State Policy and Lobbying in a Federal System: Evidence from the Production Tax Credit for Renewable Energy, 1998-2012

Supporting Information

Contents

A1 Exceptions to Regular PTC Renewal Schedule **A-2**

A2 Data Description **A-3**

A3 Identifying Assumptions: Placebo Test for Pre-RPS Years **A-4**

A4 Estimation Results from Models with Triple Interaction Term **A-5**

A5 Estimation Results from Linear Probability Models **A-6**

A6 Analysis Using All Utilities **A-8**

A7 Robustness: Analysis Using Wind ISI Instead of RPS Coverage. **A-10**

A8 Robustness: Alternative Specification of RPS Coverage **A-15**

A9 Additional Results Using Clustered Standard Errors at the Utility-level **A-21**

A10 Simple Illustration of Theoretical Expectations Using the Demand/Supply Curves in Electricity Market **A-23**

A11 Structural Topic Model Estimations of Texts in Lobbying Reports **A-25**

A11.1 Estimation Procedure A-25

A11.2 Word Clouds for Each Topic A-27

A11.3 Example Texts of Each Topic A-32

A12 Placebo Tests **A-37**

A1 Exceptions to Regular PTC Renewal Schedule

- In October 2004, the expired PTC was extended by the Bush administration under a broader tax-relief bill "Working Families Tax Relief Act of 2004." While the extension of the PTC was itself obviously influenced by the lobbying by the wind industry and environmentalists, the timing was determined by the timing of President Bush's broad tax reduction bill.

- In July 2005, the PTC was modified under another major federal energy legislation, the "Energy Policy Act of 2005." Again, the timing of the window of opportunity for PTC modification was determined by the appearance of a much broader legislative effort on the agenda.

- In August 2007, a PTC modification and extension was part of a broader legislative package passed by the House. In the end, the text of the package was appended to another bill and became law in July 2008 but without the PTC modification and extension (see next bullet point).

- In June and July 2008, the Congress (House and Senate) voted on the Renewable Energy and Job Creation Act of 2008, a comprehensive package of tax credits for clean energy and corresponding increases taxes on large corporations and the oil/gas business. The PTC and other tax credit policies were due to extend on December 31, 2008, and so legislation on extending these policies was expected during the calendar year. The timing of these roll-call votes was essentially determined by the threat of expiration of different tax credits at the end of the calendar year.

- In January 2009, President Obama increased the extension of the PTC from one year to three years under the American Recovery and Reinvestment Act of 2009, an emergency measure to deal with the global financial crisis. This opportunity was, again, unrelated to lobbying about PTC by electric utilities.

A2 Data Description

- Table A1 presents the summary statistics for dependent and explanatory variables.
- Table A2 presents the statistics comparing characteristics of the utilities in RPS and non-RPS states. We regress a variety of utility-level characteristics on a binary indicator of RPS in order to check if the utilities (or the power sectors) in RPS and non-RPS states are significantly different each other. To be clear, in the main analysis, we control for total generation and, hence, employ firm-fixed effects to account for time-invariant heterogeneity across utilities including the sector of utilities (i.e., commercial generator).

Variable	Mean	Std. Dev.	Min.	Max.	N
Lobbying (%)	61.22	48.73	0	100	16280
PTC Active	0.49	0.5	0	1	16280
RPS(binary)	0.21	0.41	0	1	16280
Renew Generator(binary)	0.43	0.49	0	1	16280
PTC*RenewGen(binary)	0.21	0.41	0	1	16280
PTC*RPS(binary)	0.1	0.3	0	1	16280
RPS(binary)*RenewGen(binary)	0.08	0.27	0	1	16280
PTC*RPS(binary)*RenewGen(binary)	0.04	0.19	0	1	16280
Total Net Generation (Logged, quarter)	10.17	4.08	0	17.67	16280

Table A1: Summary statistics for dependent and explanatory variables.

	Total Gen.	Renew. Gen.	Renew. Generator	Utility	Independent Generator	Commercial Generators	Industrial Generators
Difference in Mean (RPS - Not RPS)	-5615674.326***	-115639.004	-0.081	-0.059	-0.018	0.106***	-0.038
	(1136624.976)	(128288.434)	(0.060)	(0.068)	(0.028)	(0.029)	(0.062)
Observations	16280	16280	16280	16280	16280	16280	16280

Clustered standard errors at the state-level in parentheses.

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

Table A2: Statistical tests comparing utilities in RPS and non-RPS states.

A3 Identifying Assumptions: Placebo Test for Pre-RPS Years

- In this section, we test the validity of the assumption that RPS adoption drives differential responses to lobbying over PTC among utilities by conducting our main regressions but coding RPS adoption as 1 for a state for the 5-year period before actual RPS adoption. If the assumption is not valid, utilities should behave similarly to the actual RPS adoption dummy during the 5-year lead period, suggesting that other unobserved state-level factors correlated with RPS adoption compound the effect of PTC activity on lobbying.

- Table A3 presents results from the regressions using RPS adoption coded as 1 for a state for the 5-year period before actual RPS adoption. The results show that the substantive effects between the placebo RPS and the PTC are not found: Across all model specifications, coefficients of the interaction term is never statistically significant. This suggests that RPS adoption, as opposed to other state-level factors, leads to utilities' lobbying behavior when PTC extension is about to expire or under legislative debate.

	(1)	(2)	(3)
PTC Active	0.193***	0.499***	
	(0.073)	(0.072)	
Placebo RPS(binary)	0.629	-0.104	0.043
	(0.485)	(0.416)	(0.275)
PTC*Placebo RPS(binary)	-0.035	0.032	0.161
	(0.299)	(0.306)	(0.140)
Total Net Generation (Logged, quarter)	0.096	0.067	0.114
	(0.122)	(0.110)	(0.122)
Linear Year	Yes	No	No
Year Dummy	No	Yes	No
Biannual Dummy	Yes	Yes	No
Quarter Dummy	Yes	Yes	No
Quarter FE	No	No	Yes
Observations	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A3: Identifying assumptions: Effect of PTC activity on lobbying by electric utilities, 1998-2012 for Pre-RPS Years. We coded RPS adoption as 1 for a state for the 5-year period before actual RPS adoption.

A4 Estimation Results from Models with Triple Interaction Term

- Table A4 shows the estimated models with the triple-interaction term. The results suggest that the substitution effect between an RPS policy and the PTC depends on the size of renewable electricity generation. When the PTC is under legislative debate, the negative effect of the RPS is stronger for utilities with renewable energy generation, consistent with Hypothesis 3. All specifications yield consistent coefficients with negative signs for the triple-interaction term. While these coefficients are not statistically significant at the conventional level, the sign is always negative regardless of the specification.

	(1)	(2)	(3)
lobbying			
PTC Active	0.260***	-0.066	
	(0.097)	(0.082)	
RPS(binary)	-0.013	-0.084	-0.085
	(0.402)	(0.462)	(0.463)
Renew Generator(binary)	-0.497	0.082	0.082
	(0.484)	(0.651)	(0.652)
PTC*RenewGen(binary)	0.175	0.239	0.240
	(0.160)	(0.170)	(0.171)
PTC*RPS(binary)	-0.524***	-0.097	-0.096
	(0.174)	(0.168)	(0.172)
RPS(binary)*RenewGen(binary)	-0.413	-0.610	-0.610
	(0.718)	(0.824)	(0.824)
PTC*RPS(binary)*RenewGen(binary)	-0.165	-0.283	-0.284
	(0.354)	(0.345)	(0.345)
Total Net Generation (Logged, quarter)	0.100	0.110	0.110
	(0.114)	(0.128)	(0.128)
Linear Year	Yes	No	No
Year Dummy	No	Yes	No
Biannual Dummy	Yes	Yes	No
Quarter Dummy	Yes	Yes	No
Quarter FE	No	No	Yes
Observations	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A4: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2012.

