel method to identify the direction of lobbying – green or brown – by analyzing the political contributions of each individual lobbyist.

Perhaps surprisingly, we find that green innovators are equally likely to lobby in favor of green or brown legislative agendas. Firms' lobbying is driven by their current state of operations, what one might characterize as the status quo. This relation holds irrespective of the extent of firms' green innovation and across multiple measures of green innovation. Our results suggest that firms view patents as options to delay their investments (Bloom and Van Reenen, 2002), while protecting their current modes of operations through lobbying.

[31] 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.

We find that firms' environmental lobbying contains significant information on their environmental policies. However, we find little evidence that either MSCI's widely followed environmental ratings or UN PRI signatories' investment decisions incorporate firms' lobbying behavior.

Overall, our findings indicate that a firm's current innovation activities often do not reflect its current environmental stance. It is reasonable to assume that dollars spent on brown lobbying are more likely to slow than expedite the transition to a greener economy. A significant portion of green innovators engaging in brown lobbying are actively contributing to this slower transition.

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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
SBTi	A dummy variable that equals one if the firm signed onto the Science Based Target Initiative, and zero otherwise. Source: The official SBTi website
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
Green IO/Total IO	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: 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).

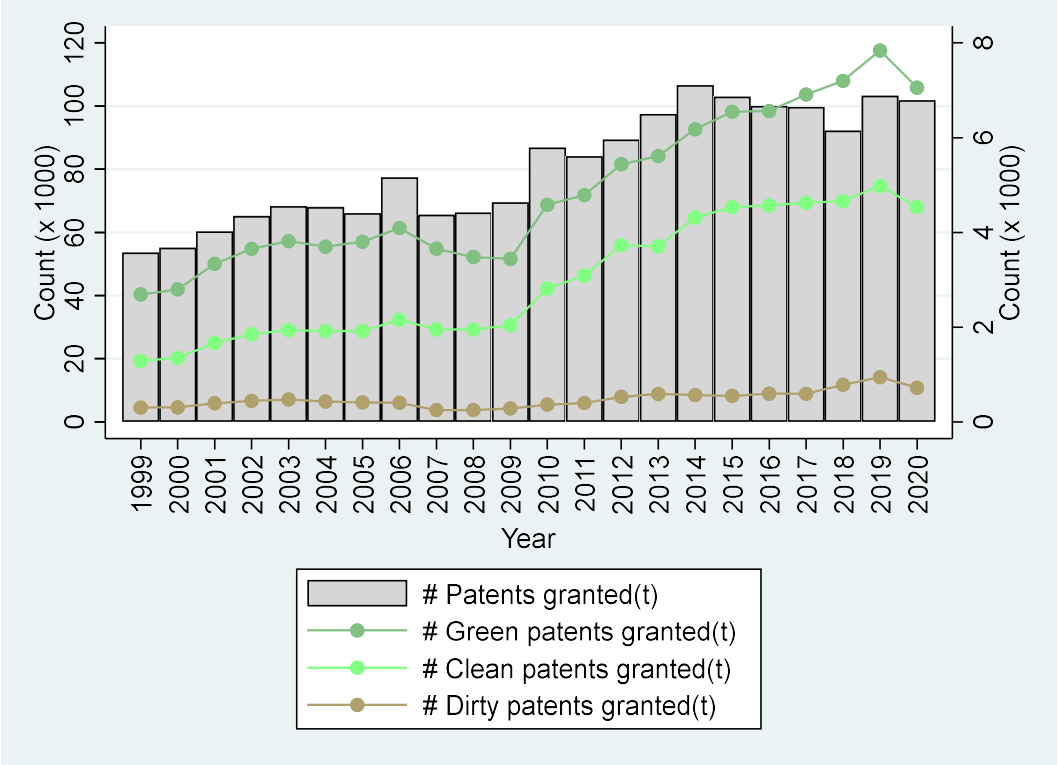
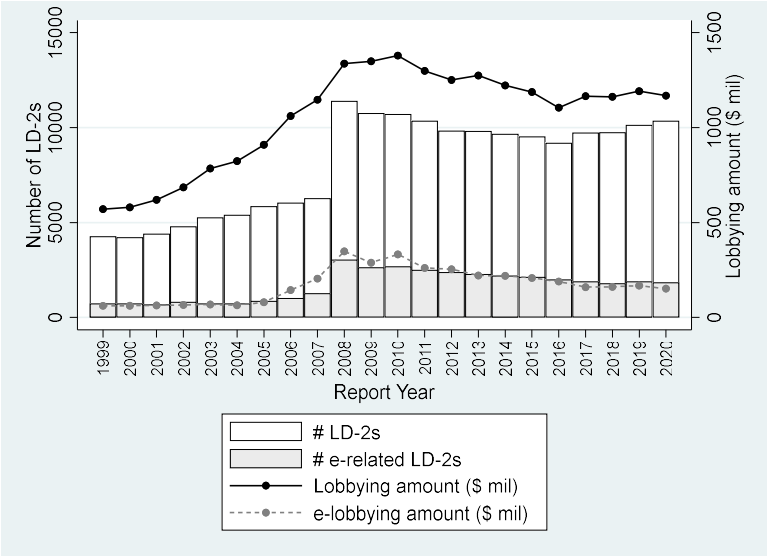


Figure 2: Lobbying and environmental lobbying

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 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 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

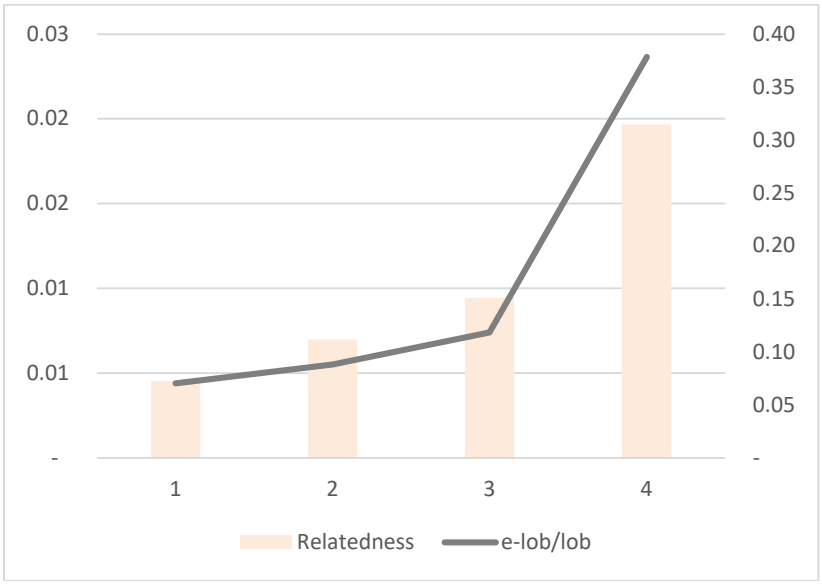


Figure 3: E-lobbying and green innovation, by industry
This figure shows e-related lobbying expenditures as a fraction of total lobbying expenditures (colored in gray) and the fraction of firm-years with green patents (colored in green), for each Fama-French 12 industry group, on average through the 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. Firm-years with missing values on firm-level controls are excluded.

