Policy Influence and Private Returns from Lobbying in the Energy Sector

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Motivation

- Government policies often have winners and losers.
- Firms attempt to influence policy-making.
  - They hire lobbyists to contact and influence legislators.
  - Total annual lobbying expenditures are over $3 billion.
- Policies affect not only firms but also the general public.
- Question: To what extent does lobbying affect policy-making?

Energy Policies and the Energy Sector

- I focus on energy policies and lobbying activities by major energy firms.
  - A major issue in the political debate and electoral politics.
  - Environmental regulations primarily affect fossil fuel firms.
  - Renewable energy firms rely heavily on government subsidies.
  - Their lobbying expenditures are 11.7% of total lobbying expenditures.

What This Paper Does

It quantifies the effect of lobbying expenditures on policy enactment by

- Constructing a novel dataset on policies and lobbying:
  1. Unit of observation is a **policy**, not an entire bill.
  2. Lobbying is measured using the reports mandated by the 1995 Lobbying Disclosure Act.
- Specifying and structurally estimating a lobbying game:
  1. Benefits/costs of a policy to individual players are heterogeneous.
  2. Lobbying expenditures by each player affect policy enactment.

Preview of Results

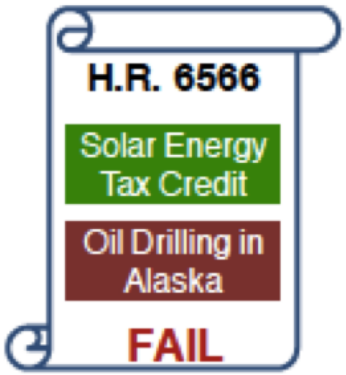
- Equilibrium probability of policy enactment differs from the initial probability by 0.05 percentage points on average.
  1. Marginal effect of lobbying expenditures
  2. Canceling-out effect of competing interests
- Average returns to major energy firms from lobbying expenditures are estimated to be over 130%.

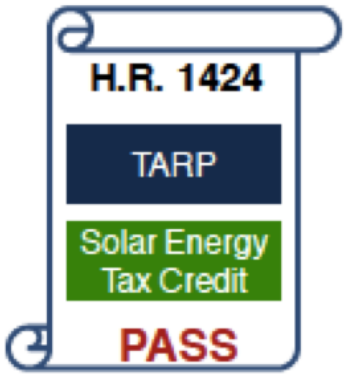
Literature Review

- Political influence of interest groups
  1. Affect the identity or platform of candidates to be elected
  2. Affect the policy choices by incumbent government
- Empirical literature using campaign contribution data:
  - Effects on the voting behavior of legislators (Ansolabehere et al, 2003)
  - Effects on the level of trade protection (Goldberg & Maggi,1999; Gawande & Bandyopadhyay, 2000)
- Empirical literature using lobbying disclosure data:
  - Returns to lobbying on earmarks (de Figueiredo & Silverman, 2006)
  - Political organization (Trebbi & Bombardini, 2009)
  - Role of lobbyists (Bertrand et al, 2011)

Policies vs. Bills

- Existing literature focuses on bills as the fundamental unit of analysis.
- Focusing on bills may misrepresent the outcome of lobbying.





	Bill Approach (H.R. 6566 only)	Policy Approach (Both bills)
Oil Drilling in Alaska	Fail	Fail
Solar Energy Tax Credit	Fail	Pass

Definition of Policy in the Analysis

- Unique bill section as defined in bill texts: In tracking bill sections,
  1. Measure the distance of texts using vectors (vector space model),
  2. Determine the set of identical texts using an algorithm for finding components (graph theory).

- Two unique bill sections are considered as the same policy if they
  1. Address one unique issue (amends/creates a section of the U.S. Code),
  2. Affect the energy industry in the same way (positively or negatively).

- The total number of policies in the dataset is 538.
  - 54% of policies appear in more than one bill. ▸ Table
  - 89% of enacted policies are also in other rejected bills.