A5 Estimation Results from Linear Probability Models

- In addition to conditional logistic regressions, we also estimate linear probability models with utility fixed effects. The dependent variable (a binary indicator for lobbying) is multiplied by 100 for a more straightforward interpretation of the results. The estimated results, presented in Tables A5 and A6, remain substantively same with the main specifications.

	(1)	(2)	(3)	(4)
PTC Active	0.025***	0.041***	0.005	
	(0.007)	(0.008)	(0.005)	
RPS(binary)	-0.052	-0.014	-0.033	-0.033
	(0.034)	(0.038)	(0.039)	(0.039)
PTC*RPS(binary)		-0.075***	-0.028	-0.028
		(0.017)	(0.017)	(0.018)
Total Net Generation (Logged, quarter)	0.010**	0.010**	0.012**	0.012**
	(0.005)	(0.005)	(0.005)	(0.005)
Linear Year	Yes	Yes	No	No
Year Dummy	No	No	Yes	No
Biannual Dummy	Yes	Yes	Yes	No
Quarter Dummy	Yes	Yes	Yes	No
Quarter FE	No	No	No	Yes
Observations	16280	16280	16280	16280

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A5: Linear Probability Model Estimations: Effect of PTC activity on lobbying by electric utilities, 1998-2012.

	(1)	(2)	(3)
PTC Active	0.033***	-0.008	
	(0.011)	(0.010)	
RPS(binary)	0.009	-0.011	-1.123
	(0.043)	(0.016)	(4.414)
Renew Generator(binary)	-0.056*	-0.014	-1.446
	(0.032)	(0.015)	(2.986)
PTC*RenewGen(binary)	0.020	0.028**	2.852
	(0.019)	(0.012)	(1.724)
PTC*RPS(binary)	-0.069***	-0.018	-1.816
	(0.021)	(0.017)	(1.874)
RPS(binary)*RenewGen(binary)	-0.067	-0.063***	-6.281
	(0.069)	(0.024)	(7.104)
PTC*RPS(binary)*RenewGen(binary)	-0.009	-0.017	-1.696
	(0.042)	(0.027)	(4.026)
Total Net Generation (Logged, quarter)	0.012**	0.012***	1.213**
	(0.005)	(0.002)	(0.481)
Linear Year	Yes	No	No
Year Dummy	No	Yes	No
Biannual Dummy	Yes	Yes	No
Quarter Dummy	Yes	Yes	No
Quarter FE	No	No	Yes
Observations	16280	16280	16280

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A6: Linear Probability Model Estimations: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2012.

A6 Analysis Using All Utilities

- As robustness checks, we run our main regression models using all the utilities regardless of whether an utility lobbied at least once from 1998 to 2012. Our main analysis is focused on variation in lobbying propensity among utilities that are generally capable of entering the lobbying game. This approach allows us to focus on the timing of lobbying among utilities that lobby, but, in this section, we show that the results are robust if we consider non-lobbying utilities as well.

- Table A7 presents the estimation results for the effect of PTC activity on lobbying by all electric utilities, including non-lobbying utilities.

- Table A8 presents the estimation results for the effect of PTC activity on lobbying by by renewable electricity generators and others, 1998-2012, including non-lobbying utilities.

	(1)	(2)	(3)	(4)
lobbying				
PTC Active	0.205***	0.336***	0.043	
	(0.062)	(0.069)	(0.046)	
RPS(binary)	-0.458	-0.153	-0.296	-0.295
	(0.291)	(0.326)	(0.367)	(0.369)
PTC*RPS(binary)		-0.606***	-0.237*	-0.240*
		(0.131)	(0.138)	(0.141)
Total Net Generation (Logged, quarter)	0.083	0.083	0.105	0.105
	(0.120)	(0.119)	(0.130)	(0.131)
Linear Year	Yes	Yes	No	No
Year Dummy	No	No	Yes	No
Biannual Dummy	Yes	Yes	Yes	No
Quarter Dummy	Yes	Yes	Yes	No
Quarter FE	No	No	No	Yes
Observations	15130	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A7: Analysis Using All Utilities: Effect of PTC activity on lobbying by electric utilities, 1998-2012.

	(1)	(2)	(3)
lobbying			
PTC Active	0.260***	-0.066	
	(0.092)	(0.082)	
RPS(binary)	-0.013	-0.084	-0.085
	(0.376)	(0.462)	(0.463)
Renew Generator(binary)	-0.497	0.082	0.082
	(0.459)	(0.651)	(0.652)
PTC*RenewGen(binary)	0.175	0.239	0.240
	(0.157)	(0.170)	(0.171)
PTC*RPS(binary)	-0.524***	-0.097	-0.096
	(0.170)	(0.168)	(0.172)
RPS(binary)*RenewGen(binary)	-0.413	-0.610	-0.610
	(0.710)	(0.824)	(0.824)
PTC*RPS(binary)*RenewGen(binary)	-0.165	-0.283	-0.284
	(0.352)	(0.345)	(0.345)
Total Net Generation (Logged, quarter)	0.100	0.110	0.110
	(0.117)	(0.128)	(0.128)
Observations	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A8: Analysis Using All Utilities: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2012.

A7 Robustness: Analysis Using Wind ISI Instead of RPS Coverage.

- The downside of the binary measure for RPS coverage is that it does not account for heterogeneity in RPS policies. Both stringency and specific regulations of state RPS policies vary across implementing states (Shrimali et al., 2015). As a complementary measure, we thus rely on *the incremental share indicator (ISI)*, which measures the incremental percentage requirement in renewable generation (Yin and Powers, 2010; Shrimali et al., 2015). By adjusting the estimates for existing renewable electricity capacity, this measures captures the utilities' need to add new renewable energy generation capacity to their portfolio (Shrimali et al., 2015). Specifically, we use the incremental requirement in *wind* energy generation, mandated by an RPS policy. We construct the variable by multiplying an utility's share of electricity generation by wind ISI in the states that the utility operates. For example, if utility i generates 30% of it's total electricity in the states where wind ISI is 20 in period t, it is recorded as 6. However, the distribution is neither continuous nor normal: the vast majority of utilities (64%) in our sample fall into 0, and it is significantly skewed to the right. Thus, we instead construct a dichotomous variable, coded as 1 for a utility that operates in the states where wind ISI is greater than 0. As an alternative specification, we use the average share of electricity generation in the states with wind ISI (4.47) as a cutoff point, and coded 1 for utilities above that point and 0 for those below.

	(1)	(2)	(3)	(4)
lobbying				
PTC Active	0.206***	0.377***	0.011	
	(0.065)	(0.091)	(0.049)	
Wind ISI(binary)	-0.273	-0.011	-0.189	-0.192
	(0.284)	(0.314)	(0.341)	(0.343)
PTC*Wind ISI(binary)		-0.493***	-0.020	-0.015
		(0.132)	(0.118)	(0.126)
Total Net Generation (Logged, quarter)	0.094	0.093	0.115	0.115
	(0.120)	(0.121)	(0.132)	(0.132)
Linear Year	Yes	Yes	No	No
Year Dummy	No	No	Yes	No
Biannual Dummy	Yes	Yes	Yes	No
Quarter Dummy	Yes	Yes	Yes	No
Quarter FE	No	No	No	Yes
Observations	15130	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A9: Analysis Using Wind ISI Requirement Instead of RPS Coverage: Effect of PTC activity on lobbying by electric utilities, 1998-2012. We coded Wind ISI Requirement as 1 if an utility generates any electricity in states with wind ISI requirement.

