Electric Utilities and American Climate Policy: Lobbying by Expected Winners and Losers*

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Abstract

When and why do individual companies lobby on environmental policies? Given the structural strength of business interests, the answer to this question is important for explaining policy. However, evidence on the strategic lobbying behavior of individual companies remains scarce. We use data from lobbying disclosure reports on all major climate bills introduced during the 111th Congress (2009-2010). We then link the lobbying disclosure reports to detailed data on the fuel choices of all electric utilities in the United States along with socio-economic, institutional, and political data from the states where the utilities operate. The expected winners (renewable energy, natural gas users) from climate policy are much more likely to lobby individually on federal legislation than the expected losers (coal users). We find that expected winners lobby for specific provisions and rents as a private good, while expected losers concentrate their efforts on collective action through trade associations and committees to prevent climate legislation. The results suggest that the supporters of climate policy believed the probability of federal climate legislation to be non-trivial.

Keywords: environmental politics; climate policy; lobbying; electricity; energy; American politics

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1 Introduction

The American Clean Energy and Security Act of 2009, often referred to as the Waxman-Markey bill, is by far the closest that the United States has ever come to adopting federal legislation to mitigate climate change. The bill passed in the House but later stalled in the Senate. Moreover, Waxman-Markey and other climate bills were also the subject of intense lobbying efforts by electric utilities at the times. While the American Coalition for Clean Coal Energy (ACCCE) spent almost USD 15 million in lobbying activities in the years 2009-2010, mostly to undermine climate legislation,[1] Duke Energy, an electric utility that had recently tried to reduce its dependence on coal and use more renewable energy, left the group as a protest.[2] The utility explained the decision to leave the group with reference to ACCCE's anti-climate policy position and, in particular, the lobbying organization's decision to use a public relations firm to send fake letters against Waxman-Markey in the name of various organizations.

The behavior of Duke Energy highlights the importance of lobbying by individual electric utilities on climate policy. With 40% of America's carbon dioxide emissions being generated in the power sector, few other industries have such a direct interest in the content of federal climate policy. Coal companies expect huge losses from limits on carbon dioxide, while users of natural gas and renewable energy may reap handsome gains due to their lower carbon dioxide emissions. Given these divisions, there is little reason to expect that electric utilities would remain indifferent or agree on what federal climate legislation, if any, there should be.

Given how important the power sector is for climate policy, it is surprising that the literature on environmental policy, both in American and comparative politics, mostly ignores the lobbying behavior of this sector. Although much has been written about the political influence of business interests in environmental policy (Bernhagen, 2008; Gullberg, 2008) and more generally (Martin, 1989; Hart, 2004; Culpepper, 2010), the political strategies of utilities have drawn little attention. One possible exception is McFarland's (1984) work that provides a largely descriptive overview of energy lobbying in five sectors – oil, natural gas, nuclear energy, coal, and research and develop-

[1] Based on our data on lobbying disclosure records. See the research design for details of data source.
[2] See "Duke Leaves Coal Group over Anti-Climate Bill Stance." *BusinessGreen* September 3, 2009.

ment (R&D) of alternative sources.[3] In contrast to the inattention to lobbying activities in the environmental policy literature, the past decade has seen considerable growth of lobbying activities in the energy sector. Specifically, electric utilities' lobbying spending more than doubled from $79 million in 2000 to $192 million in 2010.[4]

We correct this oversight by analyzing lobbying disclosure data for electric utilities – the power sector – during the 111th Congress. This Congress is ideal for the study because several major climate bills were introduced, whereas the 110th and 112th Congress did not introduce any major climate bills. We pay particular attention to the case of Waxman-Markey, since it is by far the most frequent target of lobbying among all climate bills for electric utilities, but also analyze three other major climate bills. In 2009, Waxman-Markey was the 9th-most lobbied bill among all federal legislation, measured in the number of lobbying disclosure reports that mentioned it. We combine data from the lobbying disclosure records with fuel choice data from the Environmental Protection Agency (EPA) for all electric utilities in the United States, including independent power producers.

The empirical analysis focuses on testing hypotheses on the lobbying behavior of winners (electric utilities that use renewables, natural gas) and losers (electric utilities that use coal) from new federal climate policies. We argue that individual utilities on the winning side have strong incentives to engage in lobbying, because they can try to shape the specific provisions of the legislation to increase their own profits. For these utilities, direct lobbying is a private good along the lines of Gilligan (1997). In contrast, expected losers are primarily interested in stopping the climate legislation from being enacted. For these utilities, individual lobbying makes little sense. Instead, they focus their collective efforts on stopping the legislation through Olson's (1965) collective action.

The statistical results support this interpretation. For all major climate bills under consideration, utilities that generate a lot of electricity from renewables or natural gas are much more likely to lobby than other utilities. Our empirical analysis suggests that increasing net electricity generation from renewables and natural gas by one standard deviation raises the probability of lobbying

[3] McFarland (1984) traces leading characteristics of the structure of lobbying in each sector from the 1920s to the 1980s. His main findings include the fact that there are limits to the ability of energy lobbyists to prevent costly institutional changes in Congress.

[4] The yearly lobbying spending data are available at `https://www.opensecrets.org/lobby/indusclient.php?id=E08`.

by 116% and 121%, respectively. At the same time, higher levels of net electricity generation from coal do not have such an effect. These differences cannot be attributed to differences between expected winners and losers in the existence of opportunities for collective lobbying as an alternative to individual efforts. Organized renewable energy lobbies have existed in the United States at least since the early 1970s (McFarland, 1984) and utilities have been using natural gas for an even longer time. These long histories mean that not only expected losers, but also expected winners, were able to engage in collective lobbying, as we show in a short qualitative analysis that follows our main quantitative results.

The statistical analysis also reveals other interesting patterns of lobbying that warrant further research. To illustrate, we find that electric utilities with generation capacity in states with more Republican Senators tend to lobby more on climate legislation than other electric utilities, perhaps indicating the pivotal role of anti-environmental Republicans in the passing any climate legislation in the United States. Similarly, we find that electric utilities lobby more frequently if their generation capacity is in states with renewable portfolio standards, perhaps because such policies at the state level endow utilities with an incentive to support similar policies at the federal level for a level playing field.

For scholars of environmental policy, the results highlight the importance of distinguishing between collective and individual lobbying. Most of the existing literature has shown that both winners and losers from environmental policy lobby for their preferred policies, with no clear difference in their ability to promote their interests (Vogel, 1996; Michaelowa, 2005; Gullberg, 2008; Bunea, 2013; Cheon and Urpelainen, 2013). We have shown that when we train our analytical lens on individual lobbying, the activity levels are much higher for electric utilities expecting to win than for their losing counterparts. This finding emphasizes the critical importance for distinguish between individual and collective lobbying, echoing Gilligan's (1997) argument concerning firm-specific interests in trade policy.

While our findings on individual lobbying are new, the general picture of lobbying is consistent with earlier results. Our qualitative evidence suggests that there is no difference in collective lobbying between expected winners and losers, similar to the emphasis on interest groups and advocacy coalitions in the literature (Baumgartner and Leech, 1998; Baumgartner et al., 2009; Boehmke, Gailmard, and Patty, 2013; Mahoney, 2007, 2008). This highlights the common features of lobbying on climate policy and other, often more mundane fields of lobbying. We suspect that reasons for the importance of individual lobbying among expected winners in our case are the technical complexity of the issue, the comprehensive nature of the legislation, and the heterogeneity of interests that characterizes the power sector. The legislative efforts we study all aim to effect major changes in the power sector, with clear distributional implications across electric utilities. In this case, it is understandable that individual lobbying is attractive to the expected winners. In many other cases, everyone within one industry may have the same broad interests, resulting in the primacy of collective lobbying at the expense of individual efforts.

More broadly, the findings add to the body of knowledge about the lobbying behavior of businesses. As Hart (2004) argued in a review article published a decade ago, business interests are heterogeneous and individual firms may have fundamental disagreements about economic policies. While there is a lot of empirical research on lobbying by interest groups in American politics (Galanter, 1974; Baumgartner et al., 2009; Hojnacki et al., 2012; Boehmke, Gailmard, and Patty, 2013), the behavior of individual firms has been studied less extensively. We show that Hart's (2004) argument applies to the case of environmental and energy policy. Electric utilities may, at first blush, seem to have a strong common interest in avoiding costly regulations, but this argument turns out to be invalid upon closer inspection. Moreover, only expected winners act individually.

2 Electric Utilities and Climate Policy in the American Context

Electric utilities are, by their very nature, a core sector in any analysis of climate policy. In the United States, the power sector generated, largely thanks to its heavy reliance on coal, 39% of energy-related carbon dioxide emissions in 2012.[5] The carbon intensity of the power sector is expected to decrease in the coming years due to the growing use of natural gas (low carbon emissions) and renewable energy (no carbon emissions). Any ambitious climate bill would further reduce the competitiveness of coal and promote the interests of renewable energy and natural gas.

One of the most fundamental factors that may influence the interests and lobbying behavior

[5] See `http://www.eia.gov/tools/faqs/faq.cfm?id=77&t=11`. Accessed February 27, 2014.

of electric utilities is their fuel choice. Some fuels, such as solar and wind power, do not emit any carbon. Utilities that have invested in such capacity may expect tremendous benefits from climate policies, such as carbon emission markets or renewable portfolio standards. For example, Cheon and Urpelainen (2013) consider renewable electricity generators a core interest group that supports more stringent climate policies in industrialized countries. Others, such as natural gas, have a relatively low carbon content, and so their owners may, at least in the short to medium run, expect benefits. In contrast, the use of coal produce large amounts of carbon, and users of coal have a lot to lose from the imposition of climate policies.

In practice, it is hard to categorize electric utilities based on their fuel choices, because many utilities rely on multiple fuels. The larger utilities own multiple power plants across states and, depending on local conditions and policies, use a variety of fuels. For example, a utility that uses coal in West Virginia may at the same time invest in wind power in the Dakotas. For such a utility, the decision to lobby is mixed. On the one hand, the coal business is certain to suffer from new climate legislation. On the other hand, the renewable energy business would boom upon new legislation. We do not attempt to create exclusive categories of utilities; instead, we examine the relationship between the amounts of different fuels used and lobbying behavior. This strategy allows us to consider utilities that use multiple fuels.

Figure 1 provides a rough summary of the variation in the number of fuel choices based on the Energy Information Administration (EIA) data we exploit in our data analysis. Each histogram represents the number of utilities that use a specific fuel type, arranged by the total number of fuel sources these utilities consume. For example, the histogram for utilities using renewables is restricted to the subsample of utilities utilizing renewable energy and shows how many utilities in the sub-sample rely on one or multiple fuel sources. Importantly, the number of the utilities that use more than one fuel varies significantly across the utility types. For example, the majority of renewable energy generators use only renewables, while utilities that rely on coal also use many other fuels. This indicates that renewable energy generators may have clearer incentives than coal users with regard to lobbying. Though not shown in the figure, the data also show that most utilities using renewables do not utilize other fuel sources, and only one of those generate using both renewables and coal. In contrast, the utilities using coal heavily rely on other fuel types, as compared to other sources. Again, this emphasizes the clearer incentives that renewable energy generators have with respect to lobbying on climate policy.