Scope of the Analysis

All energy policies introduced to the 110th Congress (2007–8) such that

1. Are included at least once in any non-appropriations bill text in the 110th Congress,
   - 11,081 bills
2. Contain at least one energy-relevant keyword,
   - 3,811 unique policies
   - 9,613 sections in 1,237 bills
3. **Directly** affect the energy industry.
   - **538** unique policies
   - 2,279 sections in 445 bills

Major Energy Issues in the 110th Congress

Type	Major Issues	Enacted
Regulation	Cap and Trade of Greenhouse Gases	✗
	Federal Renewable Portfolio Standard	✗
	Energy Commodity Price Management	✓
	Offshore Drilling	✗
Subsidy	Elimination of Oil/Gas Industry Subsidy	✓
	Carbon Capture and Storage	✓
	Renewable Electricity Production Tax	✓
	Advanced/New Nuclear Power Plant	✗

Lobbying Data

- The 1995 Lobbying Disclosure Act requires that for each contract with a client, lobbyists report:
  1. Lobbyists' name and previous official position
  2. Client's name and business
  3. **Total income or expenses related to lobbying activities**
  4. General lobbying issue area (e.g. Agriculture, Energy, etc.)
  5. **Specific lobbying issues: bills or bill sections** (e.g. Sec 103 of S. 6)
  6. Contacted house(s) of Congress or federal agencies

Major Energy Firms and Trade Associations

- 559 firms and trade associations in the lobbying dataset
  - Distribution of lobbying expenditures is strongly skewed. (median: $160,000 ; mean: $1,087,000)
  - Politically organized by industry.
- I study lobbying behaviors of 4 *lobbying coalitions* of 42 major firms and associations.
  - They account for 66.01% of total lobbying expenditures.
  - A lobbying coalition is assumed to act as one player.

Lobbying Coalitions ▸ List

1. Coal mining and coal utilities (7 firms, 3 assns)
2. Oil and natural gas companies (7 firms, 1 assn)
3. Nuclear energy companies and nuclear utilities (11 firms, 1 assn)
4. Renewable energy companies (6 firms, 6 assns)

Lobbying Activities in the Data

	Fraction of Policies Lobbied	Spending ($ million)
Coal	49.54%	139.6
Oil/Gas	66.79%	160.6
Nuclear	48.98%	70.7
Renewable	61.97%	30.4

Enactment and Lobbying I

	Obs.	Enactment
Not Lobbied by all	350	0.6%
Lobbied by all	188	22.9%
Supporters are dominant	122	25.4%
Opposition is dominant or at par	66	18.2%
Total	538	8.4%

Enactment and Lobbying II

	Obs.	Enactment
Not lobbied	78	0.0%
Lobbied by supporters only	225	8.4%
Lobbied by opposition only	68	4.4%
Lobbied by both sides	167	13.8%
Total	538	8.4%

Summary of Data

1. Policy-level data
   - Enactment
   - Policy characteristics (e.g. public opinion, salience, etc.)
2. Player-level data
   - Total lobbying expenditures
3. Policy-Player-level data
   - Lobbying participation and position

▸ Summary Stats

Lobbying Spending Game: Timeline and Strategies

1. For each policy, lobbying coalitions (players) know the initial level of support in the legislature (π), its value to each player ($\{v_\ell\}_{\ell \in \mathcal{L}}$), and the entry cost of lobbying for each player ($\{c_\ell\}_{\ell \in \mathcal{L}}$).
2. Players simultaneously decide whether or not to participate in lobbying the policy, incurring the entry cost:

$$\sigma_\ell^E : P \times \prod_{\ell \in \mathcal{L}} V_\ell \times \prod_{\ell \in \mathcal{L}} C_\ell \to \{Enter, DoNotEnter\}.$$

3. Upon participation, players simultaneously choose the amount of lobbying expenditures ($\{s_\ell\}_{\ell \in \mathcal{L}}$):

$$\sigma_\ell^S : P \times \prod_{\ell \in \mathcal{L}^E} V_\ell \to \mathbb{R}.$$

Lobbying Spending Game: Payoff

The enactment probability is determined by

$$p(\mathbf{s}_f, \mathbf{s}_a, \pi) = \frac{\pi(\mathbf{Z}, \xi) + \beta_f \sum_{i \in \mathcal{L}_f} s_i^\gamma}{1 + \beta_f \sum_{i \in \mathcal{L}_f} s_i^\gamma + \beta_a \sum_{j \in \mathcal{L}_a} s_j^\gamma}.$$

- $\pi(\mathbf{Z}, \xi)$ is the initial enactment probability in the absence of lobbying.
- $\mathbf{Z}$ denotes observable policy characteristics.
- ξ is *known* to the players when they make lobbying decisions.
- Parametric assumption: $\pi(\mathbf{Z}, \xi) = \Phi(\mathbf{Z}\delta + \xi)$, where Φ is the cdf of the standard normal distribution, and $\xi \sim N(0, \sigma_\xi^2)$.