	(1)	(2)	(3)
lobbying			
PTC Active	0.254**	-0.092	
	(0.101)	(0.083)	
Wind ISI(binary)	0.169	0.054	0.051
	(0.314)	(0.353)	(0.353)
Renew Generator(binary)	-0.494	0.133	0.133
	(0.491)	(0.672)	(0.672)
PTC*RenewGen(binary)	0.330*	0.263	0.264
	(0.195)	(0.212)	(0.211)
PTC*Wind ISI(binary)	-0.409***	0.046	0.053
	(0.148)	(0.159)	(0.163)
Wind ISI(binary)*RenewGen(binary)	-0.327	-0.465	-0.464
	(0.569)	(0.660)	(0.660)
PTC*Wind ISI(binary)*RenewGen(binary)	-0.247	-0.188	-0.190
	(0.305)	(0.340)	(0.341)
Total Net Generation (Logged, quarter)	0.110	0.120	0.120
	(0.116)	(0.129)	(0.129)
Linear Year	Yes	No	No
Year Dummy	No	Yes	No
Biannual Dummy	Yes	Yes	No
Quarter Dummy	Yes	Yes	No
Quarter FE	No	No	Yes
Observations	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A10: Analysis Using Wind ISI Requirement Instead of RPS Coverage: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2012. We coded Wind ISI Requirement as 1 if an utility generates any electricity in states with wind ISI requirement.

	(1)	(2)	(3)	(4)
lobbying				
PTC Active	0.209***	0.309***	0.014	
	(0.065)	(0.072)	(0.050)	
Wind ISI(binary)	-0.015	0.106	0.038	0.037
	(0.128)	(0.165)	(0.163)	(0.164)
PTC*Wind ISI(binary)		-0.231**	-0.025	-0.023
		(0.093)	(0.082)	(0.085)
Total Net Generation (Logged, quarter)	0.090	0.090	0.112	0.112
	(0.122)	(0.122)	(0.132)	(0.132)
Linear Year	Yes	Yes	No	No
Year Dummy	No	No	Yes	No
Biannual Dummy	Yes	Yes	Yes	No
Quarter Dummy	Yes	Yes	Yes	No
Quarter FE	No	No	No	Yes
Observations	15130	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A11: Analysis Using Wind ISI Requirement Instead of RPS Coverage: Effect of PTC activity on lobbying by electric utilities, 1998-2012. We coded Wind ISI Requirement as 1 if an utility's share of electricity generation in states with wind ISI requirement is greater than the average level of the share across all the utilities in our sample (4.47).

	(1)	(2)	(3)
lobbying			
PTC Active	0.222**	-0.076	
	(0.090)	(0.080)	
Wind ISI(binary)	0.232	0.175	0.174
	(0.144)	(0.168)	(0.168)
Renew Generator(binary)	-0.490	0.085	0.084
	(0.467)	(0.631)	(0.631)
PTC*RenewGen(binary)	0.228	0.233	0.234
	(0.158)	(0.174)	(0.174)
PTC*Wind ISI(binary)	-0.244***	-0.017	-0.014
	(0.078)	(0.092)	(0.094)
Wind ISI(binary)*RenewGen(binary)	-0.228	-0.229	-0.228
	(0.269)	(0.307)	(0.307)
PTC*Wind ISI(binary)*RenewGen(binary)	-0.018	-0.056	-0.058
	(0.151)	(0.171)	(0.171)
Total Net Generation (Logged, quarter)	0.105	0.113	0.113
	(0.116)	(0.127)	(0.128)
Linear Year	Yes	No	No
Year Dummy	No	Yes	No
Biannual Dummy	Yes	Yes	No
Quarter Dummy	Yes	Yes	No
Quarter FE	No	No	Yes
Observations	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A12: Analysis Using Wind ISI Requirement Instead of RPS Coverage.: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2012. We coded Wind ISI Requirement as 1 if an utility's share of electricity generation in states with wind ISI requirement is greater than the average level of the share across all the utilities in our sample (4.47).

A8 Robustness: Alternative Specification of RPS Coverage

- We check if the results remain robust when using continuous measure of RPS coverage instead of a binary specification of RPS. Specifically, we use a continuous indicator that captures yearly RES-E deployment requirement as a percent of total generation available from (Shrimali et al., 2015). Again, we weighted this measure with regard to an utility's share of electricity generation in the states where it operates.

- Table A13 presents the estimation results for the effect of PTC activity on lobbying by electric utilities, using the continuous measure of RPS policies.

- Table A14 presents the estimation results for the effect of PTC activity on lobbying by renewable electricity generators and others, using the continuous measure of RPS policies.

- Furthermore, we run our main regression models using alternative specification of RPS coverage. While we coded 1 for an utility which generates electricity in the states where RPSs are adopted as our main specification of RPS coverage variable, we also use the average share of electricity generation in RPS states as a cutoff level to classify as the utility affected by the RPS. Specifically, to capture the extend that utilities are influenced by state RPS policies, we coded RPS coverage as 1 if an utility's share of electricity generation in states with RPS politics is greater than the average level of share across all the utilities in our sample, which is equal to 23.8%. For example, if utility i generates 30% of its total electricity in the states that adopted RPS regulations in period t, it is coded as 1.

- Table A15 presents the estimation results for the effect of PTC activity on lobbying by electric utilities, using the alternative specification of RPS coverage based on the average share of electricity generation in RPS states across all the utilities as a cutoff.

- Table A16 presents the estimation results for the effect of PTC activity on lobbying by renewable electricity generators and others, using the alternative specification of RPS coverage based on the average share of electricity generation in RPS states across all the utilities as a cutoff.

- Table A17 shows the effect of PTC activity on *energy and environment related lobbying* by electric utilities, 1998-2012.

	(1)	(2)	(3)	(4)
lobbying				
PTC Active	0.382***	0.459***	0.031	
	(0.058)	(0.065)	(0.050)	
RPS(level)	-0.029	-0.015	-0.013	-0.013
	(0.022)	(0.023)	(0.024)	(0.024)
PTC*RPS(level)		-0.029***	-0.014*	-0.014*
		(0.008)	(0.008)	(0.008)
Total Net Generation (Logged, quarter)	0.075	0.073	0.102	0.102
	(0.114)	(0.114)	(0.138)	(0.138)
Linear Year	Yes	Yes	No	No
Year Dummy	No	No	Yes	No
Biannual Dummy	Yes	Yes	Yes	No
Quarter Dummy	Yes	Yes	Yes	No
Quarter FE	No	No	No	Yes
Observations	11474	11474	11474	11474

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A13: Estimations using the continuous measure of RPS policies: Effect of PTC activity on lobbying by electric utilities, 1998-2010.

	(1)	(2)	(3)
main			
PTC Active	0.311***	-0.113	
	(0.081)	(0.085)	
RPS(level)	-0.032	-0.016	-0.017
	(0.033)	(0.032)	(0.032)
Renew Generator(binary)	-0.723	0.110	0.109
	(0.506)	(0.651)	(0.652)
PTC*RenewGen(binary)	0.363**	0.340*	0.341*
	(0.179)	(0.193)	(0.193)
PTC*RPS(level)	-0.013*	0.003	0.004
	(0.007)	(0.007)	(0.007)
RPS(level)*RenewGen(binary)	0.034	0.009	0.009
	(0.039)	(0.049)	(0.049)
PTC*RPS(level)*RenewGen(binary)	-0.036***	-0.037***	-0.037***
	(0.013)	(0.011)	(0.011)
Total Net Generation (Logged, quarter)	0.088	0.101	0.101
	(0.111)	(0.142)	(0.142)
Linear Year	Yes	No	No
Year Dummy	No	Yes	No
Biannual Dummy	Yes	Yes	No
Quarter Dummy	Yes	Yes	No
Quarter FE	No	No	Yes
Observations	11474	11474	11474

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A14: Estimations using the continuous measure of RPS policies: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2010.

	(1)	(2)	(3)	(4)
lobbying				
PTC Active	0.202***	0.339***	0.027	
	(0.064)	(0.072)	(0.047)	
RPS(binary)	-0.661**	-0.397	-0.587*	-0.588*
	(0.297)	(0.323)	(0.353)	(0.354)
PTC*RPS(binary)		-0.518***	-0.108	-0.107
		(0.105)	(0.122)	(0.128)
Total Net Generation (Logged, quarter)	0.086	0.085	0.107	0.107
	(0.120)	(0.120)	(0.134)	(0.134)
Linear Year	Yes	Yes	No	No
Year Dummy	No	No	Yes	No
Biannual Dummy	Yes	Yes	Yes	No
Quarter Dummy	Yes	Yes	Yes	No
Quarter FE	No	No	No	Yes
Observations	15130	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A15: Alternative specifications of RPS coverage: Effect of PTC activity on lobbying by electric utilities, 1998-2012. We coded RPS coverage as 1 if an utility's share of electricity generation in states with RPS politics is greater than the average level of the share across all the utilities in our sample (23.8%).