[Figure 1 about here.]

Another key distinction for electric utilities is the difference between traditional, regulated utilities and independent power producers. Historically, the American power sector has been dominated by the traditional regulated utilities that are either public or private and generate power under regulations set by state and federal regulators (Hirsh, 1999). However, in 1978, Congress passed the the Public Utility Regulatory Policies Act (PURPA) aimed at allowing independent power production by co-generators and small power plants. The main motive of this act was to restore energy independence by decreasing the amount of imported oil (Russo, 2001). The individual power producers are private and are exempted from regulation policies, including gas price increases (Sine, Haveman, and Tolbert, 2005). The differences between different types of producers are illustrated in Figure 2. In total, the number of independent power producers exceed that of traditional utilities. However, in the subsample of the utilities based on coal, there are more traditional utilities than independent power producers. Indeed, the proportion of each type of utility is quite different depending on the type of fuel. In the subsample of utilities that use renewables, there are more independent power producers. For natural gas, the number is relatively uneven.

[Figure 2 about here.]

The descriptive data presented in this section have important implications for studying lobbying. For one, many utilities rely on multiple fuels, suggesting that any given utility may have mixed incentives with regard to lobbying on climate policy. This is especially true of utilities that burn coal. Second, there are clear differences between traditional utilities and independent power producers in their fuel choices. While this section does not show data on variation in utility size, it is evident that larger utilities are more likely to rely on multiple fuels than their smaller counterparts. We consider these factors in our empirical analysis of individual lobbying by utilities.

3 Electric Utilities, Lobbying, and Federal Climate Legislation in the 111th Congress

To explain lobbying patterns among electric utilities, we train an analytical lens on the federal climate legislation of the 111th Congress (2009-2010). This time period is ideal for the study because several important climate bills were introduced in the Congress and lobbying on federal climate legislation reached record heights. While none of the climate bills was enacted in the end, the Waxman-Markey bill passed in the House and there was considerable uncertainty about the prospects of the bill in the Senate. The 111th Congress was simultaneous to President Obama's first term as a president, and expectations for climate policy were high due to the dominance of Democrats in House and Senate. The hopes were also high for the Conference of Parties of the United Nations Framework Convention on Climate Change in Copenhagen, December 2009, to make major progress toward the formulation of a global climate agreement.

In this setting, federal climate policy was a hot topic for interest groups and individual companies. Our goal here is to explain variation in the lobbying activities of individual companies. In developing the framework for the analysis, we draw on a rich tradition of political-economic literature on lobbying and interest groups. We emphasize the notion of competitive lobbying, with different interest groups competing for influence over policy (Milner, 1988; Austen-Smith and Wright, 1992; Grossman and Helpman, 1994; Gullberg, 2008). As in Keohane, Revesz, and Stavins (1998) and Cheon and Urpelainen (2013), the winners prefer environmental policy due to their own commercial interest, while losers worry about the costs of environmental policy. We theorize about the lobbying behavior of the two sides based on their unique strategic considerations and goals.

An important scope condition for the analysis is that our focus is on individual lobbying targeted at a specific bill, as opposed to operations through trade associations or campaign contributions in electoral. The data we have allows us to identify direct lobbying activities by individual companies. We include lobbying activities at all stages of the legislative process in the analysis, from the initial committee debates to the final vote, if any. We do not attempt to theorize about the timing of lobbying activities. Therefore, we focus on the incentives of individual companies to lobby. In doing so, we have to depart from the typical framework for understanding interest groups as collectives

(Olson, 1965; Grossman and Helpman, 1994; Baumgartner et al., 2009) and instead build on works that consider the possibility of lobbying by individual firms (Hansen, Mitchell, and Drope, 2005; Bombardini and Trebbi, 2012).

To summarize, we argue that the expected winners of a climate bill may be expected to be much more active than the expected losers. While the main goal of expected losers is to stop the bill from being implemented, the winners have an interest in shaping the exact provisions of the bill. Here we assume the winners believe the bill has more than a minimal probability of passing, as they would otherwise not be interested in the provisions of the bill. Therefore, expected winners have stronger incentives to lobby on their own, while expected losers have little interest to do so. From their perspective, stopping the bill from advancing is a public good that requires collective action.

3.1 Context of Lobbying: Identifying Winners and Losers

Before we delve into the details of the theory, it is useful to discuss the context and the challenge of identifying winners and losers for our analysis. In the case of the 111th Congress, lobbying was about replacing non-legislation with a federal bill. In the status quo, the executive's ability to engage in climate mitigation was solely based on the Clean Air Act. The Clean Air Act is a federal law that requires the EPA to establish national ambient air quality standards for pollutants based on the latest science. It was introduced with the 1963 legislation and was expanded with the 1970, 1977 and 1990 amendments.[6] In the absence of federal climate legislation, executive's regulation is only possible under the Clean Air Act. The scope of the Clean Air Act has expanded since the initial introduction, and the EPA has made initial steps under the Act to limit emissions that cause climate change.[7] Yet, there was no federal legislation designed to address climate change. Against this background, lobbying activities targeted at passing a federal bill instead of strengthening the existing policy.

It is not straightforward to define winners and lowers under climate policy due to complicated factors that affect gains and losses for electric utilities. However, we can reasonably assume that

[6] For detailed information on the Clean Air Act, see `http://www.epa.gov/air/caa/requirements.html`.

[7] For information on the EPA's climate change related activities, see `http://www.epa.gov/climatechange/EPAactivities/regulatory-initiatives.html`.x

coal industry was expected to lose from climate legislations given coal industry's opposition to the legislations introduced during the 111th Congress. On the American Clean Energy and Security Act of 2009 (H.R. 2998), the ACCCE president announced its opposition saying that "ACCCE cannot support this bill, as it is written, because the legislation still does not adequately protect consumers and the domestic economy or ensure that the American people can continue to enjoy the benefits of affordable, reliable electricity, which has been so important to our nation."[8] Legislators also shared understanding. Charles Wilson, then Representative from Ohio, explained his vote against the American Clean Energy and Security Act of 2009 (H.R. 2454) by noting that "because we are located in an area of the country that heavily relies on coal to turn on the lights and heat our homes, Ohio families and her energy intensive industries, like steel, will bear the brunt of the cost from this version of climate change legislation."[9]

Moreover, available economic analyses of the Waxman-Markey bill supports this interpretation. According to EPA analysis of the effects of the legislation in April 2009, it would completely stop the construction of new coal power, with the exception a small increase in plants with carbon capture and storage, as compared to continued construction over time in the reference scenario (EPA, 2009: 24). According to Point Carbon (2009: 2), coal generators are at the greatest risk of failing to recover the cost of carbon pricing. In particular, "a company with many coal power plants in a market where prices are set by natural gas on the margin would not recover all its carbon costs through the price increase" (Point Carbon, 2009: 12). These two different analyses both point to the general threat that carbon pricing presents to utilities owning coal-powered plants.

Regarding winners from the legislation, the case of renewable energy is clear. The evidence for natural gas is also strong. Already by 2015, EPA (2009: 23) analysis suggests that renewable energy power generation increases from a reference case of 230 to 285 terawatt hours, an increase of 23%. According to Point Carbon (2009: 12), "[a] company with a low-carbon fleet (nuclear, renewable or even natural gas) in a market where prices are set at the margin by electricity from coal-fired generation will potentially recover more than its actual costs because it will benefit from

[8] The full text of announcement is available at `http://www.reuters.com/article/2009/06/27/idUS12352+27-Jun-2009+PRN20090627`.

[9] The press release from the representative can be found on `https://www.voxgov.com/`.

the larger price increase without having to pay for as many allowances." This basic observation allows Point Carbon (2009: 14) to characterize the winners as utilities with "[g]eneration fleets that include non-emitting fuels – hydro, nuclear and renewable energy – fare best, followed by fleets with low-emitting plants such as combined cycle gas turbines."

3.2 Lobbying by Expected Losers

For electric utilities that expect to lose from a climate bill, especially power plants that burn coal, the primary goal is to reduce the odds of it being passed. These opponents of emissions reductions have a common economic interest in opposing new climate policies, as all of them would see their competitiveness decrease in the face of more stringent constraints on carbon dioxide emissions. In such a setting, Olson's (1965) "logic of collective action" applies. Since no utility can stop federal climate legislation on its own, there is no effective alternative to collective action. Even the largest individual electric utilities are not individually capable of stopping a major federal climate legislation, but together they can undermine environmental regulations. Building on Olson's (1965) theory, Hansen, Mitchell, and Drope (2005: 151) write that "a firm would not contribute or lobby to secure a *collective good* because the individual contribution is unlikely to make a difference to the outcome and because the individual cannot be punished for not contributing."

In the case of climate policy, this logic clearly applies. If coal users manage to coordinate their efforts, they can collectively avoid the cost of constraints on carbon emissions and continue their profitable operations. In the case of climate policy, for example, effective action by utilities that rely on coal could stop legislation implementing an emissions trading scheme with a binding cap on carbon dioxide emissions in the power sector. Even if the lobby failed to stop the bill from progressing, the efforts of lobbyists could increase the amount of carbon dioxide emissions allowed or delay implementation.

Given this collective interest, there are few reasons to believe that the clear losers from a climate bill would lobby individually. If the coalition of expected losers is to stop the bill, their primary strategy will be to join their forces and lobby and campaign through a trade association. Since no individual electric utility can have a significant effect on the probability that climate legislation is passed and implemented, individual lobbying should be limited.

Hypothesis 1. *High coal use does* not *predict active individual lobbying by electric utilities.*

There is another reason that may favor collective action among coal users. As shown above, the typical utility using some coal is large. As the literature on the collective action problem in lobbying postulates, the net benefits of collective lobbying through group such as trade association should exceed those of individual lobbying or doing nohting (Olson, 1965; Bendor and Mookherjee, 1987; Sandler and Tschirhart, 1980; Magee, 2002; de Figueiredo and Tiller, 2001; Bombardini, 2008). The net benefits depend on the ability of firm to overcome fixed costs in organizing collective action and the number of firms with a shared interest. Even when there is a common interest and when the beneficiaries of collective action are participating, more financial resources available to larger firms allow them to overcome more easily the fixed cost of organizing group lobbying. In this regard, the economies of scale that favor coal burning in large units also facilitate collective action. In the presence of free-rider problem, a small number of large coal users can easily overcome obstacles to collective action and mobilize effectively to combat federal climate legislation.