▸ Alternatives

Lobbying Spending Game: Payoff (Cont'd)

- Expected payoff of player $\ell \in \mathcal{L}_f$

$$\begin{aligned}\mathbb{E}u_\ell(\mathit{In}, s_\ell|\pi, \mathbf{s}_{-\ell,f}, \mathbf{s}_a) =& p(\mathbf{s}_f, \mathbf{s}_a, \pi)v_\ell - s_\ell - c_\ell,\\ \mathbb{E}u_\ell(\mathit{Out}|\pi, \mathbf{s}_{-\ell,f}, \mathbf{s}_a) =& p(\mathbf{s}_f, \mathbf{s}_a, \pi)v_\ell.\end{aligned}$$

- Parametric assumptions:
  1. $\log|v_\ell| = \mathbf{X}_\ell\alpha_\ell + \eta_\ell$, $\mathbb{E}(\eta_\ell) = 0$.
  2. $\mathbf{X}_\ell$ includes observable policy characteristics.

Equilibrium: SPNE

Existence and uniqueness of equilibrium

1. In Stage II (spending game), equilibrium exists and is unique.
2. In Stage I (entry game), an equilibrium exists.

- In estimation, utilitarian optimum equilibrium is selected if there are multiple equilibria.

Identification Problem

- Main components of the model:
  1. Enactment production function,
  2. Distribution of initial enactment probability index,
  3. Distribution of value of a policy to each player.

- I combine individual and aggregate data:
  1. For each policy, I observe
     - Whether or not it was enacted,
     - Which position each player took regarding the policy,
     - Which players lobbied Congress on the policy.
  2. For each player, I observe total lobbying expenditures over all policies.

Key Identifying Assumptions

1. Entry cost (c_ℓ) is known
2. Equilibrium selection rule is known
3. Exclusion restrictions: Some variables affect the initial enactment probability, but do not affect the value of a policy directly.

Exclusion Restrictions: Public Opinion

- Fraction of the respondents who answered favorably on a policy in relevant polling
- Relevant to initial enactment prob: Politicians care about constituent's interests
- Exogenous to value of a policy
- Data source: Polling data from the Roper Center for Public Opinion Research

Estimation

$$\hat{\theta} = \arg\max_{\theta \in \Theta} \frac{1}{n} \sum_{k=1}^{n} \ln f(y_k, \mathbf{d}_k | \mathbf{w}_k; \theta) - \frac{\lambda}{n} \sum_{\ell=1}^{L} \left\{ 1 - \frac{\sum_{k=1}^{n} \varphi_\ell(\mathbf{w}_k; \theta)}{ss_\ell} \right\}^2,$$

- Combining individual data and aggregate data:
  - Policy-specific data $(y_k, \mathbf{d}_k, \mathbf{w}_k)_{k=1}^n$
  - Total expenditures of each player $(ss_\ell)_{\ell=1}^L$
- $f(y_k, \mathbf{d}_k | \mathbf{w}_k; \theta)$ and $\varphi_\ell(\mathbf{w}_k; \theta)$ are evaluated via simulation.
- Choice of the weight (λ) does not affect the consistency of the estimator. ▸ More

Model Fit I

	Observed	Predicted
Policy Enactment (%)		
All	8.35	8.43
Participation (%)		
Coal	49.63	49.02
Oil/Gas	66.73	65.17
Nuclear	49.07	51.27
Renewable	61.90	61.09
Total Spending ($ million)		
Coal	77.85	77.15
Oil/Gas	73.21	73.76
Nuclear	33.91	32.66
Renewable	22.11	22.36

Model Fit II

- Value of a direct spending policy (27 policies): \$736M on average with standard deviation of \$579M, mainly for renewable energy
- Estimated average value of a renewable policy: \$770M with a 95% CI [\$372.67, \$3,225.30] million.
- Value of a tax or regulatory policy is hard to measure.