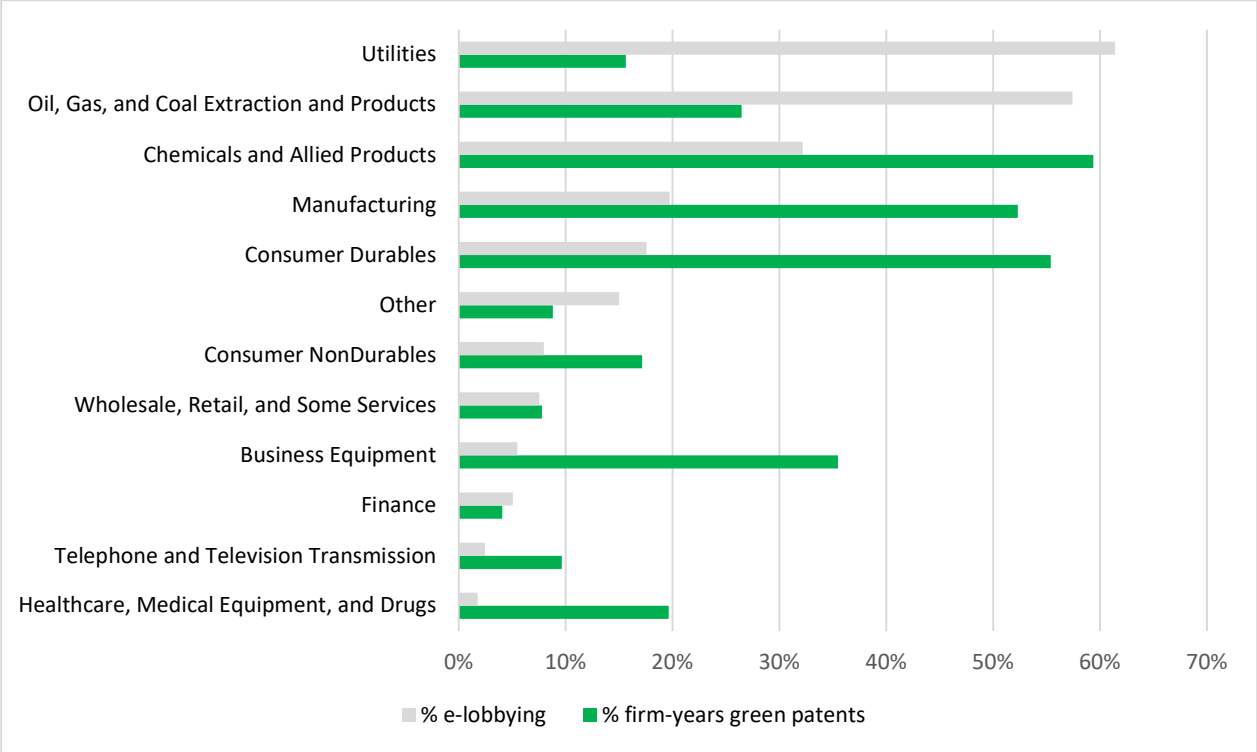
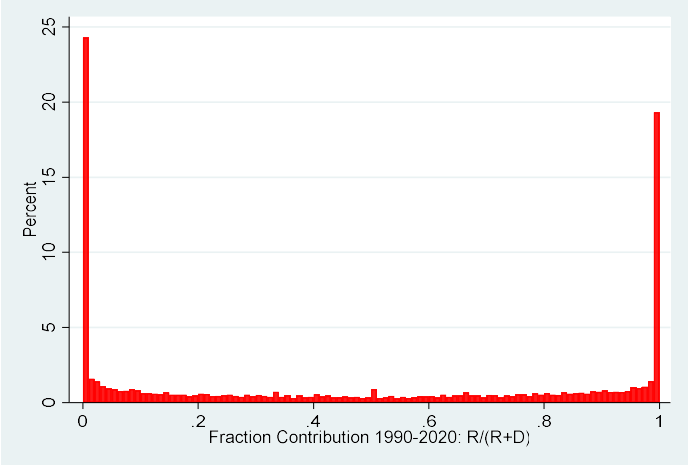


Figure 4: Political orientation of lobbying
Panel A shows the distribution of political contributions across individual lobbyists. The sample is based on 1,256,534 individual contributions made between 1990 and 2020 associated with 10,658 lobbyists who lobbied for public firms in our sample. For these 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., $D \geq 0$; $R \geq 0$). 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

