

Interstate Externalities and Corporate Environmental Performance in the Electric Utility Sector

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A Tale of Two Utility Firms:



Oklahoma Gas & Electric and Idaho Power

- **Oklahoma Gas & Electric:**

- Operates in OK & AR
- Not subject to a Renewable Portfolio Standard (RPS) in either state.
- *Has actively sourced wind power from 3 projects (114 turbines).*
- Borders TX, CO, & NM all of which have adopted RPS standards. That has led firms in those states to be some of the most active in renewable power in the country.

- **Idaho Power:**

- Not subject to an RPS in Idaho
- *Adopting Wind power from projects in ID, OR, & MT.*
- *One of only a handful IOUs to sign an agreement to source geothermal power.*
- Neighbors 4 states that have an RPS.
- Shares Idaho with 2 other IOUs (Avista and PacifiCorp) that do operate in states with RPS policies and have been very active in procuring renewable power to meet these demands.

Interstate Externalities

- A policy decision that encumbers parties that are not active in the jurisdiction where that policy was set.
- Lax regulation as a product of competition between states for industrial activity
 - Pollution Haven Hypothesis → “Race to the Bottom” (Copeland & Taylor, 1994)
→ *Not proven empirically* (Antweiler et al., 2001; Frankel & Rose, 2005; Christmann & Taylor, 2001)
- Attention now on a “Race to the Top”
 - Ratcheting up the stringency of environmental policy.
 - California Effect (Vogel, 1995)
- Both “Races” involve Policy influencing Policy and not how firms respond to variation in the stringency of a policy set elsewhere.
 - Variation in statutory obligations may shape the environmental action of those firms regulated differently.

Interstate Externality in the Electric Utility Industry (1)

1. Peer Firms

- Firms that are regulated in multiple jurisdictions can present policy makers with options that lead to new environmental policy in a focal state that other firms would have to respond to.
 - Transmission mechanism for an interstate externality as new policies spill over across state borders as firms in a common jurisdiction are regulated differently elsewhere.
- Firms can identify their peers' environmental regulatory responsibilities elsewhere, which can influence its decision to alter its own environmental performance.
 - Preview of what may come to their own jurisdiction.
 - Mimicking competitors' behaviour.

Hypothesis 1: Peer Effect

The stringency of environmental policy faced by peer electric utility firms in other jurisdictions is positively related to changes in a focal utility firms' environmental performance.

Interstate Externality in the Electric Utility Industry(2)

2. Neighboring Jurisdictions

- Geographic regions tend to share stakeholders, economic conditions, and social ideologies that lead policy issues to extend beyond state borders.
 - Midwestern Governor's Association adopts resolution in 2006 supporting a standard of 25% renewable power use by 2025 while only 3 of 13 member states had already adopted an RPS. Now 9 have RPS policies.
- Greater awareness of potential policy that can cross state borders in near future can motivate environmental action.
 - Early entry in the factor market for key resources.
 - Satisfy policy makers, environmentalists, and customers.
 - Reveal own preferences for pending/potential policy.

Hypothesis 2: Neighboring Jurisdictions

The stringency of an environmental policy in a contiguous state that the focal firm does not operate within will be positively related to changes in firm environmental performance.

Context

- U.S. Electric Utility Sector
 - Increasing regulation and investment of renewable power (wind, solar, biomass, hydro, geothermal)
 - Utility firms decision to generate or procure power from renewable sources will shape its environmental performance.
 - State policy and firm experience with renewables can vary widely.
- Renewable Portfolio Standards
 - Statutory objectives that compel utility firms to include renewable power in their fuel mix.
 - As of 2006, 21 states had adopted policies with objectives ranging form 1.1% to 30%.

Sample

- 127 investor-owned electric utilities in the US.
 - Excluding IOUs in Texas.
 - Approximately 25% of utilities operate in multiple states
 - Time period of 2001-2006.
 - Include lagged value of the DV in the model, so need data for 2000.
 - 21 states had adopted an RPS. 8 states had intensified the demand of their targets.
- *762 Firm-Year Observations*

Key Variables

Dependent Variable:

- Percent of renewable power sold by an investor owned utility.
 - Includes both power generated and purchased.

Independent Variables:

1. Peer Firms

- Average RPS faced by other utility firms that operate in a common state to the focal firm.

2. Neighboring States

- Average RPS of the contiguous states to where a focal utility operates (Neighbors RPS 1)
- Average RPS of the contiguous states to where a focal utility has more than 50% of its retail sales (Neighbors RPS 2)

Control Variables

Firm Specific:

1. Percent Renewable_{t-1} → Lagged Dependent Variable
2. RPS Objective faced by focal firm
3. Fuel Mix Diversity → Herfindahl Index
4. Interaction of RPS Objective and Fuel Mix
5. % Residential Sales
6. % Industrial Sales
7. Firm Size → Total Sales in MWh

Control Variables contd...