Effect of Lobbying on Policy Enactment

1. Literature: Small (Baumgartner et al., 2009) or mixed (Ansolabehere et al, 2003).
2. Gridlock in Congress: Democrats (49), Independents (2), Republicans (48+VP) in Senate.
3. This analysis does not include budget appropriations.
4. This paper takes into account the initial enactment probability and the canceling-out effect by competition.

Marginal effect of lobbying expenditures

$$\begin{aligned}&\triangle Pr(Enactment|\triangle s_\ell, s_\ell, \pi, \ell \in \mathcal{L}_f, \mathbf{s}_{-\ell} = \mathbf{0}) \\ &= \frac{\pi + \beta_f(s_\ell + \triangle s_\ell)^\gamma}{1 + \beta_f(s_\ell + \triangle s_\ell)^\gamma} - \frac{\pi + \beta_f s_\ell^\gamma}{1 + \beta_f s_\ell^\gamma}\end{aligned}$$

$\triangle s_\ell$	$\triangle Pr(Enactment)$ (unit: pp)	
	ℓ in Support	ℓ in Opposition
	$(\pi = 0, s_\ell = 0, \mathbf{s}_{-\ell} = 0)$	$(\pi = 1, s_\ell = 0, \mathbf{s}_{-\ell} = 0)$
\$1,000	0.003 [0.002,0.004]	-0.120 [-0.199,-0.041]
\$66,000	0.011 [0.007,0.015]	-0.403 [-0.674,-0.133]
\$3,000,000	0.032 [0.019,0.046]	-1.208 [-2.043,-0.373]

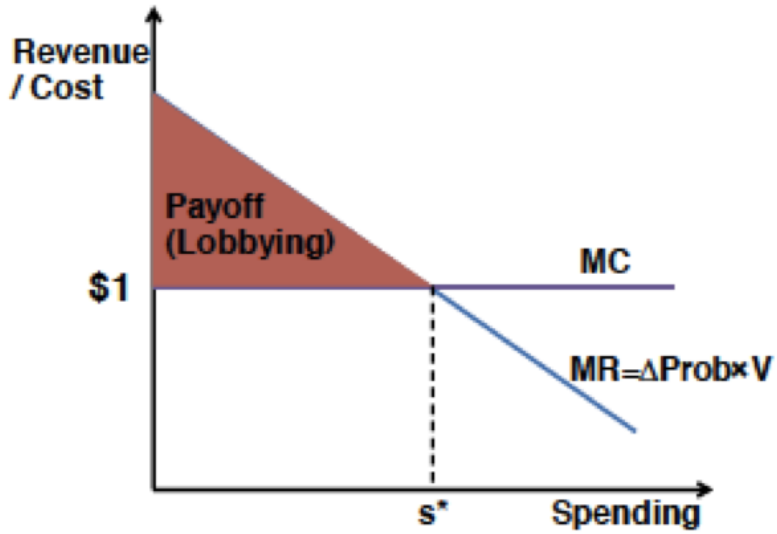
Canceling-out effect by competing interests

Lobbied by	Enactment	Effect by Supporters	Effect by Opposition
Supporters Only	8.4%	0.015 [0.003,0.031]	-
Opposition Only	4.4%	-	-0.033 [-0.342,-0.019]
Both	13.8%	0.011 [0.004, 0.023]	-0.085 [-0.645,-0.031]

Average Returns to Lobbying

Given other players' equilibrium strategies,

$$AR_{\ell,p} = \mathbb{E}\left(\frac{u_{\ell,k}(d_{k,\ell}=1|\mathbf{d}_{p,-\ell}) - u_{\ell,k}(d_{k,\ell}=0|\mathbf{d}_{p,-\ell})}{s_{\ell,k}} | \mathbf{w}_k \right).$$



Average Returns to Lobbying

	Returns to Lobbying (unit: %)
Coal	154.47 [76.70, 184.11]
Oil/Gas	156.10 [63.37, 189.05]
Nuclear	139.65 [67.06, 167.16]
Renewable	142.25 [56.09, 161.76]

- Large economic returns to lobbying:
  1. The definition of average returns to lobbying takes into account the canceling-out effect by competing interests.
  2. The value of a policy is large, so even a small change in the enactment probability can lead to large returns.