	(1)	(2)	(3)
lobbying			
PTC Active	0.237**	-0.102	
	(0.096)	(0.084)	
RPS(binary)	-0.201	-0.282	-0.285
	(0.367)	(0.428)	(0.429)
Renew Generator(binary)	-0.524	0.074	0.073
	(0.505)	(0.689)	(0.690)
PTC*RenewGen(binary)	0.243	0.295	0.297
	(0.169)	(0.181)	(0.181)
PTC*RPS(binary)	-0.395***	0.075	0.082
	(0.148)	(0.149)	(0.153)
renewgenrpsbinary_3	-0.530	-0.739	-0.738
	(0.748)	(0.857)	(0.858)
renewPTCrpsbinary_3	-0.270	-0.402	-0.405
	(0.304)	(0.306)	(0.306)
Total Net Generation (Logged, quarter)	0.105	0.115	0.115
	(0.117)	(0.134)	(0.134)
Linear Year	Yes	No	No
Year Dummy	No	Yes	No
Biannual Dummy	Yes	Yes	No
Quarter Dummy	Yes	Yes	No
Quarter FE	No	No	Yes
Observations	15130	15130	15130

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A16: Alternative specifications of RPS coverage: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2012. We coded RPS coverage as 1 if an utility's share of electricity generation in states with RPS politics is greater than the average level of the share across all the utilities in our sample (23.8%).

	(1)	(2)	(3)	(4)
Category: Environment/Energy/Utilities				
PTC Active	0.060	0.142*	0.033	
	(0.068)	(0.074)	(0.059)	
RPS(binary)	-0.409	-0.174	-0.290	0.253
	(0.317)	(0.366)	(0.334)	(0.357)
PTC*RPS(binary)		-0.472***	-0.248	-0.366**
		(0.167)	(0.182)	(0.173)
Total Net Generation (Logged, quarter)	0.135	0.136	0.160	0.151
	(0.118)	(0.117)	(0.131)	(0.122)
Linear Year	Yes	Yes	No	No
Year Dummy	No	No	Yes	No
Biannual Dummy	Yes	Yes	Yes	No
Quarter Dummy	Yes	Yes	Yes	No
Quarter FE	No	No	No	Yes
Observations	11160	11160	11160	11160

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A17: Effect of PTC activity on *energy and environment related lobbying* by electric utilities, 1998-2012.

A9 Additional Results Using Clustered Standard Errors at the Utility-level

	(1)	(2)	(3)	(4)
lobbying				
PTC Active	0.205***	0.336***	0.623***	
	(0.063)	(0.072)	(0.057)	
RPS(binary)	-0.458*	-0.153	0.960***	0.452
	(0.275)	(0.308)	(0.292)	(0.298)
PTC*RPS(binary)		-0.606***	-0.702***	-0.289*
		(0.167)	(0.169)	(0.161)
Total Net Generation (Logged, quarter)	0.083**	0.083**	0.077**	0.082**
	(0.035)	(0.036)	(0.036)	(0.037)
Observations	15130	15130	15130	15130

Clustered standard errors at the utility-level in parentheses.

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

Utility FE is included across all models

Table A18: Estimating clustered standard errors at the utility-level: Effect of PTC activity on lobbying by electric utilities, 1998-2012.

	(1)	(2)	(3)
lobbying			
PTC Active	0.260***	0.564***	
	(0.098)	(0.089)	
RPS(binary)	-0.013	1.181***	0.624*
	(0.363)	(0.347)	(0.350)
Renew Generator(binary)	-0.497	0.335	0.122
	(0.308)	(0.314)	(0.327)
PTC*RenewGen(binary)	0.175	0.121	0.504***
	(0.147)	(0.147)	(0.121)
PTC*RPS(binary)	-0.524***	-0.625***	-0.120
	(0.202)	(0.207)	(0.190)
RPS(binary)*RenewGen(binary)	-0.413	-0.595	-0.433
	(0.580)	(0.571)	(0.582)
PTC*RPS(binary)*RenewGen(binary)	-0.165	-0.151	-0.544
	(0.359)	(0.359)	(0.355)
Total Net Generation (Logged, quarter)	0.100***	0.072*	0.080**
	(0.037)	(0.038)	(0.039)
Observations	15130	15130	15130

Clustered standard errors at the utility-level in parentheses.

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

Utility FE is included across all models

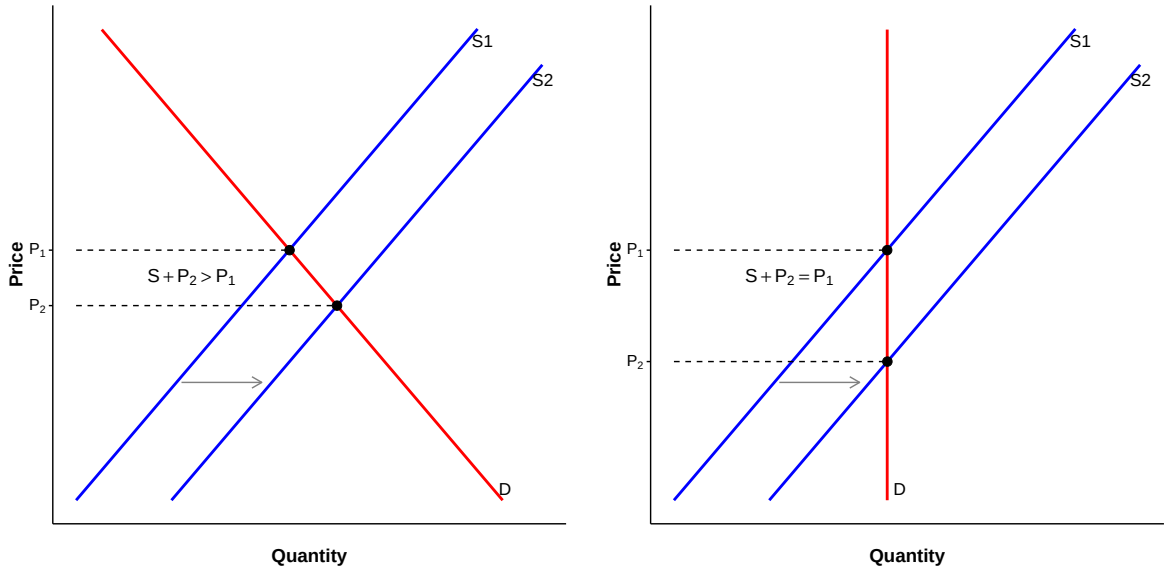
Table A19: Estimating clustered standard errors at the utility-level: Effect of PTC activity on lobbying by renewable electricity generators and others, 1998-2012.

A10 Simple Illustration of Theoretical Expectations Using the Demand/Supply Curves in Electricity Market

Figure A1 illustrates the effect of PTC expiration on the price of renewable energy in two scenarios – without RPS (left) and with RPS (right). The figure represents the market of (renewable) electricity producers (supply) selling to utilities (demand). Without an RPS, both types of electric utilities have increased incentives to lobby on PTC since the utilities that do not own or develop renewable energy assets typically meet this requirement by making long term contracts with other independent renewable producers or by purchasing renewable energy credits. Without an RPS, electric utilities with renewable electricity generation capabilities expect large benefits from the PTC. By reducing the net production cost of renewables, the PTC increases the supply of electricity and thus suppresses market prices (Fell, Linn, and Munnings, 2012), as illustrated in the left sub-graph in Figure A1. The reduction of market prices, however, is offset by the subsidy provided by the PTC, as $S + P_2 > P_1$. Thus, renewable electricity generators expect net gains from the PTC.