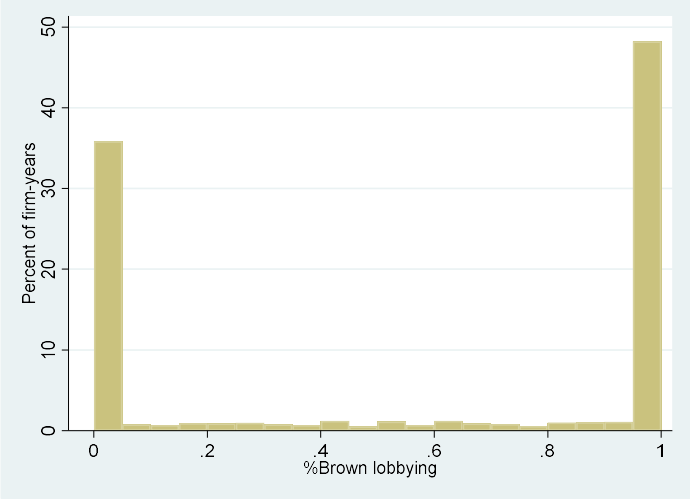
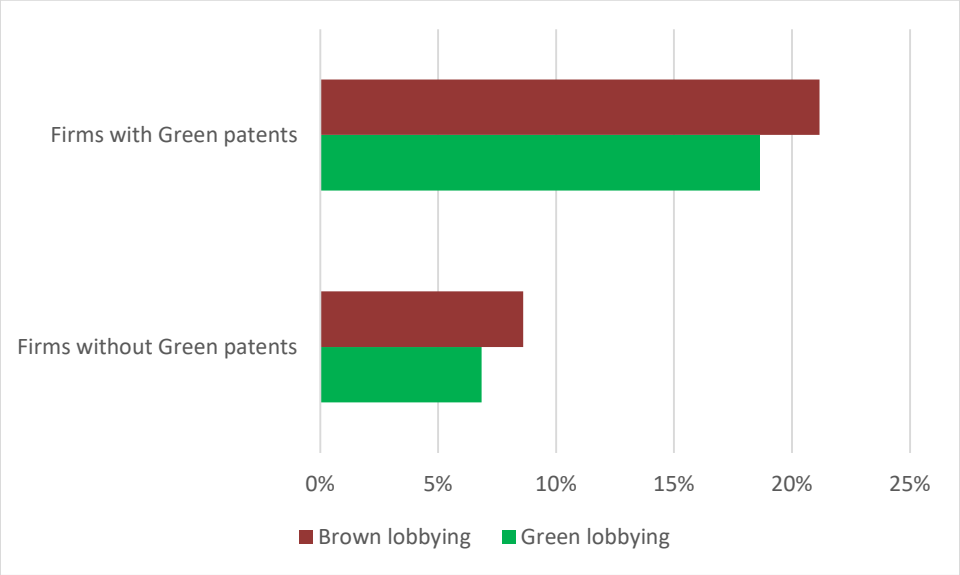


Figure 5: Green and brown lobbying among green innovators and non-green innovators
The sample includes firm-years between 1999 and 2020 with lobbying transactions and at least one patent (granted in the last five years). We limit the sample to firm-years with at least $10 million in assets and positive sales. Firm-years with missing values on firm-level controls are excluded. 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

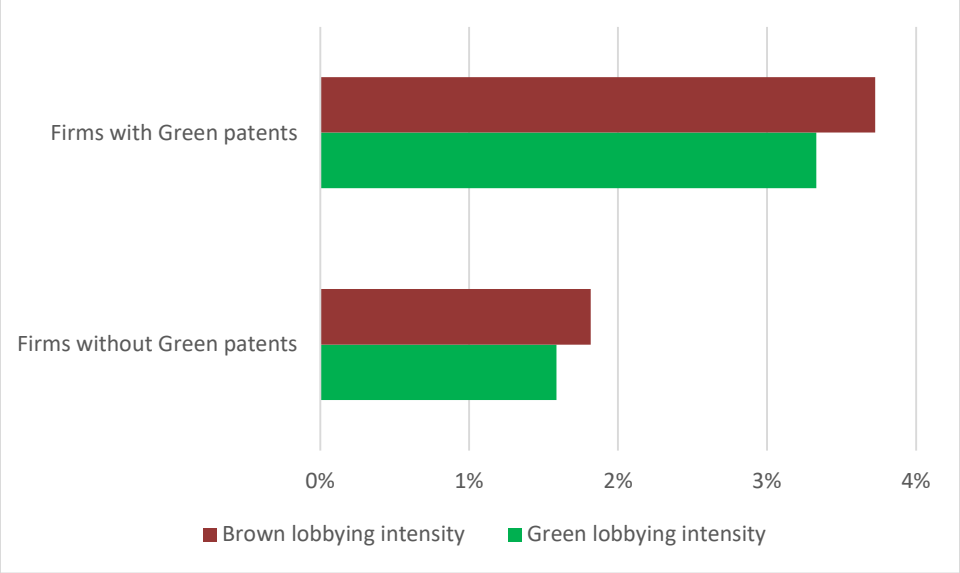


Table 1: Summary statistics

This table shows summary statistics on the baseline sample. The sample consists of 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 the availability of data. All variables except innovation-related variables are measured as of year *t*. Variable definitions are in Appendix A.

VARIABLES	(1) N	(2) mean	(3) sd	(4) p5	(5) p25	(6) p50	(7) p75	(8) p95
Firm-level controls								
Total assets ($mil)	19,251	16,442	32,962	76.08	809.9	3,524	14,900	88,785
Book leverage	19,251	0.27	0.22	0.00	0.10	0.25	0.39	0.67
EBIT/Assets	19,251	0.04	0.17	-0.25	0.02	0.07	0.11	0.22
Cash/Assets	19,251	0.17	0.20	0.01	0.03	0.09	0.23	0.62
Lobbying								
Lobbying expenditures ($ mil)	19,251	1.08	2.54	0.01	0.07	0.20	0.84	5.29
e-Lobbying expenditures ($ mil)	19,251	0.20	0.79	0.00	0.00	0.00	0.06	1.05
Innovation								
# Patents granted [t-4, t]	19,251	208.60	1,212.00	0.00	0.00	1.00	28.00	883.00
# Green patents granted [t-4, t]	19,251	12.31	103.40	0.00	0.00	0.00	0.00	32.00
Quality (Patents) [t-4, t]	19,251	0.77	1.99	0.00	0.00	0.09	1.05	2.75
Quality (Green patents) [t-4, t]	19,251	0.40	2.07	0.00	0.00	0.00	0.00	1.88
MV (Patents) [t-4, t]	19,251	14.39	42.33	0.00	0.00	0.61	10.09	70.93
MV (Green patents) [t-4, t]	19,251	6.66	32.57	0.00	0.00	0.00	0.00	34.06
Other variables								
Relatedness	11,942	0.01	0.01	0.00	0.01	0.01	0.01	0.03
Current green operations	15,357	0.00	0.00	0.00	0.00	0.00	0.00	0.00
On-site toxic emission (million pounds)	2,001	2.391	7.205	3.60e-08	0.00338	0.0709	0.857	11.86
E-score	9,472	5.02	2.11	1.60	3.58	4.90	6.40	9.00