Conclusion

- I develop a new empirical framework to study the effect of lobbying on policy enactment.
  - Construct a novel dataset on policies and lobbying.
  - Estimate a model of an all-pay contest with heterogeneous players.
- I employ this framework to quantify the effect of lobbying expenditures on the enactment of energy policies.
- This framework can be applied to study other policies or other Congresses.

Movement of Policies across Bills

Back

First Bill	Last Bill	Obs	Mean (# of Bills)	SD (# of Bills)
Introduced	Introduced	387	1.92	1.66
	Reported	76	6.03	5.29
	Enacted	30	8.67	6.14
Reported	Reported	30	2.90	2.44
	Enacted	15	5.14	4.31
Total		538	3.00	3.56

List of Firms and Assns

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Player	List of Entities
Coal	Ameren Corp, American Electric Power, Duke Energy, Energy Future Holdings Corp, Peabody Energy, Southern Co, Xcel Energy; ACCCE, EEI, NMA
Oil/Gas	BP, Chevron Corp, Conocophillips, Exxon Mobil, Koch Industries, Marathon Oil, Shell; API
Nuclear	Areva Group, Constellation Energy, Dominion Resources, Energysolutions, Entergy Corp, Exelon Corp, FPL Group, General Atomics, Pinnacle West Capital, Public Service Enterprise Group, USEC; NEI
Renewable	Archer Daniels Midland, Climatemaster, Covanta Energy Corp, New Generation Biofuels, PG&E Corp, Poet; AWEA, NBB, NFU, NHA, RFA, SEIA

Alternative Enactment Production Functions

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- Tullock (1980):

$$\begin{cases} \frac{s_F^\gamma}{s_F^\gamma + s_A^\gamma} & \text{if } \max\{s_F, s_A\} > 0, \\ \frac{1}{2} & \text{otherwise.} \end{cases}$$

- Binary response model:

$$\omega(\mathbf{Z}, \xi) + \beta_f \sum_{i \in \mathcal{L}^F} s_i^\gamma - \beta_a \sum_{j \in \mathcal{L}^A} s_j^\gamma - \epsilon \geq 0.$$

Summary Stats

Back

	Obs.	Mean	SD	Min	Max
Public Opinion	538	0.375	0.355	0.000	0.910
Salience	538	0.543	0.498	0	1
More Regulation	538	0.286	0.452	0	1
Less Regulation	538	0.156	0.363	0	1
More Gov Spending	538	0.457	0.498	0	1

Summary Stats

Back

	Obs.	Mean	SD	Min	Max
Pro-Coal	538	0.691	0.462	0	1
Pro-Oil/Gas	538	0.619	0.486	0	1
Pro-Nuclear	538	0.697	0.460	0	1
Pro-Renewable	538	0.697	0.460	0	1
Relevance (Coal)	538	0.269	0.444	0	1
Relevance (Oil)	538	0.498	0.501	0	1
Relevance (Nuc)	538	0.202	0.402	0	1
Relevance (Ren)	538	0.467	0.499	0	1

Imbens & Lancaster (1994)

Back

$$\hat{\theta}_{GMM} = \arg\min_{\theta \in \Theta} g_n(\theta)' \Omega g_n(\theta),$$

where

$$g_n(\theta) \equiv \begin{bmatrix} \frac{1}{n}\sum_{k=1}^{n} \partial \ln f(y_k, \mathbf{d}_k | \mathbf{w}_k; \theta)/\partial\theta \\ \frac{1}{n}\sum_{k=1}^{n} \left(s_{k,1} - \mathbb{E}(s_{k,1}|\mathbf{w}_k;\theta)\right) \\ \vdots \\ \frac{1}{n}\sum_{k=1}^{n} \left(s_{k,L} - \mathbb{E}(s_{k,L}|\mathbf{w}_k;\theta)\right) \end{bmatrix},$$

and Ω is the optimal weighting matrix.