3.3 Lobbying by Expected Winners

For the expected winners of a climate bill, the optimal strategy for lobbying is somewhat different from that of the expected losers. To begin with similarities, expected winners also face the challenge of collective action in trying to promote new legislation. They have a collective interest in constraints on carbon emissions, as such constraints increase their profitability. For them, the logic of collective action is about acting together to compel legislators to implement new federal legislation.

In terms of individual lobbying, however, there is an important difference between expected losers and winners. While the former have little to gain from acting individually, the latter also have a strong interest in the details of the climate legislation. Users of renewable energy prefer specific provisions to promote renewables, while users of natural gas want policies that create demand for their products. Since lobbying is not very expensive relative to the large scale of operations for many electri c utilities, they have an incentive to request specific, beneficial legislative provisions even if they believe their probability of success to be small. For example, the version of the most important legislative bill we consider, H.R. 2454, was 1,428 pages long when it passed the House in a roll-call vote, illustrating the detailed nature of the provisions.[10] Since Representatives are selected by district and Senators by House, it is plausible that they have the ear of specific policymakers on Capitol Hill. As de Figueiredo and Tiller (2001) point out, when an individual firm wants the government to tailor specific policies according to its needs, the firm is more likely to lobby individually. In such a setting, lobbying also generates "private goods" (Gilligan, 1997) because it allows electric utilities to promote specific provisions that benefit them in particular.

Hypothesis 2. *High renewable energy use predicts active individual lobbying by electric utilities.*

Hypothesis 3. *High natural gas use predicts active individual lobbying by electric utilities.*

To understand this hypothesis, it may be useful to relate it to studies of lobbying on trade policy. Bombardini and Trebbi (2012) note that in oligopolistic markets with differentiated products, firms often lobby for specific protective measures to increase their prices and profits. Since this is not a profitable approach in a more competitive industry, however, collective lobbying for higher tariffs across the board is the preferred strategy of firms. In the case of climate policy, both actions are needed. First, expected winners must secure the passing of a climate bill. Second, they must make sure that the bill generates rents for them upon enactment and implementation.

While the relatively small size of many renewable energy and natural gas generators may complicate collective action, it is important to note that this, in and of itself, would not promote individual lobbying. The alternative to collective action is to do nothing. Our argument emphasizes individual lobbying as an activity that has a different goal than collective action. If anything, there should be a certain complementarity relationship between individual and collective lobbying among the expected winners. Without any collective action, individual lobbying activities for specific provisions may prove futile because the climate bill is never passed by the Congress.

4 Research Design

The basic idea of our research design is to combine lobbying disclosure data with detailed information on the fuel choice and other characteristics of electric utilities in the United States. We then

[10] The text is available at `http://www.gpo.gov/fdsys/pkg/BILLS-111hr2454eh/pdf/BILLS-111hr2454eh.pdf`.

use the fuel choice to predict lobbying activity on a series of major climate bills introduced during the 111th Congress (2009-2010).

The analysis captures both traditional, regulated utilities and independent power producers. We exclude industrial and commercial co-generators because, for them, power generation is a side activity. These firms often have significant other interests in lobbying climate policy. For example, heavy industry often has some electricity co-generation alongside their industrial operations. Including such operators in the sample would prevent us from focusing on utilities. Letting i indicate utility and j state, we estimate probit models of the following type:

$$\Pr(Y_{ij} = 1) = \Phi(\alpha + \beta_1 \text{Coal}_{ij} + \beta_2 \text{Renewables}_{ij} + \beta_3 \text{Natural Gas}_{ij} + \gamma \mathbf{X}_{ij} + \delta \mathbf{Z}_j + \mu), \quad (1)$$

where Φ denotes the normal distribution. Each utility i is located within state j based on the largest annual net generation by state. We expect β_i to be negative and β_2, β_3 to be positive. Vectors **X,Z** denote control variables at the utility and state level, respectively. Finally, μ is a vector of region fixed effects. Some specifications also include state fixed effects.

An important limitation of our data is the lack of information about how much money utilities spent in lobbying any specific bill. While the lobbying disclosure records provide quarterly data on total lobbying, the lobbyist is not required to disaggregate this total amount by legislative item. Therefore, we cannot use the sum spent on lobbying as the dependent variable.

4.1 Dependent Variable

Our dependent variable is a binary indicator for whether or not an electric utility lobbied a given climate legislation introduced in the 111th Congress. We collected all the lobbying reports of this period that mention a given climate bill and then matched the lobbying dataset with the electric utilities dataset. We examined whether an electric utility lobbied a given bill and constructed a binary variable taking the value of 1 if the electric utility lobbied for at least one out of eight quarters in the years 2009-10 and 0 otherwise.

We have four sets of dependent variables indicating whether an electric utility i lobbied for each of the four major climate bills: (i) the American Clean Energy and Security Act (H.R. 2454) that would have imposed a cap on greenhouse gas emissions and implement emissions trading, (ii) the Clean Energy Jobs and American Power Act (S. 1733), the first senate version of H.R. 2454, (iii) the Carbon Limits and Energy for America's Renewal (CLEAR) Act (S. 2877) that aim to promote clean energy jobs and economic growth through the establishment of a program to regulate commercial usage of fossil carbon, and (iv) the American Clean Energy Leadership Act (S. 1462) that would have established a renewable energy standard.

We chose to focus on these key bills among many other energy-related bills taking into consideration of the list of key climate legislations selected by the Center for Climate Energy Solutions. The center provides a summary of climate-related legislative activities and depicts key climate legislation for each congressional term from the 106th Congress to the 112th Congress.[11] Among over 200 climate- or energy-related bills, resolutions, and amendments in the 111th Congress, a total of eight bills and one discussion draft were highlighted as key legislation during the 111th Congress.[12] The center chose the key legislative activities by excluding activities that amend previous legislation or codes and by focusing on bills targeted at (i) limiting greenhouse gas emissions, (ii) promoting clean energy jobs, and (iii) supporting a transition to a clean energy economy through cap-and-trade program or other clean technology policies.

We collected all the relevant lobbying reports on these bills. However, only four of them turn out to have been lobbied by a substantial number of electric utilities: H.R. 2454 American Clean Energy and Security Act was the most frequently lobbied bill among the nine key legislations (7% of electric utilities in our dataset lobbied for this bill), followed by S. 1733 Clean Energy Jobs and American Power Act, the senate version of H.R. 2454 (4% of utilities lobbied), S. 1462 American Clean Energy Leadership Act (4% of utilities lobbied), and S. 2877 the Carbon Limits and Energy for America's Renewal (CLEAR) Act (2% of utilities lobbied). We do not consider the other four bills that were lobbied by less than 1% of electric utilities. Those utilities that lobbied on these four bills tend to be exceptionally large utilities such as Exxon Mobile Production that exert lobbying efforts on a variety of legislative activities.[13]

[11] The list of key bills is available at `http://www.c2es.org/federal/congress`.

[12] The Center for Climate Energy Solutions chose one discussion draft about the Kerry-Lieberman American Power Act. This act, however, had not been introduced.

[13] The other bills that we do not consider are the Clean Energy Partnerships Act of 2009 (S.2729), the Clean Energy

We estimate binary probit models for each bill instead of count models, because we expect net generation using renewable energy and natural gas to be positively associated with the probability of lobbying on climate bills, while the amount of coal net generation should have no impact on the lobbying probability. For a stringent empirical test, it is appropriate to test the hypotheses for each of the bills separately. Using count models, however, we also check if the amount of net generation using different fuel types affects the frequency of lobbying activities across the bills. We estimate zero-inflated negative binomial models that account for lobbying and non-lobbying decisions, thereby addressing concerns about excessive zeros in the dependent variable. Across all the specifications, the results shows that the amount of renewable net generation and that of natural gas net generation predict non-lobbying activity. Specifically, higher levels of renewable and natural gas net generation have negative impacts on the lobbying probability on at least one major bill, while the amount of coal net generation has little impact on the probability of lobbying. We do not find evidence that the amount of renewable and natural gas net generation predicts the probability to lobby on the number of climate bills among those utilities that lobby at least once. See the supplementary appendix for details.

4.2 Explanatory Variables

The primary explanatory variables are quantities of electricity generated from different types of fuels. Given that many electric utilities in the U.S use different combinations of renewables, coal, and natural gas, the use of binary indicators for fuel sources by utility would be problematic. Therefore, we utilize net electricity generation quantities from coal, renewable energy and natural gas in 2008, respectively. The raw data for net electricity generation in 2008 are from the EIA and are measured in megawatt hours.[14] Since the EIA dataset gives the net generation data at the plant level, we use the sum of net generation across the plants operated by any given utility.

The value of net generation at the utility level is logarithmized for the analysis.[15] An alternative

Act of 2009 (S.2776), Lugar Practical Energy and Climate Plan (S. 3464), and the Renewable Energy Promotion Act of 2010 (S.3813).

[14]Net electricity generation quantities are calculated by subtracting the total electricity used for station service from total electrical output at each plant operated by each utility. For more details, see http://www.eia.gov/electricity/data/eia923/).

[15]In fact, there are a few utilities recorded negative values in net generation. In order to include the logarithm of the net generation values from these utilities, we substitute the negative net generation value with 0, and added '1'

would have been to use the share of a certain fuel, such as renewables, by the utility. However, this measurement strategy would deviate from our theory. We do not expect tiny utilities to lobby even if they only rely on renewables, natural gas, or coal. Instead, we expect the increased importance of renewables, natural gas, or coal to change the behavior of a utility. For example, if renewable energy use increases in the plants operated by a utility, we expect a higher likelihood of lobbying.

As described above, the primary losers from any climate legislation are utilities that burn coal. The variable Coal_{ij} refers to the net electricity quantities that utility i generated from coal within state j where the utility i recorded the largest net generation in 2008. Similarly, for the winners, we include the separate variables of Renewables_{ij} and Natural Gas_{ij} which represent the annual net electricity generation from renewable energy source and natural gas. The renewable energy source included in Renewables_{ij} are solar, water, wind, geothermal, biomass, and biogenic components of municipal solid waste.

4.3 Control Variables

We include a series of control variables to account for confounding influences. To control for utility size, we also include the logarithm of all electricity generation other than coal, renewable energy, and natural gas. Fuels such as hydroelectric power, petroleum, agricultural waste, and pre-existing nuclear power do not generate as clear incentives for or against climate policy – though we recognize that new nuclear power potential could, at least in principle – as the fuels under consideration. Considering these fuels allows us to account for utility size, while still allowing coal, natural gas, and renewables to have differing effects for scientific hypothesis testing.

We include an indicator for independent power producers. Traditional utilities may, due to their being subject to federal regulations, have stronger incentives to lobby than independent power producers. Moreover, we noted above that renewable energy tends to be produced by independent power producers. To avoid confusing utility type with the renewable energy choice, this control variable is useful.