With RPS, utilities are required to purchase at least x% of power from renewables, which implies a flipped J-shaped demand curve. Yet, utilities may not have incentives to purchase more renewable power than the minimum requirement mainly due to the presence of other cheaper conventional sources of energy. Thus, the demand curve, in practice, is fixed at the level of minimum requirement set by RPS in the market. In this regard, for simplicity, we present the vertical demand line in the figure.[1] Then, the effect of a PTC subsidy must be a corresponding decrease in the price of renewable electricity; with inelastic supply, the price must adjust until supply and demand are in equilibrium. This, in turn, means that renewable electricity generators do not gain from the RPS. At the same time, utilities expecting to have to purchase renewable electricity from others also do not have any obvious additional incentive to lobby. Again, this logic is illustrated in the sub-figure on the right. The reduction of market prices exceeds the compensation from the PTC, which reduces the incentive for lobbying for PTC.

[1] Similarly, Felder and Loxley (2012) notes that RPS leads to vertical demand curve. Hence, many studies suggest vertical demand in various renewable energy certificates markets (e.g., Berry, 2002; Binder, Mjelde, and Woodward, 2016). However, this does not necessarily imply that all utilities would behave in the same way. Some utilities that have a high reliance on renewable energy power regardless of the RPS requirements can achieve over-compliance.



(a) No RPS (b) RPS

Figure A1: Effect of the PTC on demand and supply of renewable energy without RPS (left) and with RPS (right). With price on the y-axis and quantity on the x-axis, the red line indicates the demand curve and the blue line indicates the supply curve without the PTC (S_1) and with the PTC (S_2). The figure illustrates our logic of why the effect of PTC on the incentive for lobbying is different depending on the presence of RPS.

A11 Structural Topic Model Estimations of Texts in Lobbying Reports

A11.1 Estimation Procedure

- The first step of analyzing texts is to pre-process them. We collected texts in the specific lobbying issue section in the lobbying reports, and pre-processed our texts using the programs provided through the R package STM. Specifically, we dropped "stop words" such as "and" and "the" in order to remove words that occur very frequently. We also stemmed our words. Stemming refers to the process of reducing words to their word stem (i.e. legislation to legis).

- We then estimated the Structural Topic Model. We incorporated two document-level structural variables (RPS level in first year of the state where electric utilities are based and PTC Active for the period when lobbying reports were filed) as well as their interaction terms.

- In estimating an unsupervised topic model, we need to specify a number of topics. We estimated a total of 8 topic models setting a number of topic to 5, 10, 15, 20, 25, 30, and 35, to 40. Diagnostic values by number of topics for these estimated models is presented in Figure A2. We chose the model with 15 topic models because the diagnostic value for semantic coherence dramatically reduces from the model with 20 topics (For more discussion on diagnostics, see Roberts et al. (2014) and its appendix). We also manually examined the results from different topic models and decided that a model with 15 topics provides helpful insights for understanding issues in the lobbying reports while models with more topics do not provide new insights.

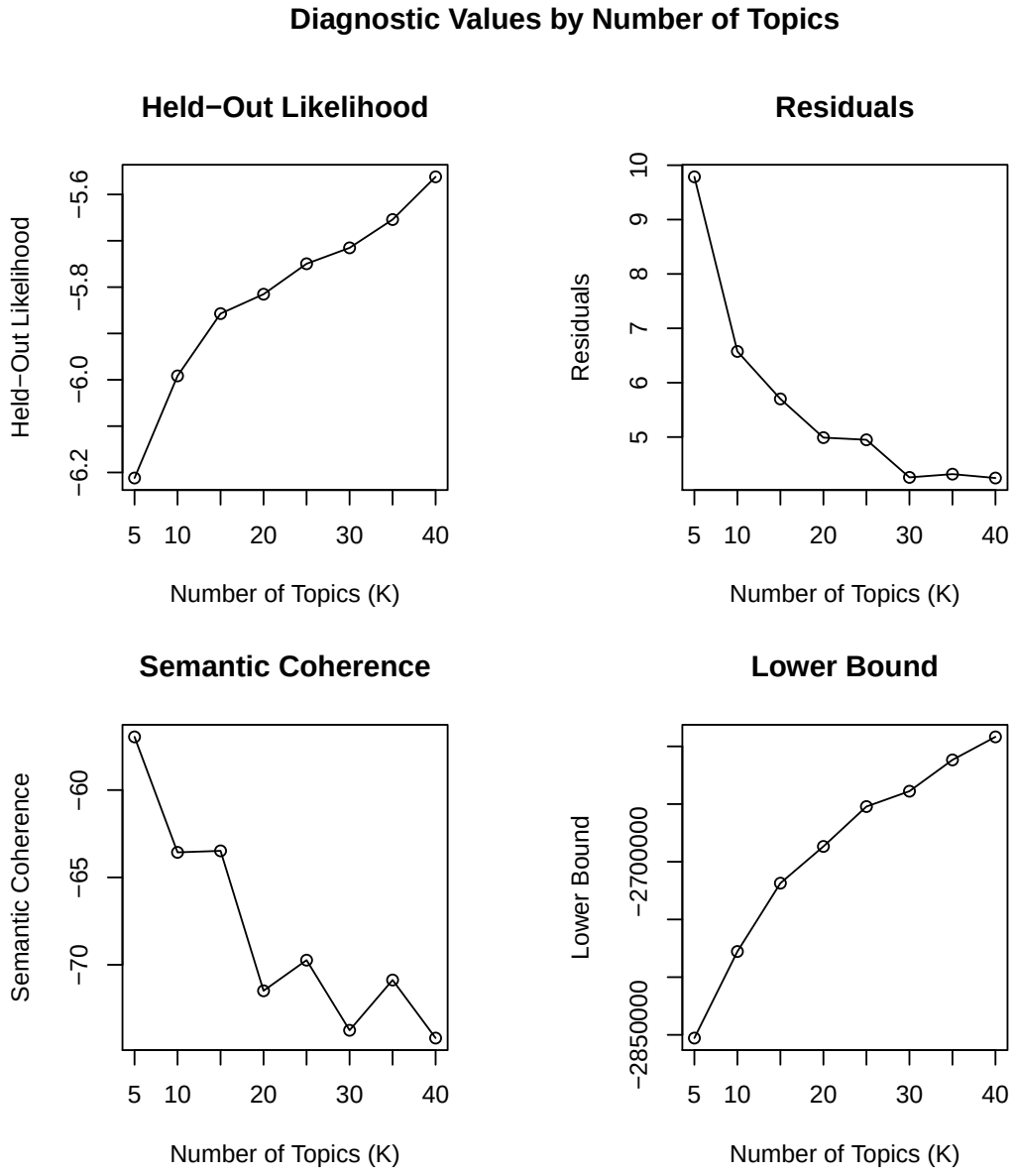
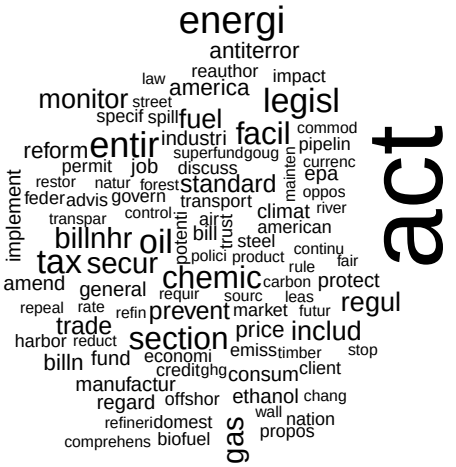


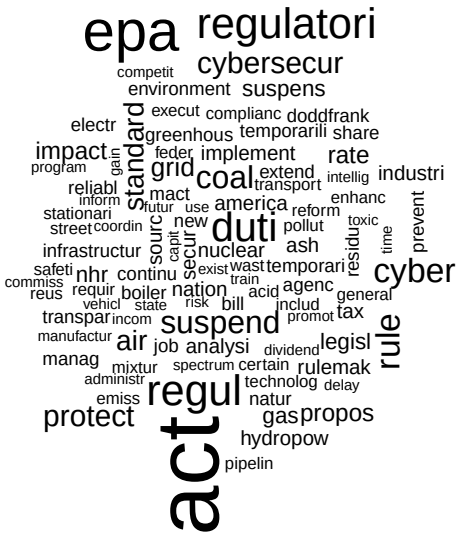
Figure A2: Diagnostic Values by Number of Topics. We estimated eight models with different number of topics. We choose a model with 15 topics based on diagnostics because semantic coherence reduces substantially from a model with 15 topics to a model with 20 topics. We also manually examine the estimation results and reached the same conclusion.