State Specific:

1. % of Gross State Product from Manufacturing
 2. Environmentalist pressure → Sierra club membership
 3. Industry Emissions → CO₂ emissions by utility industry
 4. Indicator for market deregulation/restructuring
 5. Voluntary/Involuntary reporting of GHG emissions/fuel mix
 6. State intervention in Generation → Nuclear Moratorium
 7. Political Affiliation → Democrat alignment of legislature & Governor's Office
 8. State Government Budget
 9. Public Utility Commission Tenure
 10. Elected Public Utility Commission
- *Year and Firm Fixed effects are also included.*

Estimation

- Dynamic Panel Estimator
 - Arellano-Bond GMM approach.
- Panel with few years (6) but many firms (127)
- DV is based on its prior realizations
- IVs that are possibly correlated with past & current error terms
- Require firm fixed effects
- Concerned with heteroscedasticity/autocorrelation

Base Model

	Model 1	Model 2
Percent Renewable _{t-1}	0.262*** (0.089)	0.224*** (0.030)
RPS	1.919** (0.787)	1.648*** (0.200)
Fuel Mix Diversity	6.661*** (1.273)	7.279*** (0.444)
RPS X Fuel Mix Diversity	0.209** (0.085)	0.178*** (0.022)
Instruments	54	54
Sargan-Hansen Statistic	24.67	24.67
Difference in Hansen Test (C Stat)	18.63	18.63
AR (1)	0.243	0.177
AR (2)	0.935	0.815
Two Step Robust Standard Errors	No	Yes

n=762

Coefficients for Controls omitted.

*P<0.1, **P<0.05, ***P<0.01

Hypothesized Results

	Model 3	Model 4
Percent Renewable _{t-1}	0.239*** (0.031)	0.240*** (0.031)
RPS	1.594*** (0.198)	1.583*** (0.195)
Fuel Mix Diversity	6.987*** (0.443)	7.014*** (0.450)
RPS X Fuel Mix Diversity	0.192*** (0.024)	0.192*** (0.024)
Peer Firms RPS	0.242*** (0.745)	0.243*** (0.074)
Neighbors RPS 1	-0.054** (0.026)	
Neighbors RPS 2		-0.049** (0.023)
Chi-Square	9352.00***	9322.01***
Instruments	56	56
Sargan-Hansen Statistic	26.87	26.69
Difference in Hansen Test (C Stat)	21.22	21.10
AR (1)	0.162	0.163
AR (2)	0.989	0.988

n=762; Coefficients for Controls omitted.

Two-Step robust standard errors are presented in parentheses.

*P<0.1, **P<0.05, ***P<0.01

Further Analysis

	Model 5
Percent Renewable _{t-1}	0.241*** (0.029)
RPS	1.621*** (0.218)
Fuel Mix Diversity	7.057*** (0.428)
RPS X Fuel Mix Diversity	0.188*** (0.024)
Peer Firms RPS	0.121* (0.070)
Neighbors RPS 1	-0.046* (0.027)
Peer Firms RPS > Focal firm RPS	1.311*** (0.466)
Neighbors RPS > Focal firm RPS	-0.588** (0.269)
Chi-Square	9192.08***
Instruments	58
Sargan-Hansen Statistic	26.75
Difference in Hansen Test (C Stat)	21.31
AR (1)	0.158
AR (2)	0.958

n=762; Coefficients for Controls omitted.

Two-Step robust standard errors are presented in parentheses.

*P<0.1, **P<0.05, ***P<0.01

Results

- Support for Peer Firm Effect (H1)
 - Increases in the stringency of a policy faced by competing firms in a common jurisdiction leads a focal firm to increase the renewable power used.
- Inverse relationship for Neighboring Jurisdictions (H2)
 - Increases in the stringency of a policy in neighboring jurisdictions leads a focal firm to decrease renewable power used.
 - Difficulty in siting power plants, sourcing turbines, developing purchase agreements while demand for power continues to grow on an annual basis.
- Controls
 - Residential sales and firm size negatively related to renewable power use.
 - Deregulation, environmentalists, and democrat aligned political environment positively related to renewable power use.

Implications

- Must consider the broader policy environment and its impact on a firm's ability to respond to environmental concerns.
 - Policy can bleed across state lines to shape environmental performance.
- Role for understanding how competitive dynamics may shape sustainability efforts.
 - Not only in the product market but also in factor markets
- Questions the possibility for a regulatory-induced first mover advantage if firms are responding to the stringent standards already adopted elsewhere.