We also include a series of state-level control variables based on the state where a given electric utility's largest annual net generation is located. From the Database of State Incentives for Renew-

to all the net generation values before calculating the logarithm values.

ables and Efficiency, we include data on whether or not a state has an active renewable portfolio standard. Such a policy could influence an electric utility's interest in renewable energy policy at the federal level, as federal legislation could supersede the state legislation. From the EIA, we also include control variables for active and suspended electricity deregulation to account for the possibility that higher levels of regulation induce lobbying by traditional utilities. Since Republican legislators could play a pivotal role in stopping climate policies under a Democrat President, we also include the percentage of Republican Senators and Democrats in the state. Region fixed effects are included for the Atlantic, Northeastern, Northwestern, Midwestern, and Southeastern states.

5 Findings

This section presents our main results from the analyses of electric utilities' lobbying behavior. We focus on four sets of energy bills introduced during the 111th Congress and estimate binary probit models separately for each bill. The main results from analyses, presented in Table 1, are in line with our theoretical expectation. Across all estimated models, we find the amount of coal net generation to have little impact on the probability to lobby on climate bills while the amount of renewable net generation and that of natural gas net generation are found to increase the lobbying probability.

[Table 1 about here.]

The first sub-table in Table 1 summarizes the estimation result from the probit regression models for lobbying on the American Clean Energy and Security Act (H.R. 2454). The following sub-tables are for lobbying on the Clean Energy Jobs and American Power Act (S. 1733), the American Clean Energy Leadership Act (S. 1462), and the Carbon Limits and Energy for America's Renewal (CLEAR) Act (S. 2877). We present only the coefficients on key variables of interests here and the full results tables with coefficients on other control variables are presented in the appendix.

In our base model (1), we control for the binary indicator for independent generators. In models (2) - (6), we control for the amount of other types of net generations excluding the amount of generations from coal, renewable and natural gas. Controlling for the amount of net generation from other sources, the coefficients for the amount of renewable net generation and the amount of natural gas net generation remain statistically significant at $p < 0.01$ level. We add state fixed effects in model (3). We further control for state-level energy policies – renewable portfolio standards, power sector deregulation, and suspension of deregulation – in model (4). We control for the share of Republican house representatives and the share of Republican senators in model (5). Finally, we add regional dummy variables, Atlantic, Northeast, Northwest, Midwest, and Southeast, in our final model (6) to control for the effect of region where electric utilities mainly operate. We include the regional fixed effects in order to control for any unobservable factors common to each region that influences characteristics of electric utilities operating in each region as well as their lobbying behaviors. Utilities operating in different regions tend to differ in many characteristics, including the type of energy they mainly rely on. The inclusion of regional fixed effects helps to control for unobservable differences across regions, such as differences in the design of the electric grid and the availability of various fuels.

Across all six models for four sets of dependent variables, our results provide empirical support for our hypotheses. The amount of coal net generation does not obtain the conventional level of statistical significance in explaining the lobbying decision of electric utilities in any of the estimated models. The amounts of net generation in renewable energy and natural gas consistently appear to have positive association with the probability of lobbying on climate bills at the conventional level of statistical significance. This shows that expected winners are more likely to lobby for the climate bills that they expect to benefit, while expected losers do not individually lobby against them.

We assess the substantive effect of energy use in renewable and natural gas on the probability that an electric utility lobbies a given climate bill. We calculate the probability that an electric utility with characteristics of the sample mean (or median for categorical variables) lobbies a given climate bill based on model (6), setting the regional indicator to Midwest. The results from 1,000 simulations are described in Figures 3 and 4. Figure 3 shows that the amount of renewable net generation has a positive effect on the probability of lobbying for all four climate bills. An electric utility with mean level of renewable net generation is on average 3.7% likely to lobby on the American Clean Energy and Security Act but one standard deviation increase in renewable energy generation (from 4.7 to 10.1 in logarithmized amounts) raises the probability to 7.9%, more than doubling the probability to lobby. In regard to natural gas, Figure 4 shows that an increase of one standard deviation from the mean level of power generation (from 4.6 to 10.4 in logarithmized amounts) raises the probability to lobby from 3.7% to 8.1 %, again more than doubling the probability. The substantive effect appears more or less similar for the other climate bills.

[Figure 3 about here.]

[Figure 4 about here.]

We compare the performance of models based on the Akaike information criterion, AIC, a commonly used measure of goodness-of-fit (Akaike, 1998). A smaller value of the AIC indicates a better model. We present the calculated AIC value for each model in Table 1. In explaining the utilities' lobbying on the American Clean Energy and Security Act (H.R. 2454), model (2) appears to be the best among the six estimated models. This model includes the logarithmized values of coal net generation, renewable energy net generation, and natural gas net generation, with an additional control variable for the logarithm of other energy net generation, as well as a binary indicator for independent utility. When we include additional controls or state fixed effects in models (3)-(6), the model fit becomes poorer, as indicated by the higher AIC values. This suggests that the additional control variables included in the models (3)-(6) do not add much explanatory power for the lobbying behavior of electric utilities.

Given that electric utilities rely on multiple fuels, it is also worth looking at the lobbying behaviors of different types of electric utilities. Among the 1,655 electric utilities under examination, about half of them rely on only one type of fuel source. These utilities tend to be small in their net generation. They rarely lobbied on climate bills probably because they have far less resources to spend for lobbying activities due to their small size. This is consistent with the previous literature that smaller interests in general do not individually lobby as they lack the resources and the political power to influence outcomes (de Figueiredo and Richter, 2014).

None of the utilities relying only on coal sources lobbied any of the four climate bills, and about 2 percent of utilities relying only on renewable sources or only on natural gas lobbied for the American Clean Energy and Security Act (H.R. 2454). This suggests the importance of the size of utilities in understanding their lobbying activities, yet also underscores the role of renewable energy use in increasing the probability of lobbying by utilities. Despite the relatively low baseline rates, the difference between renewable and coal generators is clear from the data.

It is also notable that 14% of coal generators that use either renewable energy sources or natural gas in combination with coal lobbied on the American Clean Energy and Security Act. Given that none of the coal generators that use only coal sources participated in the lobbying, this again shows that the use of renewable energy or natural gas was an important factor that motivated utilities to lobby individually. Utilities that use multiple fuels become more active as the importance of renewable energy and natural gas grow.

6 Qualitative Evidence on Lobbying: Winners and Losers

The above quantitative analysis provides detailed evidence on the determinants of individual lobbying. In this section, we provide case studies of collective lobbying and the specific goals of lobbying of major expected winners. This evidence provides insights into the causal mechanisms supporting the statistical associations characterized above.

6.1 Collective Lobbying

If the primary opponents of federal climate policy in the power sector did not lobby the bills, what did they do instead? Based on anecdotal evidence, they certainly did not sit still and accept their fate. As we noted in the introduction, for example, ACCCE – a group of electric utilities expecting heavy losses from new climate legislation – was active in lobbying against the Waxman-Markey and related bills. This pattern is consistent with the idea that the expected losers largely focus on collective action to stop new climate legislation.

As expected, there is plenty of evidence for lobbying through associations. Beyond ACCCE, opponents of Waxman-Markey organized themselves under the United States Chamber of Commerce, which called the Waxman-Markey approach of a cap on greenhouse gas emissions a "terrible option" for the United States.[16] According to our data, the group spent a total of 145 million dollars on lobbying in 2009 alone. While we cannot separate between climate and other bills, the Chamber

[16] See *Wall Street Journal*, "Chamber of Commerce Details Opposition to Waxman-Markey Bill." May 14, 2009.

took an open hostile stance against H.R. 2454, "strongly" urging Congressmen to reject it.[17]

To summarize, the behavior of expected losers accords with the analytical logic posited above. If the opponents were fundamentally interested in stopping or weakening climate legislation, individual action would be much less effective than collective action. While winners both engage in collective action to support legislation and lobby individually to secure rents in the event of a new policy, losers join forces to stop the adoption of federal climate policy. While we do not have enough data to test hypotheses on the behavior of trade associations on climate legislation in the 111th Congress, the examples provided above show that joint lobbying by opponents of climate legislation was common at the time.

To be sure, we are not arguing that the winners did not engage in any collective lobbying. We do not claim that individual lobbying is a weak substitute for collective action, as the Olson (1965) prediction is that the alternative to collective action is no action at all. The expected winners lobby individually because they want to promote their individual interests, not because they are incapable of collective action. The evidence clearly shows that the expected winners also engaged in collective lobbying. During the 2009-2010 period, the American Wind Energy Association spent USD 10.8 million in lobbying and all lobbying disclosure reports by the association specifically mentioned the Waxman-Markey bill as one of their key targets. The Renewable Fuels Association lobbied for USD 1.3 million, while the American Gas Association spent USD 2.2 million on lobbying activities. The Solar Industries Association spent USD 2.4 million. All these groups expected clear benefits from the Waxman-Markey bill, and while their individual members lobbied on their own, the associations also engaged in collective lobbying through standard channels.

6.2 Goals of Winners and Losers

Expected winners and losers had different goals in regard to climate legislation. On the American Clean Energy and Security Act of 2009, for instance, renewable energy producers, expected winners as we identified above, expressed support for the bill while expected losers, mostly coal producers, showed a strong opposition to the bill as described above. It was not the case, however, that

[17] See "Letter Opposing H.R. 2454, the 'American Clean Energy and Security Act of 2009.'" Available at https://www.uschamber.com/letter/letter-opposing-hr-2454-american-clean-energy-and-security-act-2009. Accessed March 11, 2014.

expected winners merely showed support for the bill. In fact, both renewable energy and natural gas users had several specific requests that they wanted to be included in the bill.

Exelon, one of America's largest utilities, has made major investments in renewable energy and also distributes natural gas to customers. On May 15, 2009, the company's Chief Executive Officer, John W. Rowe, gave a speech on the Waxman-Markey legislation. In addition to offering his strong endorsement, he outlined a few specific goals that Exelon had in the legislative process, reiterating "Exelon's longstanding position that a large percentage of allowances be given to local utilities so they can sell them and use the proceeds for rebates, low-income assistance, energy efficiency and other measures to help customers most affected by energy prices" (Exelon, 2009). He also noted that "a renewable portfolio standard is a down payment toward a sound climate policy but is not enough" (Exelon, 2009). For a company with major renewable energy investments, a natural gas distribution network, and a large pool of more than five million customers, these policies would furnish direct benefits both in terms of profitability and public relations.