A11.2 Word Clouds for Each Topic

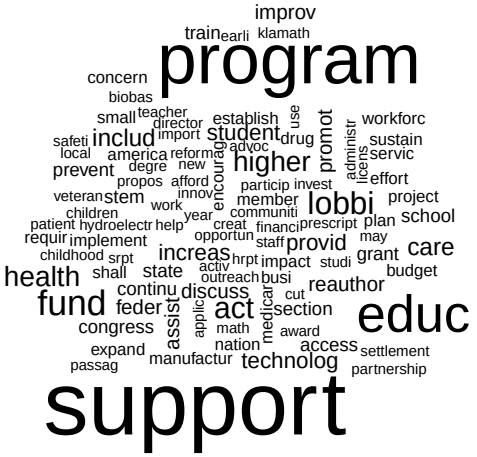
- We presented word clouds for two topics that are relevant to the energy issue (Topics 9 and 12) to demonstrate that a large proportion of lobbying issues are in fact about the energy issue. We present word clouds for all the classified topics to aid understanding of other topics as well (Figures A3-A6). Word clouds represent the most frequently used words in each classified topic.



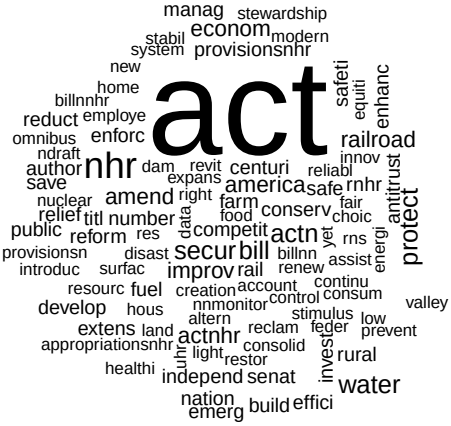
Topic 1



Topic 2

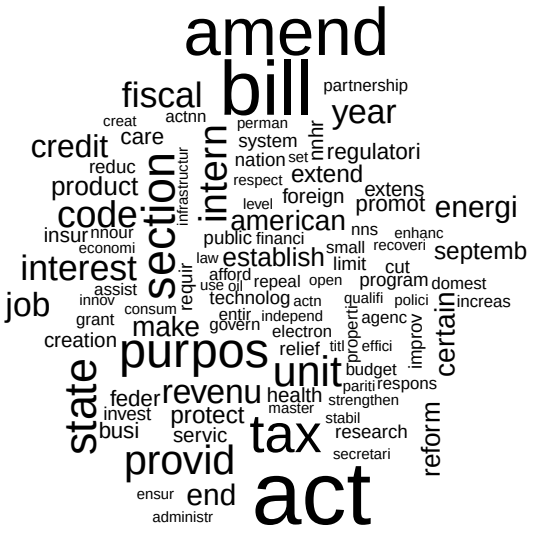


Topic 3



Topic 4

Figure A3: Word Clouds for Topics 1, 2, 3, and 4.



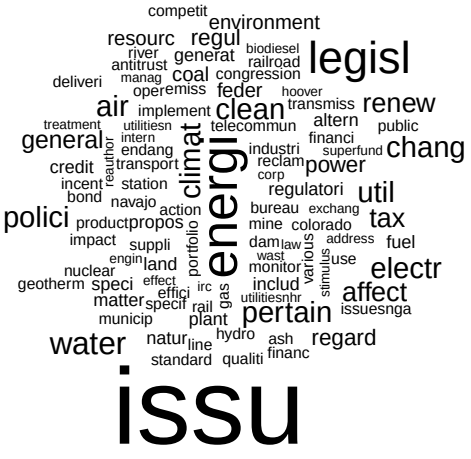
Topic 5

Topic 6

Topic 7

Topic 8

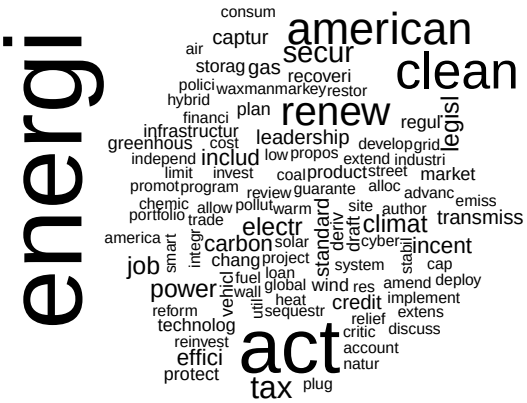
Figure A4: Word Clouds for Topics 5, 6, 7, and 8.



Topic 9

Topic 10

Topic 11



Topic 12

Figure A5: Word Clouds for Topics 9, 10, 11, and 12.

Topic 13

Topic 14

Topic 15

Figure A6: Word Clouds for Topics 13, 14, and 15.

A11.3 Example Texts of Each Topic

- We also present example texts highly associated with each topic in Figures A7 - A10. Due to the space constraints, we only present the first part of each texts. We present 8 example texts for each topic.