Table 2: 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 column 1, statistics are provided across all firm-years. In columns 2 – 4, 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 5 – 6, 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				
	All firm-years	Green patents	Patents other than Green	No patents	Clean patents	Dirty patents
All firms: # firm-years	87,722	8,797	20,982	57,943	5,567	2,350
% Firm-yrs with: Any lobbying	21.9%	50.6%	26.3%	16.0%	56.5%	67.7%
% Firm-yrs with: E-lobbying	7.8%	29.2%	6.7%	5.0%	34.8%	49.4%
Firms that lobby: # firm-years	19,251	4,450	5,519	9,282	3,146	1,590
$ spent Lobbying	$1,079,751	$2,329,872	$845,359	$619,781	$2,576,416	$3,141,150
$ spent E-lobbying	$194,899	$437,728	$110,417	$128,713	$502,895	$763,285
% Firm-yrs with: Green lobbying	10.7%	18.7%	6.8%	9.1%	20.1%	25.2%
% Firms-yrs with: Brown lobbying	12.9%	21.2%	8.6%	11.6%	22.2%	28.4%
$ Green lobbying	$21,033	$32,068	$9,632	$22,521	$33,925	$43,985
Std Dev($ Green lobbying)	$317,219	$163,916	$66,926	$439,357	$172,347	$177,940
$ Brown lobbying	$26,500	$49,569	$18,251	$20,344	$54,071	$68,092
Std Dev($ Brown lobbying)	$150,514	$213,193	$127,763	$123,134	$228,190	$222,651
Green/All lobbying	2.7%	3.3%	1.6%	3.0%	3.4%	3.3%
Brown/All lobbying	3.2%	3.7%	1.8%	3.8%	3.7%	4.6%
Firms that lobby G or B: # firm-yrs	3,845	1,458	725	1,662	1,095	698
% Brown (=B/(B+G)): $	56.3%	54.8%	57.8%	57.0%	53.7%	55.0%

Table 3: 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 columns 1–2, we measure innovation based on the natural log of one plus the number of patents granted to the firm over the last five years. In column 3, we measure innovation based on the quality of patents; across all patents granted in the last five years, we calculate the average truncation bias-corrected number of forward citations; we define this as zero for firm-years with no patents over the period. In column 4, we measure innovation based on the average market value of patents, using the measure of Kogan et al (2017). The definition of green lobbying is described in the text. 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)
# Green patents	-0.004*	-0.004		
	(0.002)	(0.002)		
Q(Green patents)			-0.003	
			(0.007)	
MV(Green patents)				-0.002
				(0.002)
Current green operations		21.039***	20.929***	20.963***
		(4.095)	(4.124)	(4.126)
ln(Assets)	-0.001	-0.002	-0.003*	-0.002
	(0.001)	(0.002)	(0.002)	(0.002)
Book leverage	0.008	0.006	0.007	0.006
	(0.008)	(0.009)	(0.009)	(0.009)
EBIT/Assets	-0.024**	-0.022*	-0.021	-0.021
	(0.011)	(0.013)	(0.013)	(0.013)
Cash/Assets	-0.006	-0.002	-0.004	-0.003
	(0.010)	(0.011)	(0.011)	(0.011)
Observations	17,930	14,772	14,772	14,772
R-squared	0.078	0.103	0.103	0.103
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 4: Variance decomposition

This table decomposes the explanatory power of the independent variables used in Table 3. First, for each independent variable, we calculate the semipartial correlation coefficient after removing the effects of all other variables in the model. Second, we take the squared values for each semipartial correlation coefficient. Finally, we divide the squared semipartial correlation coefficient of each variable by the sum of the squared semipartial correlation coefficients of all variables. This ratio represents the proportion of variance in the dependent variable that is explained by each independent variable only. For year FE (industry FE), we construct dummy variables for each year (industry), calculate squared semipartial correlation, and sum across all years (industries).

	Dept Var = Green lobbying intensity$_{t+1}$			
	Model 1	Model 2	Model 3	Model 4
Year FE	0.281	0.054	0.058	0.060
Industry FE	0.531	0.158	0.150	0.128
# Green patents	0.083	0.029		
Q(Green patents)			0.004	
MV(Green patents)				0.011
ln(Assets)	0.021	0.018	0.040	0.026
Book leverage	0.010	0.004	0.004	0.004
EBIT/Assets	0.073	0.018	0.018	0.019
Cash/Assets	0.000	0.000	0.000	0.000
Current green operations		0.720	0.726	0.752
Adj. R^2	0.078	0.103	0.103	0.103

Table 5: Exogenous shock to green innovation

This table examines innovation and lobbying activities before and after the USPTO Pilot program for green technologies. The sample is based on firm-years between 2007-2012, with at least $10 million in assets and positive sales. *Treated* equals one if a firm applied for at least one green patent between 1/1/2006 and 11/30/2009, and zero otherwise. *Post* is a dummy variable that equals one for firm-years 2010-2012, and zero otherwise. In column 1, the sample is based on all firm-years. In columns 2-4, the sample is restricted to firm-years with lobbying activities. In columns 1 and 2, the dependent variable is the natural log of one plus the number of green patent applications. In column 3(4), the dependent variable is green (brown) lobbying intensity. The green patent classification is based on the OECD classification, and green and brown lobbying are described in the text. 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(# Green patent apps)$_{t+1}$	ln(# Green patent apps)$_{t+1}$	Green lobbying intensity$_{t+1}$	Brown lobbying intensity$_{t+1}$
Treated x Post	0.026**	0.064***	-0.001	-0.002
	(0.012)	(0.022)	(0.008)	(0.008)
Treated	0.259***	0.278***	-0.005	0.010
	(0.021)	(0.031)	(0.012)	(0.011)
ln(Assets)	0.018***	0.050***	-0.001	0.000
	(0.003)	(0.009)	(0.002)	(0.002)
Book leverage	-0.022	-0.019	0.022	-0.019*
	(0.016)	(0.055)	(0.015)	(0.011)
EBIT/Assets	-0.025**	-0.112**	-0.062***	-0.008
	(0.011)	(0.045)	(0.024)	(0.013)
Cash/Assets	0.007	0.128***	-0.005	-0.010
	(0.011)	(0.048)	(0.015)	(0.013)
Observations	21,706	5,413	5,413	5,413
R-squared	0.258	0.324	0.093	0.122
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 6: Robustness to alternative measures of green innovation and current green operations, and across political regimes

This table re-estimates the regression in Column 2 of Table 3. The dependent variable is the green lobbing intensity of a firm. Column 1: we use an alternative measure of green innovation, introduced in Bolton, Kacperczyk, and Wiedemann (2024), which separates green patents into pure green patents and fuel efficiency patents. Column 2: we measure current green operation 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. Column 3: 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). Column 4: we include the variable SBTi, which equals one for firms that have signed onto the Science Based Target Initiative, zero otherwise. Column 5: we estimate the regression using only the subsample of single-segment firms. Columns 6 and 7: we estimate the regression separately for Democratic and Republican political regimes, defined as year in with the Democratic (Republican) party controls two or more of the following positions: President, Senate, and the House.