Another major electric utility, PSE&G, based in New Jersey, also supported Waxman-Markey. Having made major recent investments in renewable energy, the company paid had a specific interest in a federal renewable portfolio standard. In a February 2009 testimony to the House Committee on Energy and Commerce, Subcommittee on Energy and Environment, Chief Executive Officer Ralph Izzo emphasized that a cap-and-trade system would not be enough, as "effectively combating global warming will require a comprehensive package of policy solutions ... a federal [renewable electricity standard] will create demand for technologies that will transform the way we generate electricity" (Izzo, 2009). While the standard economic approach to carbon abatement suggests that a cap-and-trade system is the most cost-effective approach to carbon abatement, Izzo was arguing for complementary policies that would enhance the profitability of renewable energy.

A third company, Progress Energy, was, until it was merged with Duke Energy in 2012, a major user of natural gas. In a public statement on May 18, 2009, Chief Executive Officer Bill Johnson emphasized that the utility supports Waxman-Markey and emphasized that, while "the bill being debated has improved markedly ... we must all understand that reducing carbon emissions will increase energy costs for all energy users in the future. We will continue to support positive changes that achieve emissions reductions while preserving our ability to provide reliable and affordable electricity to homes and businesses" (Progress Energy, 2009). The press release containing this statement emphasized that Progress Energy is pursuing a "balanced strategy" including energy efficiency, renewables, and an improved electricity system (Progress Energy, 2009). Of course, Progress Energy was also a nuclear energy generator with plans to expand.

7 Conclusion

This article has evaluated the lobbying behavior of individual electric utilities with respect to four major climate bills in the 111th Congress, 2009-2010. The analysis combines lobbying disclosure and fuel choice data for all electric utilities in the United States, including independent power producers. This unique dataset allows us to examine the individual lobbying choices of the power sector, which is responsible for four tenths of all energy-related carbon dioxide emissions in the United States, in great detail, filling an important gap in the existing literature.

The empirical analysis uncovers a large difference between the expected winners and losers from climate policy. While high electricity generation from coal, which would make climate policy costly to an electric utility, does not predict individual lobbying, high electricity generation from renewable energy or natural gas does. These two fuels are among the expected winners from federal climate policy and, thus, have an incentive to lobby for specific provisions that maximize their gains. A qualitative analysis shows that the expected losers, while shying away from individual lobbying, acted collectively to undermine the progress of climate legislation through political channels in the Congress. This is consistent with the notion that expected winners lobbied because they wanted to secure specific concessions in case new climate policy would be formulated, while expected losers focused on the collective good – from their perspective – of preventing new legislation from coming into being. Collecting appropriate data, an important future extension of our research could focus on the effects of individual lobbying on the legislative process and final provisions of various climate bills.

The behavior of expected winners is also important for evaluating the prospects of federal climate legislation in the future. On the one hand, individual lobbying by expected winners promises some hope for the supporters of more ambitious action at the federal level, as individual lobbying would not make a lot of sense if the expected winners thought the legislation is hopeless. On the other hand, individual lobbying may divert attention from collective action that would improve the odds of the enactment of new climate legislation. In this regard, the practice of individual lobbying could undermine the development of new climate legislation. Moreover, individual lobbying could undermine the substantive effectiveness of climate legislation by increasing the number of "pork barrel" (Ferejohn, 1974) provisions that generate targeted benefits to specific constituencies at the expense of the general public. The common practice of individual lobbying could be a dysfunctional feature of the political system.

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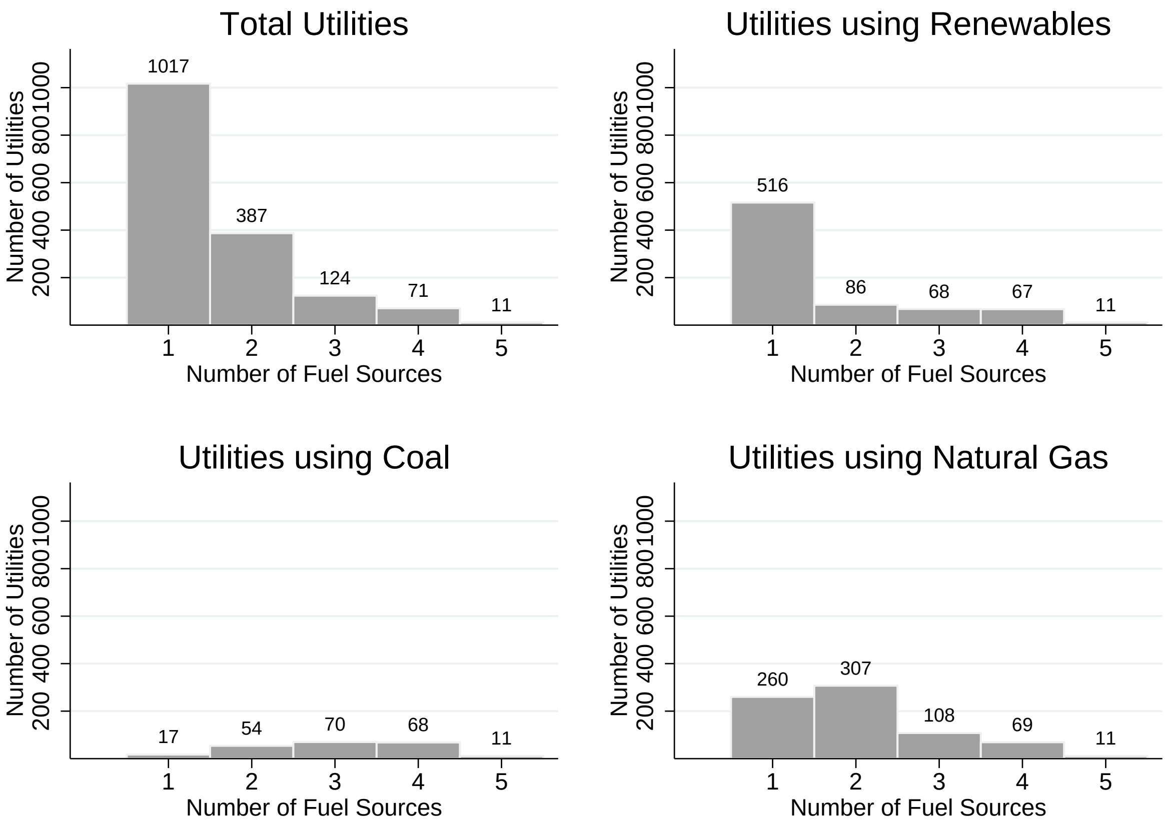

Figure 1: Number of fuel sources that different utilities use.

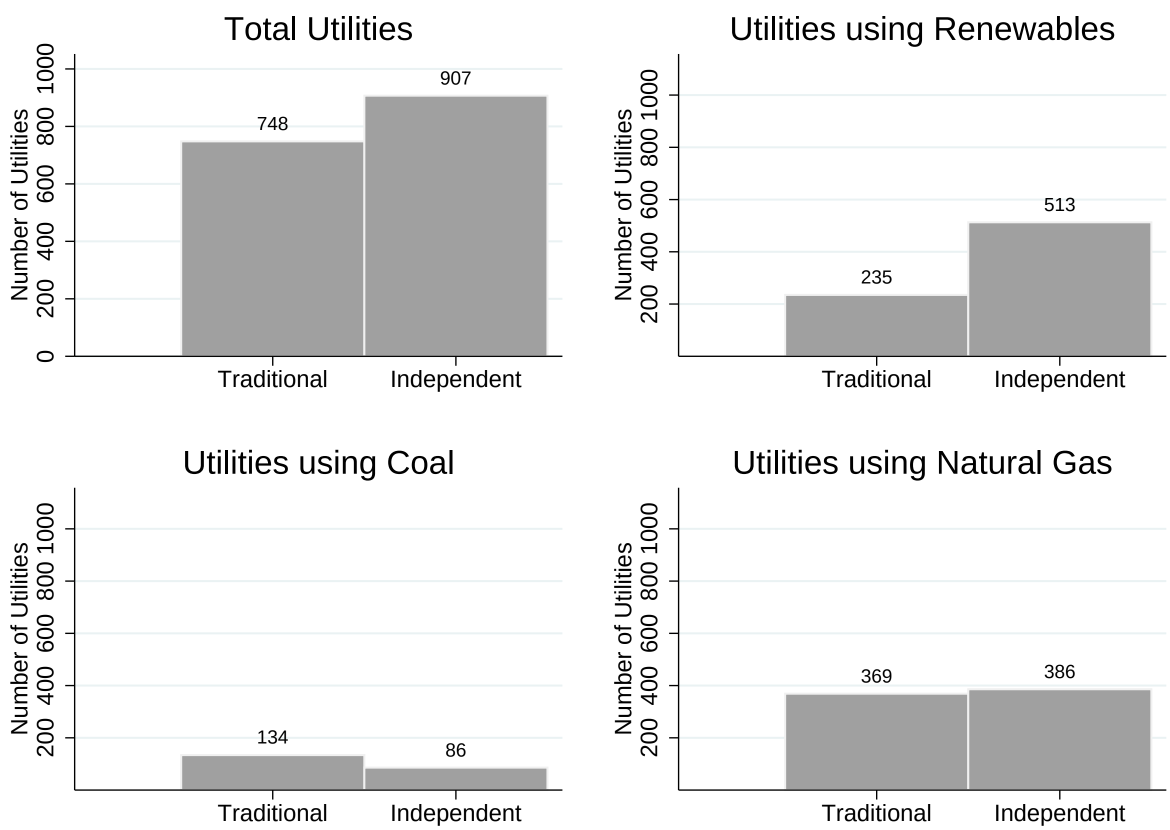

Figure 2: Different types of utilities in the United States by fuel type used.