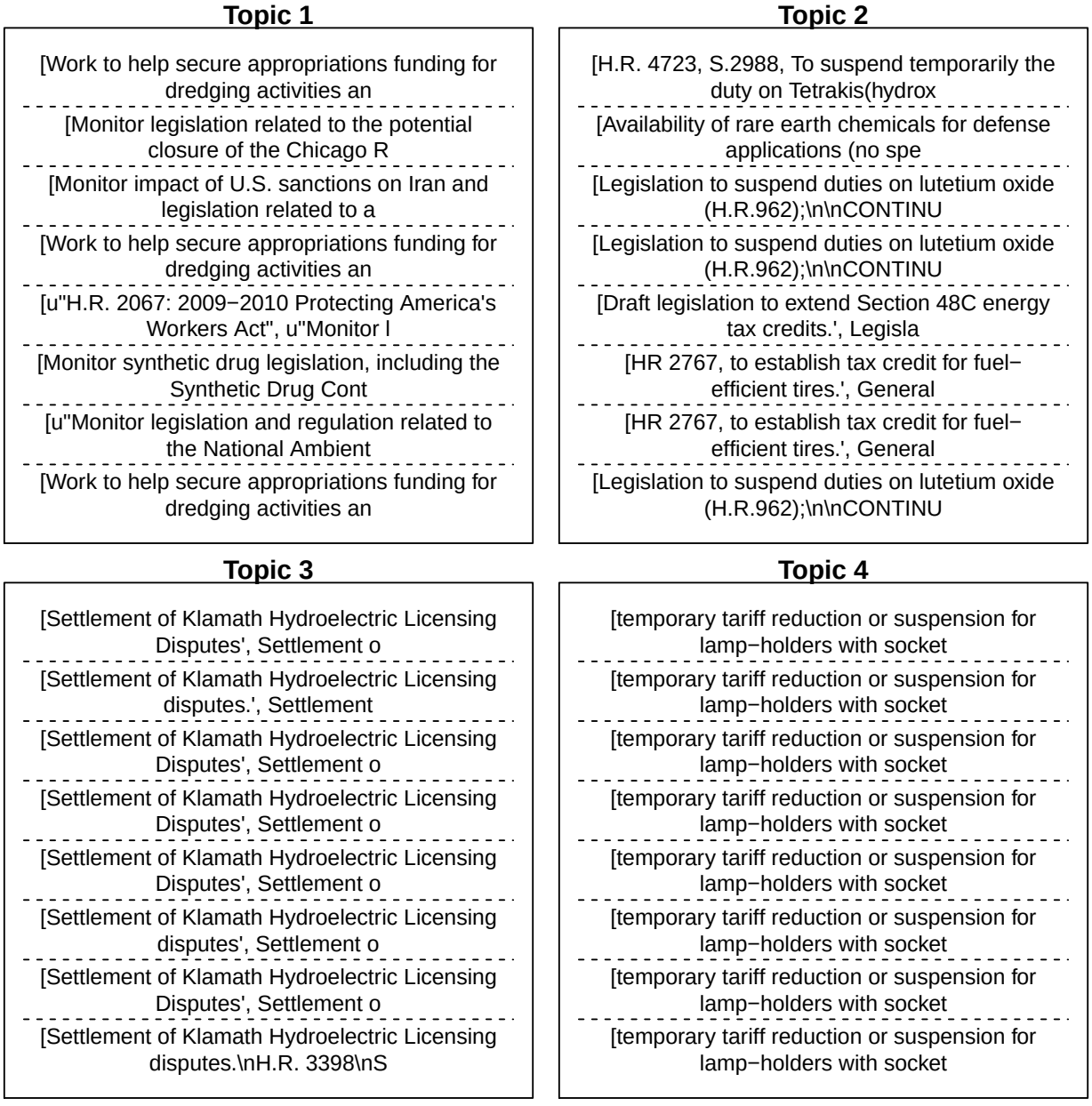


Figure A7: Example Texts for Topics 1, 2, 3, and 4

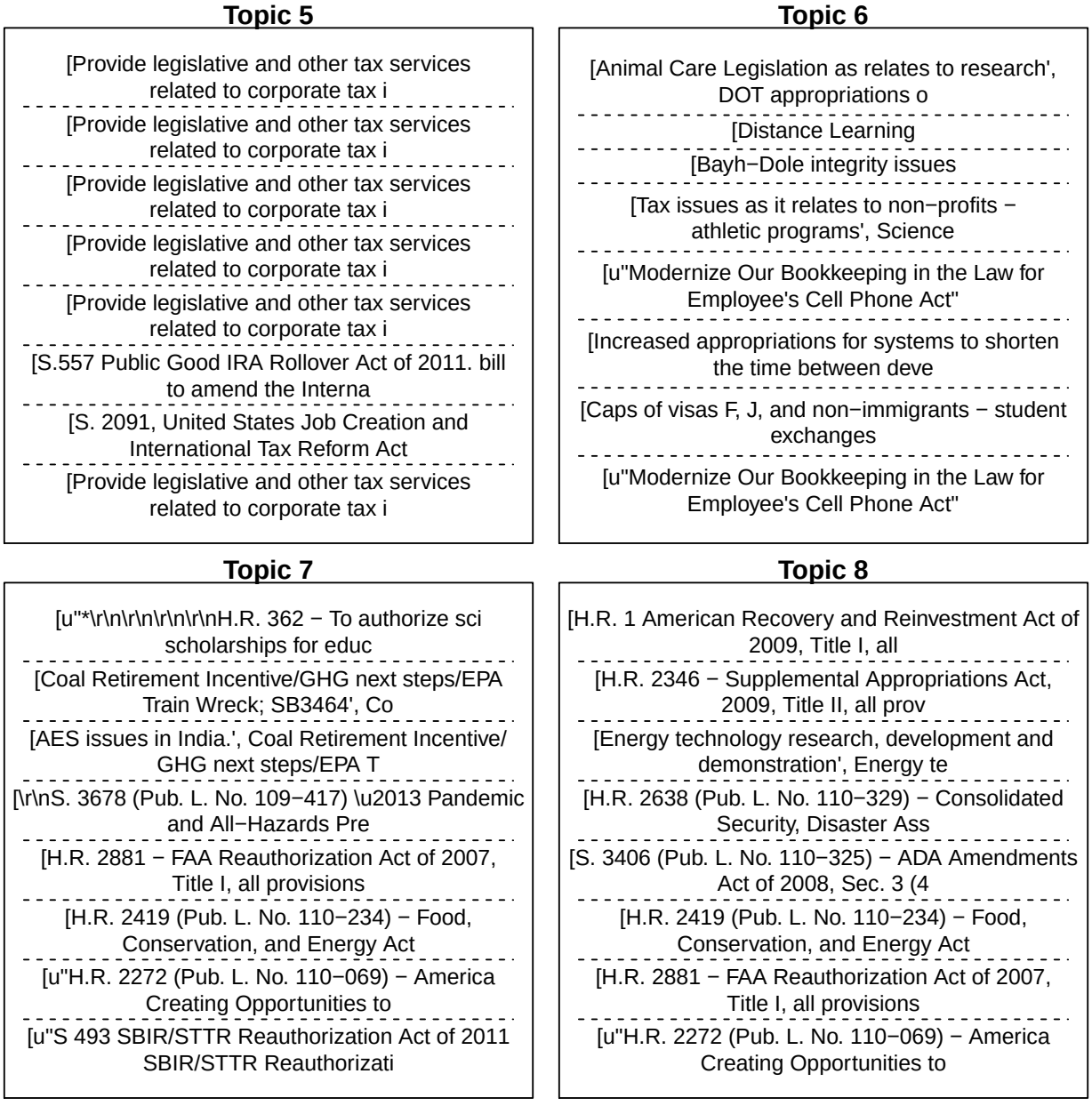


Figure A8: Example Texts for Topics 5, 6, 7, and 8

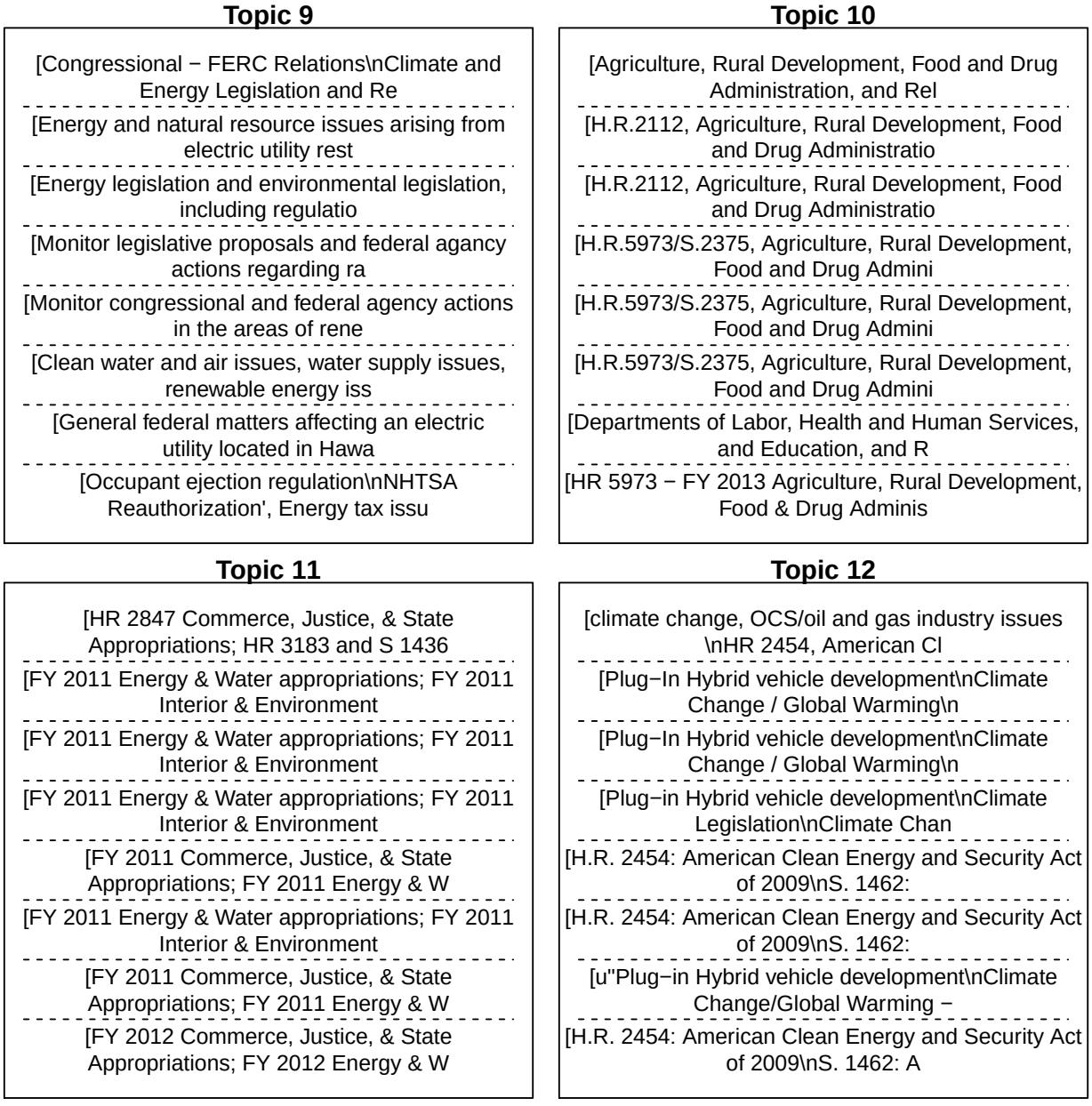


Figure A9: Example Texts for Topics 9, 10, 11, and 12

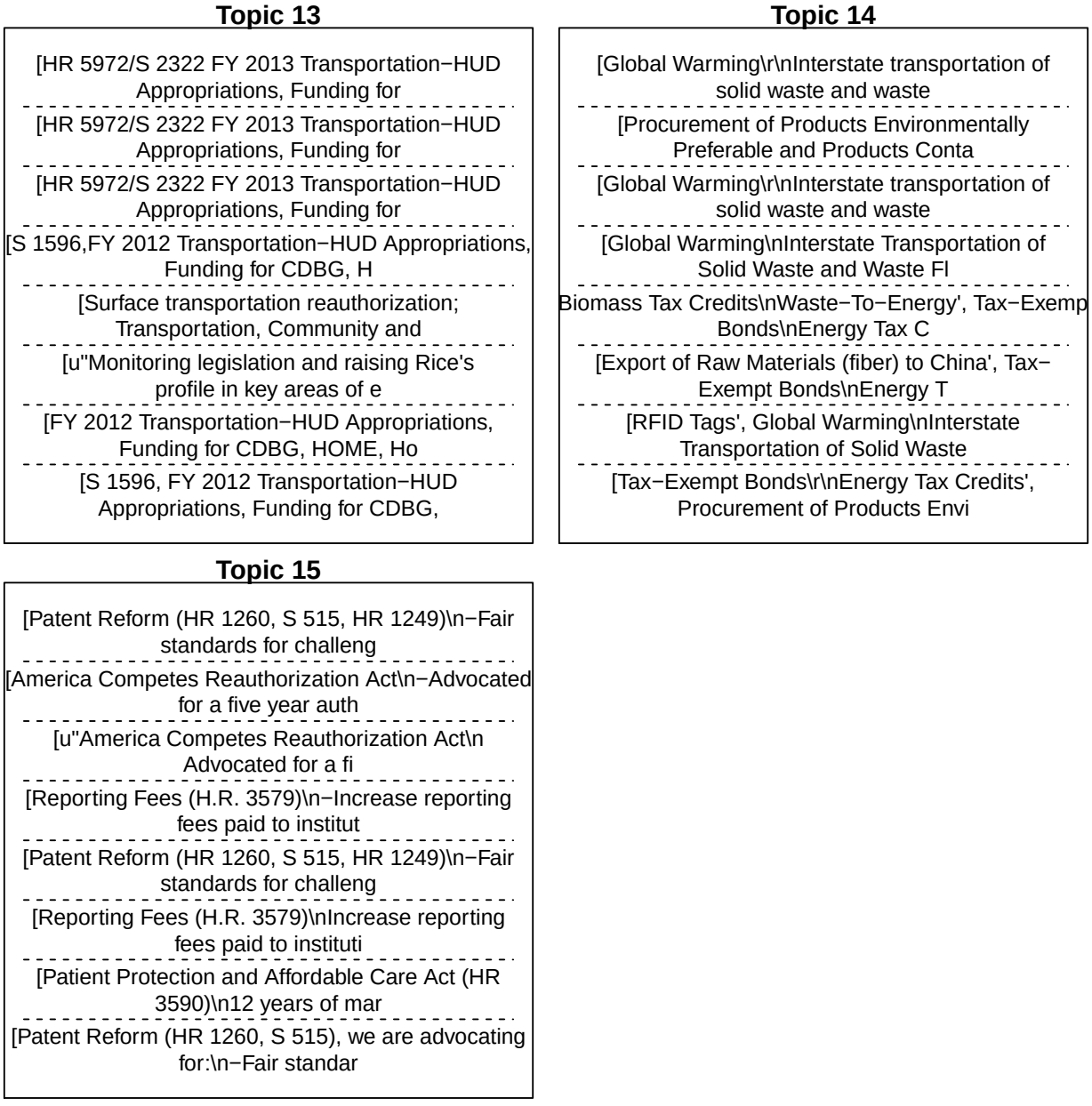


Figure A10: Example Texts for Topics 13, 14, and 15

A12 Placebo Tests

Table A20 presents the results with lobbying on trade as dependent variable. There is no evidence of the substitution effect between RPS and the PTC on trade-related lobbying activities.

	(1)	(2)	(3)	(4)
Category: Trade(Domestic/Foreign)				
PTC Active	-0.103	-0.041	-0.028	
	(0.134)	(0.151)	(0.148)	
RPS(binary)	-0.008	0.129	0.097	0.482
	(0.226)	(0.275)	(0.297)	(0.322)
PTC*RPS(binary)		-0.273	-0.100	-0.403
		(0.299)	(0.297)	(0.260)
Total Net Generation (Logged, quarter)	0.062	0.062	0.073	0.050
	(0.244)	(0.243)	(0.256)	(0.214)
Observations	2954	2954	2954	2954

Clustered standard errors at the state-level in parentheses.

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

Utility FE is included across all models

Table A20: Effect of PTC activity on *trade-related lobbying* by electric utilities, 1998-2012.

Supplementary Appendix: References

Berry, David. 2002. "The market for tradable renewable energy credits." *Ecological Economics* 42 (3): 369 – 379.

URL: *http://www.sciencedirect.com/science/article/pii/S0921800902001283*