	Dept Variable = Green lobbying intensity$_{t+1}$						
	Alt. measure of green innovation (1)	Alt. measure of green op's (2)	Alt. measure of green op's (3)	Influence of SBTi signatory (4)	Single segment firms (5)	Democratic political regimes (6)	Republican political regimes (7)
# Pure Green patents	0.001						
	(0.003)						
# Fuel efficiency patents	-0.008**						
	(0.004)						
# Green patents		-0.005**	-0.000	0.001	0.003	-0.006	-0.003
		(0.002)	(0.007)	(0.004)	(0.005)	(0.004)	(0.002)
Current green operations	21.075***			16.325**	23.637***	23.846***	16.739**
	(4.036)			(7.804)	(4.816)	(4.334)	(6.964)
Current green operations (green patent text)		0.330***					
		(0.107)					
% Green revenue			0.061*				
			(0.036)				
SBTi				0.006			
				(0.009)			
ln(Assets)	-0.002	-0.002	-0.010	-0.006*	-0.003	-0.002	-0.002
	(0.002)	(0.002)	(0.010)	(0.004)	(0.002)	(0.002)	(0.002)
Book leverage	0.006	0.004	-0.052	-0.013	-0.000	0.014	0.002
	(0.009)	(0.009)	(0.073)	(0.013)	(0.011)	(0.014)	(0.010)
EBIT/Assets	-0.023*	-0.020	-0.099	0.010	-0.011	-0.059**	-0.005
	(0.013)	(0.013)	(0.094)	(0.013)	(0.016)	(0.028)	(0.012)
Cash/Assets	-0.003	-0.006	-0.071	-0.018	-0.000	0.004	-0.004
	(0.011)	(0.011)	(0.070)	(0.020)	(0.009)	(0.018)	(0.010)
Observations	14,772	14,772	1,699	2,716	4,232	5,837	8,935
R-squared	0.104	0.089	0.119	0.127	0.160	0.130	0.086
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: 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. In Panel A we measure green innovation as the natural log of one plus the number of green patents granted to the firm. In Panel B we measure green innovation using forward citations and the market value of green patents. 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.

Panel A: Main specification

	Dep't Variable = ln(Emissions) at time:			
	t+1	*t*+1	*t*+2	*t*+3
Green lobbying intensity	-0.012	-0.021	-0.075	0.048
	(1.009)	(1.031)	(1.029)	(0.987)
Brown lobbying intensity	1.234**	1.274**	1.188**	1.082*
	(0.598)	(0.604)	(0.601)	(0.608)
Total lobbying expenditures	0.040	0.140	0.034	-0.111
	(0.461)	(0.450)	(0.445)	(0.439)
# Green patents		-0.138	-0.173	-0.160
		(0.168)	(0.170)	(0.172)
ln(Assets)	0.947***	1.002***	1.048***	1.058***
	(0.190)	(0.205)	(0.206)	(0.205)
Book leverage	-0.284	-0.340	-0.361	-0.264
	(1.240)	(1.258)	(1.288)	(1.306)
EBIT/Assets	-1.470	-1.602	-2.863	-2.024
	(2.260)	(2.261)	(2.261)	(2.196)
Cash/Assets	-1.806	-1.536	-1.679	-2.039
	(1.974)	(1.963)	(2.059)	(2.022)
Observations	1,995	1,995	1,981	1,966
R-squared	0.469	0.470	0.467	0.464
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Panel B: Alternative measures of green innovation

	Dep't Variable = ln(Emissions) at time:					
	t+1	*t*+2	*t*+3	*t*+1	*t*+2	*t*+3
Green lobbying intensity	-0.014	-0.042	0.098	-0.019	-0.059	0.074
	(1.006)	(1.001)	(0.966)	(1.021)	(1.017)	(0.979)
Brown lobbying intensity	1.227**	1.129*	1.010*	1.248**	1.163*	1.051*
	(0.601)	(0.597)	(0.598)	(0.599)	(0.592)	(0.594)
Total lobbying expenditures	0.033	-0.094	-0.229	0.108	-0.007	-0.158
	(0.465)	(0.463)	(0.458)	(0.477)	(0.475)	(0.471)
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)	0.942***	0.979***	0.996***	0.981***	1.022***	1.031***
	(0.191)	(0.191)	(0.190)	(0.196)	(0.195)	(0.193)
Book leverage	-0.274	-0.299	-0.196	-0.338	-0.380	-0.279
	(1.254)	(1.286)	(1.300)	(1.244)	(1.278)	(1.295)
EBIT/Assets	-1.471	-2.698	-1.847	-1.414	-2.625	-1.820
	(2.261)	(2.245)	(2.177)	(2.241)	(2.232)	(2.169)
Cash/Assets	-1.839	-2.015	-2.326	-1.731	-1.920	-2.250
	(1.966)	(2.045)	(2.020)	(2.001)	(2.078)	(2.047)
Observations	1,995	1,981	1,966	1,995	1,981	1,966
R-squared	0.469	0.465	0.462	0.470	0.466	0.462
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: 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. We measure green innovation as the natural log of one plus the number of green patents granted to the firm. 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*+1	*t*+2	*t*+3
Dem lobbying intensity	-1.020	-1.036	-1.006	-1.194
	(0.742)	(0.746)	(0.768)	(0.808)
Rep lobbying intensity	-0.149	-0.204	-0.409	-0.813
	(0.524)	(0.529)	(0.508)	(0.526)
Total lobbying expenditures	-0.042	0.053	-0.067	-0.226
	(0.459)	(0.449)	(0.442)	(0.434)
# Green patents		-0.137	-0.170	-0.159
		(0.170)	(0.171)	(0.172)
ln(Assets)	0.945***	1.000***	1.050***	1.055***
	(0.189)	(0.203)	(0.205)	(0.205)
Book leverage	-0.314	-0.372	-0.416	-0.352
	(1.240)	(1.259)	(1.288)	(1.301)
EBIT/Assets	-1.431	-1.560	-2.780	-1.884
	(2.242)	(2.241)	(2.258)	(2.196)
Cash/Assets	-1.713	-1.454	-1.697	-2.252
	(1.989)	(1.980)	(2.074)	(2.028)
Observations	1,995	1,995	1,981	1,966
R-squared	0.470	0.471	0.469	0.467
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 9: E-ratings and UNPRI ownership