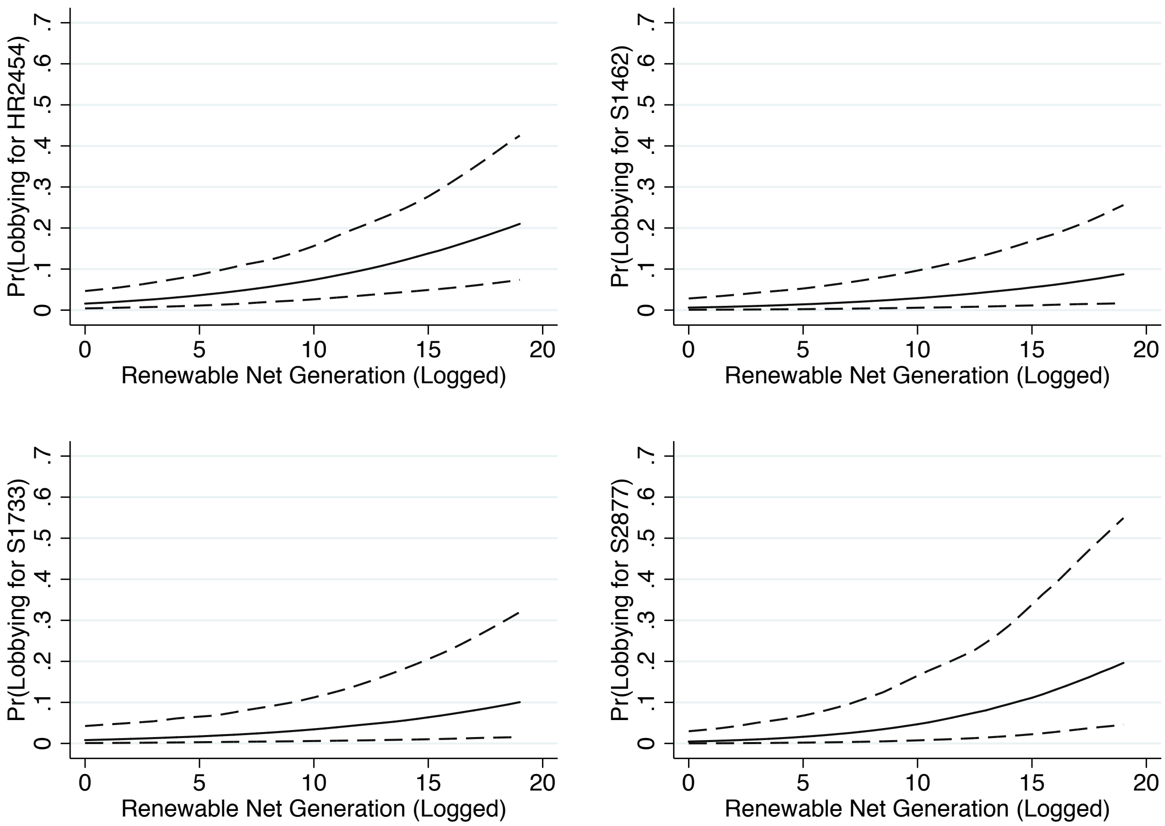

Figure 3: The effect of renewable energy net generation on the predicted probability of lobbying on climate bills. We estimate the predicted probability based on the Model (6) in Table 1 and set all continuous variables at their mean values and other categorical variables at their median values. The region is set to Midwest and the the utility type is set to Independent Utility. The calculation is based on 1,000 simulations using *Clarify* software (Tomz, Wittenberg, and King., 2003).

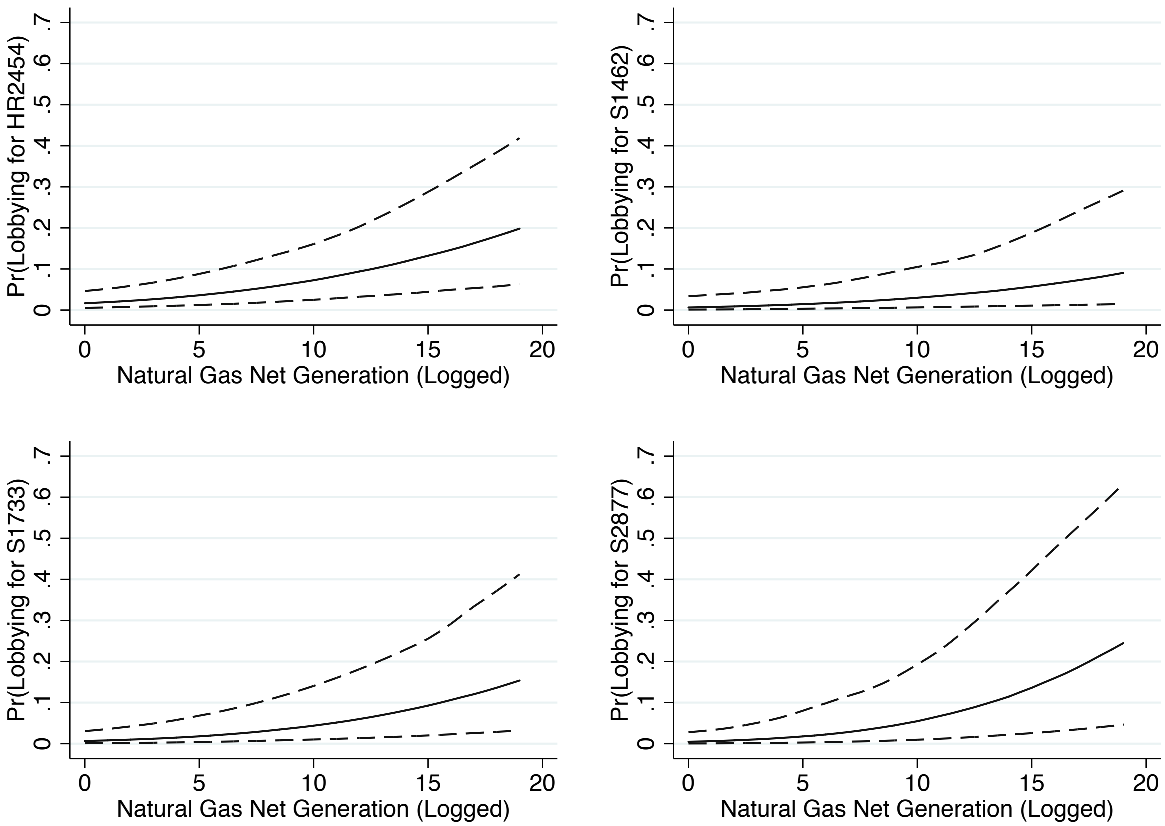

Figure 4: The effect of natural gas net generation on the predicted probability of lobbying on climate bills. We estimate the predicted probability based on the Model (6) in Table 1 and set all continuous variables at their mean values and other categorical variables at their median values. The region is set to Midwest and the the utility type is set to Independent Utility. The calculation is based on 1,000 simulations using *Clarify* software (Tomz, Wittenberg, and King., 2003).

	(1)	(2)	(3)	(4)	(5)	(6)
Lobbying for H.R. 2454 American Clean Energy and Security Act						
Coal Net Generation (Logged)	0.023**	-0.005	-0.008	-0.006	-0.008	-0.008
	(0.010)	(0.012)	(0.014)	(0.012)	(0.012)	(0.013)
Renewable Net Generation (Logged)	0.076***	0.071***	0.074***	0.071***	0.072***	0.071***
	(0.011)	(0.011)	(0.013)	(0.011)	(0.011)	(0.012)
Natural Gas Net Generation (Logged)	0.078***	0.066***	0.072***	0.067***	0.064***	0.068***
	(0.011)	(0.011)	(0.013)	(0.011)	(0.012)	(0.012)
Observations	1655	1655	1519	1655	1654	1654
Pseudo R^2	0.203	0.249	0.299	0.251	0.259	0.269
AIC	525.305	497.768	533.226	502.108	501.053	505.003
Lobbying for S. 1733 Clean Energy Jobs and American Power Act						
Coal Net Generation (Logged)	0.021*	-0.011	-0.011	-0.013	-0.016	-0.012
	(0.012)	(0.014)	(0.017)	(0.014)	(0.015)	(0.015)
Renewable Net Generation (Logged)	0.072***	0.062***	0.073***	0.062***	0.062***	0.059***
	(0.013)	(0.014)	(0.018)	(0.014)	(0.014)	(0.014)
Natural Gas Net Generation (Logged)	0.091***	0.077***	0.095***	0.078***	0.074***	0.077***
	(0.013)	(0.014)	(0.018)	(0.015)	(0.015)	(0.015)
Observations	1655	1655	1287	1655	1654	1654
Pseudo R^2	0.228	0.292	0.371	0.298	0.307	0.319
AIC	350.684	324.569	337.989	327.880	328.106	332.719
Lobbying for S. 1462 American Clean Energy Leadership Act						
Coal Net Generation (Logged)	0.018	-0.015	-0.013	-0.013	-0.016	-0.012
	(0.012)	(0.014)	(0.017)	(0.014)	(0.014)	(0.015)
Renewable Net Generation (Logged)	0.070***	0.064***	0.069***	0.062***	0.062***	0.060***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.013)	(0.014)
Natural Gas Net Generation (Logged)	0.075***	0.061***	0.069***	0.059***	0.056***	0.060***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.013)	(0.014)
Observations	1655	1655	1357	1655	1654	1654
Pseudo R^2	0.188	0.255	0.332	0.263	0.272	0.293
AIC	379.928	351.041	366.422	353.465	353.273	353.712
Lobbying for S. 2877 the Carbon Limits and Energy for America's Renewal Act						
Coal Net Generation (Logged)	0.027*	0.002	-0.009	0.004	0.005	0.004
	(0.014)	(0.017)	(0.022)	(0.018)	(0.018)	(0.019)
Renewable Net Generation (Logged)	0.096***	0.083***	0.107***	0.088***	0.088***	0.092***
	(0.018)	(0.018)	(0.023)	(0.019)	(0.019)	(0.020)
Natural Gas Net Generation (Logged)	0.107***	0.088***	0.101***	0.096***	0.093***	0.101***
	(0.018)	(0.018)	(0.023)	(0.020)	(0.020)	(0.022)
Observations	1655	1655	1038	1655	1654	1654
Pseudo R^2	0.289	0.317	0.382	0.360	0.366	0.388
AIC	234.555	227.654	232.642	220.253	222.244	225.465
Controls	Base	Other Fuels	Other Fuels	Extended(1)	Extended(2)	Extended(2)
State FE	No	No	Yes	No	No	No
Regional FE	No	No	No	No	No	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
In model (1), we include a binary indicator for independent generators. In models (2) and (3), we control for net generation with fuels other than coal, renewables, and natural gas, and we include state-fixed effect in model (3). In model (4), we add state-level control variables. In models (5) and (6), we additionally control for the share of Republicans among House Representatives and Senators.

Table 1: Probit regressions on electric utilities and lobbying on climate bills. The coefficients for control variables are shown in the supplementary appendix.

Electric Utilities and American Climate Policy

Supporting Information

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Contents

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A1 Data Description

- Table A1 presents the list of the utilities in the U.S. using coal and renewable sources together, their net generation, types of utilities, and the states they are located on.
- Table A2 presents the summary statistics for the lobbying from electric utilities for the environmental bills that we consider in this article in 112th Congress.
- Table A3 presents the summary statistics for explanatory variables.
- Table A4 presents the summary statistics for net generation by utility type.
- Table A5 presents the correlation matrix.