Binder, Kyle E, James W Mjelde, and Richard T Woodward. 2016. "Price Interaction in State-Level Renewable Energy Credit Trading Programs." *The Electricity Journal* 29 (4): 15–21.

Felder, Frank A, and Colin J Loxley. 2012. "The implications of a vertical demand curve in solar renewable portfolio standards." Center for Research in Regulated Industries, Rutgers University.

URL: *http://ceeep.rutgers.edu/wp-content/uploads/2013/11/VerticalDemandCurve.pdf*

Fell, Harrison G, Joshua Linn, and Clayton Munnings. 2012. "Designing renewable electricity policies to reduce emissions." Resources for the Future Discussion Paper 12-54.

URL: *http://www.rff.org/research/publications/designing-renewable-electricity-policies-reduce-emissions*

Roberts, Margaret E., Brandon M. Stewart, Dustin Tingley, Christopher Lucas, Jetson Leder-Luis, Shana Kushner Gadarian, Bethany Albertson, and David G. Rand. 2014. "Structural Topic Models for Open-Ended Survey Responses." *American Journal of Political Science* 58 (4): 1064–1082.

Shrimali, Gireesh, Gabriel Chan, Steffen Jenner, Felix Groba, and Joe Indvik. 2015. "Evaluating renewable portfolio standards for in-state renewable deployment: Accounting for policy heterogeneity." *Economics of Energy & Environmental Policy* 4 (2): 127–142.

Yin, Haitao, and Nicholas Powers. 2010. "Do state renewable portfolio standards promote in-state renewable generation?" *Energy Policy* 38 (2): 1140–1149.