This table examines how firms' environmental lobbying activities are perceived by market participants. The sample is as described in prior tables, with the added requirement that firms have available data on MSCI environmental ratings (columns 1 – 3) or UN PRI Signatory ownership data (columns 4 – 6). In columns 1 – 3, 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. In columns 4 – 6, the dependent variable is ownership by green institutions as a fraction of total institutional ownership, which ranges from 0 to 1. Green institutions are defined as institutions that signed up for PRI (Principles for Responsible Investment). The sample is as described in prior tables, but starts in 2006, the first year of the UNPRI signatory directory. 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$_{t+1}$			Dep't Var = Green IO / Total IO$_{t+1}$		
Green lobbying intensity	0.308	0.278	0.272	0.023*	0.022*	0.022*
	(0.256)	(0.254)	(0.256)	(0.012)	(0.012)	(0.012)
Brown lobbying intensity	0.136	0.124	0.096	0.015	0.014	0.014
	(0.211)	(0.216)	(0.216)	(0.011)	(0.011)	(0.011)
# Green patents	0.211***			0.003*		
	(0.039)			(0.002)		
Q(Green patents)		0.286***			0.007*	
		(0.104)			(0.004)	
MV(Green patents)			0.171***			0.001
			(0.034)			(0.001)
Total lobbying expenditures	0.361***	0.432***	0.370***	-0.006*	-0.005*	-0.005
	(0.081)	(0.081)	(0.082)	(0.003)	(0.003)	(0.003)
ln(Assets)	0.204***	0.240***	0.208***	-0.002	-0.002	-0.002
	(0.041)	(0.041)	(0.041)	(0.001)	(0.001)	(0.001)
Book leverage	0.276	0.276	0.308	-0.025**	-0.024**	-0.025**
	(0.230)	(0.231)	(0.230)	(0.010)	(0.010)	(0.010)
EBIT/Assets	0.532*	0.509	0.411	0.014	0.013	0.013
	(0.306)	(0.311)	(0.309)	(0.014)	(0.014)	(0.014)
Cash/Assets	0.603**	0.680**	0.601**	-0.017	-0.017	-0.016
	(0.305)	(0.308)	(0.306)	(0.012)	(0.012)	(0.012)
Observations	9,218	9,218	9,218	12,558	12,558	12,558
R-squared	0.259	0.251	0.257	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

By: Sungjoung Kwon, Michelle Lowry, and Michela Verardo

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

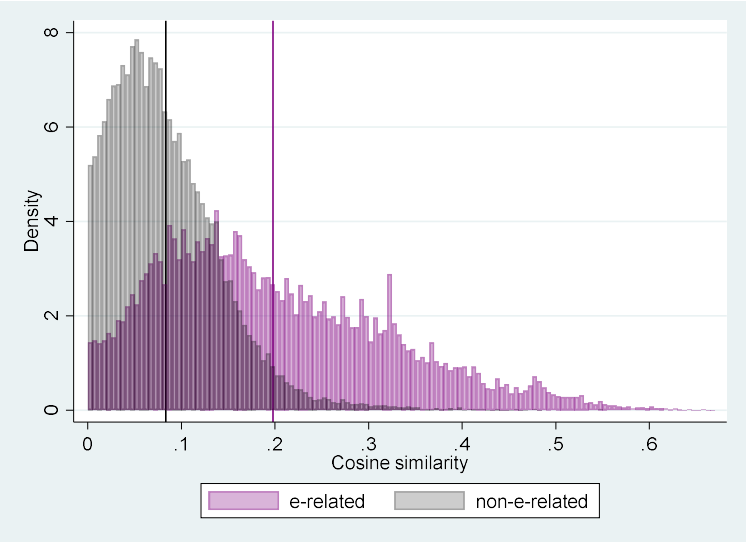
Printed Name and Title: -

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.

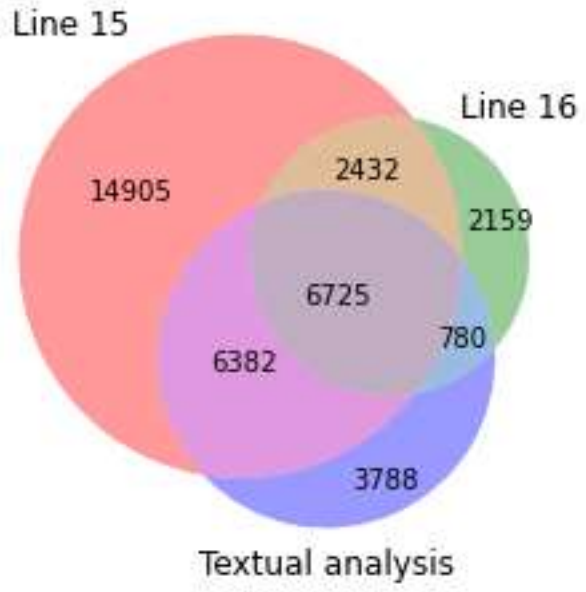
Panel A: Word cloud for environmental lobbying