Name	*Net Generation*	*Type*	*State*	*Name*	*Net Generation*	*Type*	*State*
AES	25443.13	Independent	MD	ALABAMA POWER CO	77841.38	Traditional	AL
ALLEGHENY ENERGY	36813.64	Traditional	VA	AMERICAN MUNICIPAL POWER	1440.847	Traditional	WV
APPALACHIAN POWER CO	38595.4	Traditional	WV	ARIZONA PUBLIC SERVICE CO	57969.98	Traditional	NM
BASIN ELECTRIC POWER COOPERATIVE	23345.17	Traditional	SD	BLACK HILLS POWER	2952.607	Independent	CO
CALPINE MIDATLANTIC GENERATION	2781.227	Independent	MD	CEDAR BAY OPERATING SERVICES	1718.119	Independent	FL
CITY OF AMES	451.901	Traditional	IA	CITY OF COLORADO SPRINGS	5744.179	Traditional	CO
CITY OF COLUMBIA	100.736	Traditional	MO	CITY OF GRAND HAVEN	360.444	Traditional	MI
CITY OF HAMILTON	579.965	Traditional	OH	CITY OF MARQUETTE	313.484	Traditional	MI
CITY OF PELLA	65.971	Traditional	IA	CITY OF PERU	91.593	Traditional	IN
CITY OF VIRGINIA	107.009	Traditional	MN	CITY UTILITIES OF SPRINGFIELD	2738.541	Traditional	MO
COLMAC CLARION	267.012	Independent	PA	CONSUMERS ENERGY CO	18533.94	Traditional	MI
CPI USA NC	552.132	Independent	NC	CRISP COUNTY POWER COMM	36.414	Traditional	GA
DAIRYLAND POWER COOP	5975.724	Traditional	WI	DTE ENERGY	987.891	Independent	MI
DUKE ENERGY	165394.4	Independent	OH	EASTERN KENTUCKY POWER COOPERATIVE	10367.81	Traditional	KY
EMPIRE DISTRICT ELECTRIC	4138.19	Traditional	KS	ENTERGY	115558	Independent	NY
EXELON	154281.3	Independent	PA	FIRSTLIGHT POWER RESOURCES SERVICES	1433.103	Independent	CT
GAINESVILLE REGIONAL UTILITIES	1623.172	Traditional	FL	GEORGIA POWER CO	122664.2	Traditional	GA
GRAND RIVER DAM AUTHORITY	8006.298	Traditional	OK	GREAT RIVER ENERGY	10129.46	Traditional	MN
HAWAIIAN COMMERCIAL AND SUGAR	198.968	Independent	HI	HIBBING PUBLIC UTILITIES COMM	174.297	Traditional	MN
HOOSIER ENERGY R E C	8273.375	Traditional	IN	IHI POWER	892.271	Independent	CA
INDIANA MICHIGAN POWER CO	39733.8	Traditional	IN	INTERSTATE POWER AND LIGHT CO	10142.66	Traditional	MN
JEA	14502.22	Traditional	FL	KANSAS CITY POWER AND LIGHT CO	21578.18	Traditional	KS
KCPANDL GREATER MISSOURI OPERATIONS CO	3358.405	Traditional	MO	KENTUCKY UTILITIES CO	18066.78	Traditional	KY
LOS ANGELES DEPTOF WATER AND POWER	24201.24	Traditional	UT	LOUISVILLE GAS AND ELECTRIC CO	18495.04	Traditional	KY
LOWER COLORADO RIVER AUTHORITY	16364.35	Traditional	TX	MADISON GAS AND ELECTRIC	519.53	Traditional	WI
MANITOWOC PUBLIC UTILITIES	491.127	Traditional	WI	MIDAMERICAN ENERGY HOLDINGS	31381.13	Traditional	IA
MINNESOTA POWER	9877.288	Traditional	MN	MISSISSIPPI POWER CO	16215.96	Traditional	MS
MONTANADAKOTA UTILITIES CO	966.705	Traditional	ND	NEBRASKA PUBLIC POWER DISTRICT	17840.91	Traditional	NE
NIAGARA GENERATION	291.9	Independent	NY	NORTHERN INDIANA PUB SERV CO	14998.32	Traditional	IN
NORTHERN STATES POWER MINNESOTA	35779.87	Traditional	SD	NRG ENERGY	113.995	Independent	TX
OHIO POWER CO	54195.67	Traditional	WV	OKLAHOMA GAS AND ELECTRIC CO	28831.15	Traditional	OK
OMAHA PUBLIC POWER DISTRICT	12267.19	Traditional	NE	ORLANDO UTILITIES COMM	5879.876	Traditional	FL
OTTER TAIL POWER CO	7378.499	Traditional	SD	PACIFICORP	60803.48	Traditional	CA
PLATTE RIVER POWER AUTHORITY	2187.564	Traditional	WY	PORTLAND GENERAL ELECTRIC	11284.26	Traditional	OR
POWERSOUTH ENERGY COOPERATIVE	4766.315	Traditional	AL	PPL	59586.76	Independent	MT
PROGRESS ENERGY	99080.02	Traditional	FL	PUBLIC SERVICE ENTERPRISE GROUP	62716.11	Traditional	NH
ROCHESTER GAS AND ELECTRIC	345.306	Traditional	NY	ROCHESTER PUBLIC UTILITIES	233.163	Traditional	MN
SALT RIVER PROJECT	31226.54	Traditional	AZ	SIERRA PACIFIC POWER CO	6176.645	Traditional	CA
SOUTH CAROLINA ELECTRICANDGAS CO	22953.24	Traditional	SC	SOUTH CAROLINA PUBLIC SERVICE AUTHORITY	24002.94	Traditional	SC
TENNESSEE VALLEY AUTHORITY	163571.9	Traditional	TN	TES FILER CITY STATION LP	482.381	Independent	MI
TUCSON ELECTRIC POWER CO	9947.037	Traditional	AZ	UNION ELECTRIC	49211.67	Traditional	MO
UPPER PENINSULA POWER CO	210.933	Traditional	MI	US OPERATING SERVICES	7561.859	Independent	PA
VIRGINIA ELECTRIC AND POWER CO	65623.34	Traditional	NC	WESTAR ENERGY	19079.21	Traditional	KS
WHEELABRATOR TECHNOLOGIES	5206.606	Independent	PA	WISCONSIN ELECTRIC POWER CO	20515.09	Traditional	WI
WISCONSIN POWER AND LIGHT CO	13407.38	Independent	WI	WISCONSIN PUBLIC SERVICE	6916.426	Traditional	WI

Table A1: List of Utilities using both coal and renewables

Variable	**Mean**	**N**
Lobbying for H.R.2454	0.049	1655
Lobbying for S.1733	0.03	1655
Lobbying for S.2877	0.019	1655
Lobbying for S.1462	0.031	1655

Table A2: Summary statistics for the environmental bills in 112th Congress

Variable	Mean	Std. Dev.	Min.	Max.	N
Net Generation	2401	11015	-274	165394	1655
Renewable Net Generation	212	1812	-1	49234	1655
Coal Net Generation	1189	6407	-2	105499	1655
Natural Gas Net Generation	486	2169	-2	59025	1655
Renewable Net Generation (Logged)	4.85	5.45	0	17.71	1610
Coal Net Generation (Logged)	1.97	5.02	0	18.47	1610
Petroleum Net Generation (Logged)	2.60	3.74	0	15.52	1610
Natural Gas Net Generation (Logged)	4.70	5.81	0	17.89	1610
Net Generation (Other, Logged)	3.02	4.20	0	18.79	1610
RPS	0.71	0.45	0	2	1655
Deregulation	0.35	0.47	0	1	1655
Deregulation suspension	0.17	0.38	0	1	1655
Republican Representatives %	42.5	24.5	0	100	1654
Republican Senators %	35.8	39.1	0	100	1655
Independent Generators	0.54	0.49	0	1	1655

The values of net generations are measured in thousands Megawatts per hour

Table A3: Summary statistics for explanatory variables

Traditional Utilities					
Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Net Generation	3043	12047	-274	163571	748
Renewable Net Generation	320	2607	-0.4	49234	748
Coal Net Generation	1807	7641	-2	97597	748
Natural Gas Net Generation	423	2629	-2	59025	748
Independent Generators					
Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Net Generation	1871	10061	-13	165394	907
Renewable Net Generation	123	608	-1.2	12360	907
Coal Net Generation	679	5122	0	105499	907
Natural Gas Net Generation	538	1699	-0.4	27590	907

The values of net generations are measured in thousands Megawatts per hour

Table A4: Summary statistics for net generation by utility type

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Coal Net Generation (Logged)	1.00									
(2) Renewable Net Generation (Logged)	0.01	1.00								
(3) Natural Gas Net Generation (Logged)	0.26	-0.29	1.00							
(4) Net Generation (Other, Logged)	0.45	-0.09	0.20	1.00						
(5) RPS	-0.09	0.07	-0.01	-0.15	1.00					
(6) Deregulation	0.00	0.01	0.08	-0.00	0.47	1.00				
(7) Deregulation suspension	-0.09	0.12	0.07	-0.14	0.08	-0.34	1.00			
(8) Republican Representatives %	0.08	-0.16	0.04	0.09	-0.50	-0.37	-0.10	1.00		
(9) Republican Senators %	0.09	-0.12	0.12	0.04	-0.45	-0.07	-0.33	0.51	1.00	
(10) Independent Generators	-0.13	0.22	0.08	-0.26	0.26	0.29	0.20	-0.32	-0.17	1.00

Table A5: Cross-correlation table

A2 Full Results

- Table A6 presents the probit estimation of the lobbying behavior of individual electric utilities with respect to the American Clean Energy and Security Act (H.R. 2454).
- Table A7 presents the probit estimation of the lobbying behavior of individual electric utilities with respect to the Clean Energy Jobs and American Power Act (S. 1733).
- Table A8 presents the probit estimation of the lobbying behavior of individual electric utilities with respect to the American Clean Energy Leadership Act (S. 1462).
- Table A9 presents the probit estimation of the lobbying behavior of individual electric utilities with respect to the American Power Act (S. 2877).