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

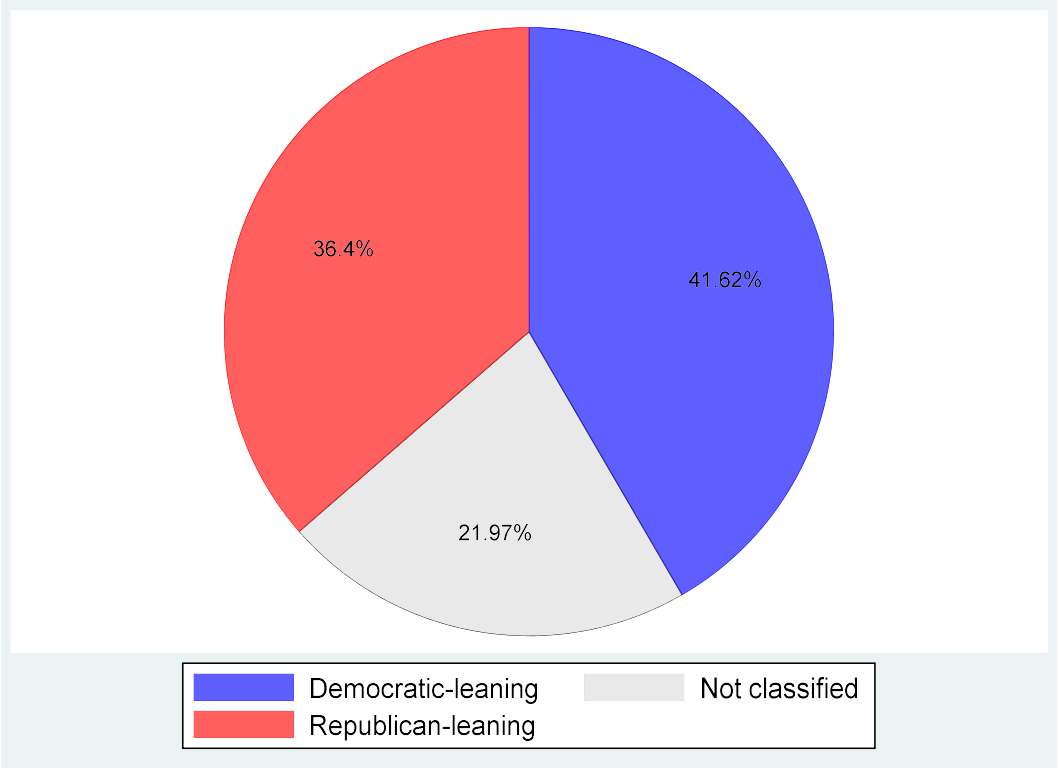


Internet Appendix Figure A2: Classification of LD-2s

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.

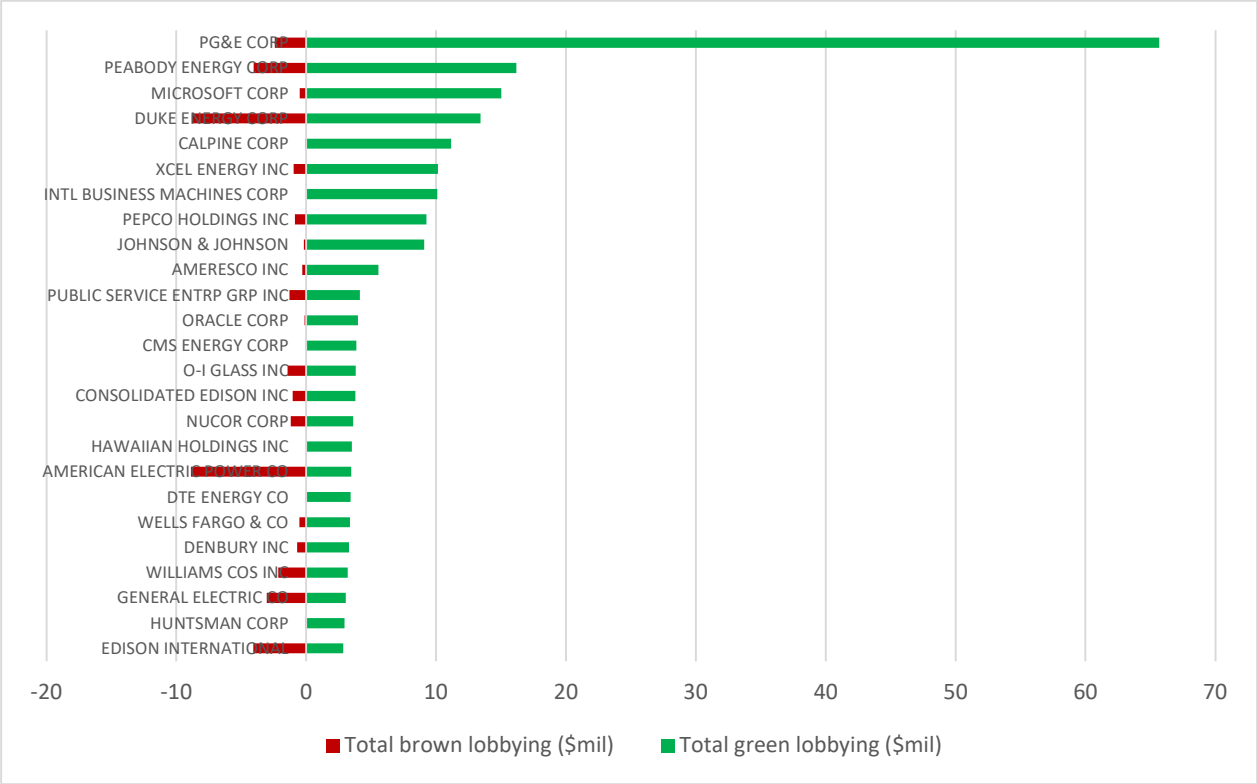


Internet Appendix Figure A3: Classification of lobbyists' political orientation
This figure shows the classification of lobbyists' political orientations in our sample. We define a lobbyist to be Democratic (Republican) party-leaning if more than 75% of the lobbyist's individual contributions are allocated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

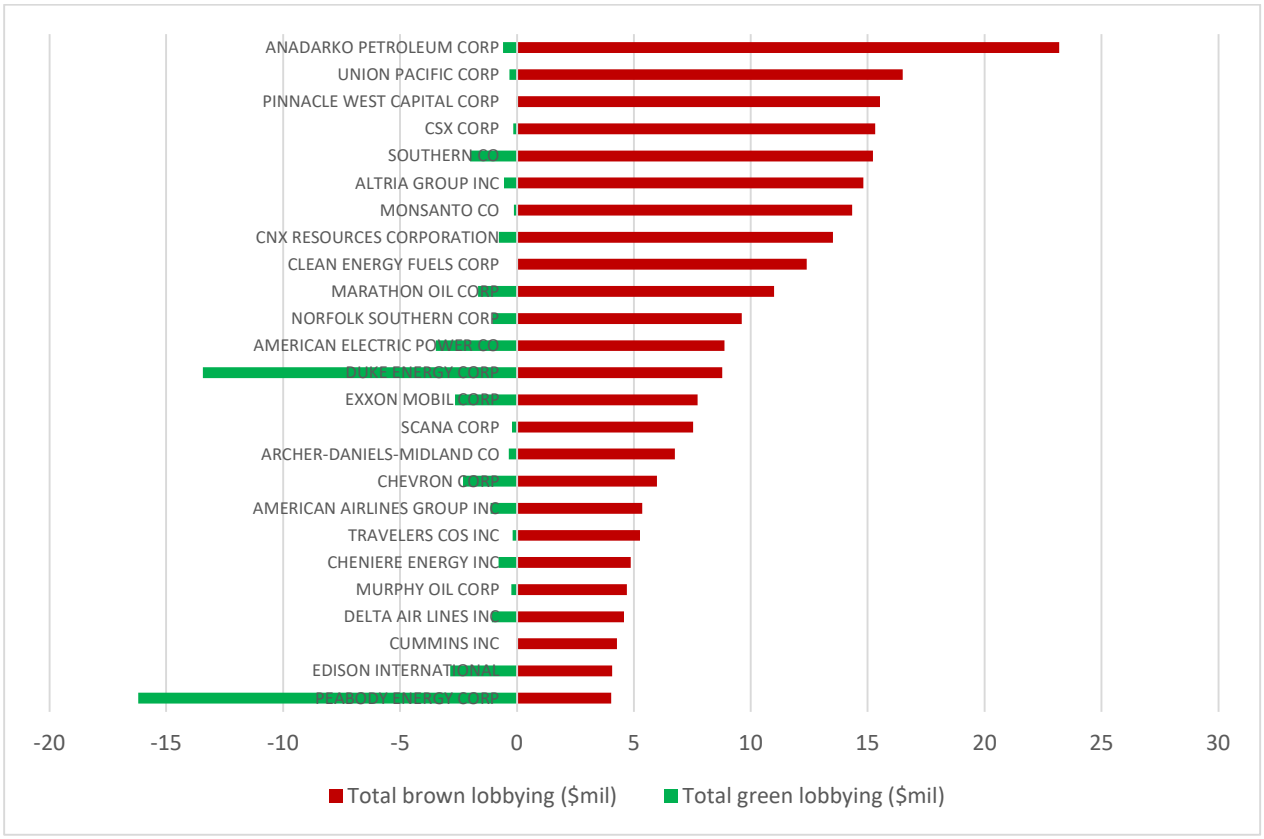


Internet Appendix Figure A4: Top 25 firms with green and brown lobbying
This figure shows the dollars spent in green and brown lobbying for the top 25 firms that spent the most dollars lobbying green (Panel A) and brown (Panel B) during our sample period.

Panel A: Top 25 green lobbying companies



Panel B: Top 25 brown lobbying companies



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: Determinants of brown lobbying

This table examines the determinants of firms' brown 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 columns 1–2, we measure innovation based on the natural log of one plus the number of patents granted to the firm over the last five years. In column 3, we measure innovation based on the quality of patents; across all patents granted in the last five years, we calculate the average truncation bias-corrected number of forward citations; we define this as zero for firm-years with no patents over the period. In column 4, we measure innovation based on the average market value of patents, using the measure of Kogan et al (2017). The definition of green lobbying is described in the text. 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 = Brown lobbying intensity$_{t+1}$			
	(1)	(2)	(3)	(4)
# Green patents	-0.002	-0.003		
	(0.002)	(0.003)		
Q(Green patents)			0.005	
			(0.006)	
MV(Green patents)				-0.000
				(0.002)
Current green operations		-1.550	-1.590	-1.617
		(2.595)	(2.625)	(2.612)
ln(Assets)	0.001	0.001	-0.000	0.000
	(0.001)	(0.002)	(0.001)	(0.001)
Book leverage	-0.009	-0.011	-0.010	-0.011
	(0.007)	(0.008)	(0.008)	(0.008)
EBIT/Assets	-0.009	-0.012	-0.012	-0.012
	(0.008)	(0.009)	(0.009)	(0.009)
Cash/Assets	-0.012*	-0.013	-0.016*	-0.015*
	(0.007)	(0.008)	(0.008)	(0.008)
Observations	17,930	14,772	14,772	14,772
R-squared	0.123	0.127	0.127	0.127
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Internet Appendix Table A3: 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

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 neutralit	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 investmer	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

Internet Appendix Table A4: Additional approaches to addressing endogeneity

Panel A is similar in spirit to Table 5, with the exception that it employs a 2SLS specification instead of a difference-in-difference specification. It shows the relation between innovation and lobbying expenditures, using the USPTO Green Pilot program as an instrument to control for endogeneity. The sample consists of firm-years starting three years prior to the beginning of this program and ending in the last program year, i.e., 2007 to 2012. Column 1 shows the first-stage regression, where the instrument is *USPTO Green Pilot Program*, which is an indicator variable equal to 1 for the years the program was in effect: 2010, 2011, and 2012 among firms that applied for green patents between 1/1/2006 and 11/30/2009. Columns 2 and 3 show second-stage regressions. The dependent variable in column 1 is the natural log of one plus the number of green patent applications in year *t*. The dependent variables in columns 2 and 3 are green lobbying intensity in year *t*+1 and brown lobbying intensity in year *t*+1, respectively. The sample includes firms with any lobbying. In Panel B, we estimate OLS regressions, examining whether firms that were granted more patents under the green tech pilot program were more likely to lobby green versus brown. The dependent variable equals green lobbying intensity in column 1 and brown lobbying intensity in column 2. The sample begins in 2013 (approximately three years after the program started) and extends until 2015 (approximately three years after it ends). # Green tech pilot program patents is calculated using the FOIA data: it represents the stock of patents (defined over three years) on which a firm successfully obtained expedited processing under the pilot program. All other variables are defined in prior tables and in Appendix A. 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.

Panel A: 2SLS

	ln(# Green patent applications)	Green lobbying intensity(t+1)	Brown lobbying intensity(t+1)
VARIABLES	*First Stage*	*Second Stage*	*Second Stage*
USPTO Green Pilot Program	0.262***		
	(0.030)		
ln(# Green patent applications)		-0.019	0.025
		(0.037)	(0.038)
ln(Assets)	0.066***	-0.000	-0.001
	(0.010)	(0.003)	(0.003)
Book leverage	-0.041	0.022	-0.019
	(0.054)	(0.015)	(0.011)
EBIT/Assets	-0.118***	-0.065***	-0.005
	(0.046)	(0.024)	(0.014)
Cash/Assets	0.157***	-0.003	-0.012
	(0.048)	(0.017)	(0.014)
Observations	5,413	5,413	5,413
R-squared	0.288		
Remark	1st stage	2nd stage	2nd stage
Year FE	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes
First-stage F-stat		78.56	78.56

Panel B: FOIA data

VARIABLES	(1) Green lobbying intensity(t+1)	(2) Brown lobbying intensity(t+1)
# Green pilot patents	0.004	-0.006
	(0.014)	(0.008)
ln(Assets)	-0.004	0.001
	(0.003)	(0.002)
Book leverage	0.003	-0.011
	(0.017)	(0.016)
EBIT/Assets	-0.046	-0.026
	(0.034)	(0.019)
Cash/Assets	-0.000	-0.012
	(0.023)	(0.017)
Observations	2,403	2,403
R-squared	0.112	0.166
Year FE	Yes	Yes
Industry FE	Yes	Yes