	(1)	(2)	(3)	(4)	(5)	(6)
Coal Net Generation (Logged)	0.023**	-0.005	-0.008	-0.006	-0.008	-0.008
	(0.010)	(0.012)	(0.014)	(0.012)	(0.012)	(0.013)
Renewable Net Generation (Logged)	0.076***	0.071***	0.074***	0.071***	0.072***	0.071***
	(0.011)	(0.011)	(0.013)	(0.011)	(0.011)	(0.012)
Natural Gas Net Generation (Logged)	0.078***	0.066***	0.072***	0.067***	0.064***	0.068***
	(0.011)	(0.011)	(0.013)	(0.011)	(0.012)	(0.012)
Independent Generators	0.019	0.107	0.168	0.100	0.108	0.122
	(0.128)	(0.131)	(0.162)	(0.141)	(0.143)	(0.150)
Net Generation (Other, Logged)		0.074***	0.090***	0.076***	0.082***	0.086***
		(0.013)	(0.016)	(0.014)	(0.014)	(0.015)
RPS				0.205	0.377**	0.456**
				(0.164)	(0.184)	(0.198)
Deregulation				-0.118	-0.131	-0.209
				(0.171)	(0.178)	(0.199)
Deregulation suspension				-0.115	-0.003	0.063
				(0.189)	(0.198)	(0.236)
Republican Representatives %					0.002	0.002
					(0.003)	(0.004)
Republican Senators %					0.003*	0.005**
					(0.002)	(0.002)
Atlantic						-0.001
						(0.263)
Northeast						0.219
						(0.260)
Northwest						0.332
						(0.250)
Midwest						0.045
						(0.202)
Southeast						-0.630
						(0.397)
State FE	NO	NO	YES	NO	NO	NO
Observations	1655	1655	1519	1655	1654	1654
Pseudo R^2	0.203	0.249	0.299	0.251	0.259	0.269
AIC	525.305	497.768	533.226	502.108	501.053	505.003

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Lobbying for H.R.2454 American Clean Energy and Security Act

	(1)	(2)	(3)	(4)	(5)	(6)
Coal Net Generation (Logged)	0.021*	-0.011	-0.011	-0.013	-0.016	-0.012
	(0.012)	(0.014)	(0.017)	(0.014)	(0.015)	(0.015)
Renewable Net Generation (Logged)	0.072***	0.062***	0.073***	0.062***	0.062***	0.059***
	(0.013)	(0.014)	(0.018)	(0.014)	(0.014)	(0.014)
Natural Gas Net Generation (Logged)	0.091***	0.077***	0.095***	0.078***	0.074***	0.077***
	(0.013)	(0.014)	(0.018)	(0.015)	(0.015)	(0.015)
Independent Generators	0.223	0.284*	0.415*	0.321*	0.320*	0.307
	(0.166)	(0.168)	(0.224)	(0.182)	(0.184)	(0.194)
Net Generation (Other, Logged)		0.084***	0.103***	0.088***	0.095***	0.098***
		(0.016)	(0.020)	(0.016)	(0.017)	(0.017)
RPS				0.289	0.447**	0.617**
				(0.200)	(0.221)	(0.246)
Deregulation				-0.294	-0.333	-0.528**
				(0.213)	(0.223)	(0.262)
Deregulation suspension				-0.180	-0.051	-0.047
				(0.232)	(0.244)	(0.289)
Republican Representatives %					-0.000	0.001
					(0.004)	(0.005)
Republican Senators %					0.004*	0.006**
					(0.002)	(0.003)
Atlantic						0.058
						(0.311)
Northeast						0.371
						(0.325)
Northwest						0.360
						(0.306)
Midwest						-0.155
						(0.265)
Southeast						-0.473
						(0.422)
State FE	NO	NO	YES	NO	NO	NO
Observations	1655	1655	1287	1655	1654	1654
Pseudo R^2	0.228	0.292	0.371	0.298	0.307	0.319
AIC	350.684	324.569	337.989	327.880	328.106	332.719

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7: Lobbying for S.1733 Clean Energy Jobs and American Power Act

	(1)	(2)	(3)	(4)	(5)	(6)
Coal Net Generation (Logged)	0.018	-0.015	-0.013	-0.013	-0.016	-0.012
	(0.012)	(0.014)	(0.017)	(0.014)	(0.014)	(0.015)
Renewable Net Generation (Logged)	0.070***	0.064***	0.069***	0.062***	0.062***	0.060***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.013)	(0.014)
Natural Gas Net Generation (Logged)	0.075***	0.061***	0.069***	0.059***	0.056***	0.060***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.013)	(0.014)
Independent Generators	0.093	0.199	0.135	0.150	0.147	0.125
	(0.150)	(0.156)	(0.203)	(0.171)	(0.173)	(0.183)
Net Generation (Other, Logged)		0.085***	0.107***	0.090***	0.096***	0.100***
		(0.015)	(0.019)	(0.016)	(0.016)	(0.017)
RPS				0.346*	0.508**	0.726***
				(0.199)	(0.219)	(0.244)
Deregulation				-0.092	-0.136	-0.367
				(0.203)	(0.213)	(0.252)
Deregulation suspension				0.053	0.169	0.245
				(0.216)	(0.227)	(0.282)
Republican Representatives %					-0.001	0.001
					(0.004)	(0.004)
Republican Senators %					0.004*	0.007**
					(0.002)	(0.003)
Atlantic						0.146
						(0.305)
Northeast						0.562*
						(0.300)
Northwest						0.483
						(0.304)
Midwest						-0.090
						(0.265)
Southeast						-0.602
						(0.464)
State FE	NO	NO	YES	NO	NO	NO
Observations	1655	1655	1357	1655	1654	1654
Pseudo R^2	0.188	0.255	0.332	0.263	0.272	0.293
AIC	379.928	351.041	366.422	353.465	353.273	353.712

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8: Lobbying for S.1462 American Clean Energy Leadership Act

	(1)	(2)	(3)	(4)	(5)	(6)
Coal Net Generation (Logged)	0.027*	0.002	-0.009	0.004	0.005	0.004
	(0.014)	(0.017)	(0.022)	(0.018)	(0.018)	(0.019)
Renewable Net Generation (Logged)	0.096***	0.083***	0.107***	0.088***	0.088***	0.092***
	(0.018)	(0.018)	(0.023)	(0.019)	(0.019)	(0.020)
Natural Gas Net Generation (Logged)	0.107***	0.088***	0.101***	0.096***	0.093***	0.101***
	(0.018)	(0.018)	(0.023)	(0.020)	(0.020)	(0.022)
Independent Generators	0.690***	0.642***	0.787***	0.581**	0.572**	0.681**
	(0.246)	(0.236)	(0.300)	(0.257)	(0.260)	(0.282)
Net Generation (Other, Logged)		0.059***	0.087***	0.066***	0.067***	0.070***
		(0.019)	(0.024)	(0.021)	(0.021)	(0.022)
RPS				1.038***	1.121***	1.266***
				(0.326)	(0.341)	(0.375)
Deregulation				-0.168	-0.257	-0.321
				(0.246)	(0.262)	(0.298)
Deregulation suspension				-0.146	-0.076	0.253
				(0.283)	(0.297)	(0.401)
Republican Representatives %					-0.006	-0.002
					(0.006)	(0.006)
Republican Senators %					0.004	0.006*
					(0.003)	(0.004)
Atlantic						-0.104
						(0.478)
Northeast						0.770**
						(0.387)
Northwest						0.593
						(0.469)
Midwest						0.390
						(0.372)
Southeast						0.044
						(0.531)
State FE	NO	NO	YES	NO	NO	NO
Observations	1655	1655	1038	1655	1654	1654
Pseudo R^2	0.289	0.317	0.382	0.360	0.366	0.388
AIC	234.555	227.654	232.642	220.253	222.244	225.465

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A9: Lobbying for S.2877 Clear Act

A3 Zero-inflated Negative Binomial Count Model

- In addition to understanding decisions to lobby on any particular bill, we check if the amount of net generation using different fuel type has impact on the frequency of lobbying activities.
- We create the count variable for the frequency of lobbying decisions on the major climate bills. In order to address a concern about excessive zeros (over 90% of total observations that never lobbied on any bill among the major bills), we implemented a zero-inflated negative binomial estimation that accounts for lobbying and non-lobbying decisions in the logit part of the models and thereby addresses concerns about excessive zeros in the dependent variable.
- Table A10 presents the zero-inflated negative binomial count estimation of the lobbying behavior of individual electric utilities with respect to all of the major climate bills together.
- Across all the specifications, the results show that the amount of renewable net generation and that of natural gas net generation predict non-lobbying activity. Specifically, the amount of renewable net generation and that of natural gas net generation have negative impacts on the lobbying probability on at least one major bill while amount of coal net generation to have little impact on the probability to lobby. However, we did not find evidence that the amount of renewable net generation and that of natural gas net generation predict increase the probability to lobby on one more climate bill.

	(1)	(2)	(3)	(4)	(5)
DV=Lobbying count					
Coal Net Generation (Logged)	0.003	-0.006	-0.003	-0.004	-0.002
	(0.011)	(0.012)	(0.013)	(0.013)	(0.015)
Renewable Net Generation (Logged)	0.001	0.001	0.000	-0.001	-0.001
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
Natural Gas Net Generation (Logged)	0.032**	0.022	0.016	0.016	0.018
	(0.016)	(0.017)	(0.018)	(0.018)	(0.020)
Independent Generators	0.213	0.221	0.188	0.188	0.167
	(0.165)	(0.165)	(0.174)	(0.188)	(0.194)
Net Generation (Other, Logged)		0.027	0.033*	0.031*	0.032
		(0.018)	(0.018)	(0.019)	(0.020)
RPS			0.346	0.326	0.403
			(0.213)	(0.233)	(0.261)
Deregulation			-0.055	-0.068	-0.119
			(0.209)	(0.217)	(0.222)
Deregulation suspension			-0.038	-0.052	0.064
			(0.246)	(0.266)	(0.353)
Republican Representatives %				-0.002	0.001
				(0.006)	(0.006)
Republican Senators %				0.000	0.000
				(0.003)	(0.004)
Atlantic					0.073
					(0.429)
Northeast					0.422
					(0.293)
Northwest					0.325
					(0.353)
Midwest					0.029
					(0.289)
Southeast					0.211
					(0.488)
Inflate					
Coal Net Generation (Logged)	-0.033	0.017	0.019	0.022	0.020
	(0.022)	(0.024)	(0.025)	(0.025)	(0.027)
Renewable Net Generation (Logged)	-0.174***	-0.155***	-0.154***	-0.156***	-0.151***
	(0.024)	(0.024)	(0.025)	(0.025)	(0.026)
Natural Gas Net Generation (Logged)	-0.166***	-0.142***	-0.145***	-0.137***	-0.141***
	(0.024)	(0.025)	(0.026)	(0.026)	(0.027)
Independent Generators	-0.163	-0.207	-0.180	-0.183	-0.231
	(0.287)	(0.286)	(0.309)	(0.313)	(0.328)
Net Generation (Other, Logged)		-0.132***	-0.136***	-0.148***	-0.156***
		(0.028)	(0.029)	(0.030)	(0.031)
RPS			-0.301	-0.645	-0.827*
			(0.376)	(0.418)	(0.454)
Deregulation			0.190	0.266	0.503
			(0.378)	(0.397)	(0.452)
Deregulation suspension			0.092	-0.127	-0.224
			(0.411)	(0.431)	(0.535)
Republican Representatives %				-0.001	-0.001
				(0.008)	(0.008)
Republican Senators %				-0.008*	-0.012**
				(0.005)	(0.005)
Atlantic					0.062
					(0.610)
Northeast					-0.514
					(0.564)
Northwest					-0.569
					(0.547)
Midwest					-0.016
					(0.458)
Southeast					1.530*
					(0.886)
Observations	1655	1655	1655	1654	1654
AIC	798.993	774.822	782.198	785.371	794.962

The result from the estimation using state fixed effects is not reported since the model does not converge.
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A10: Zero-Inflated Negative Binomial Count Model Estimation