Pork Barrel as a Signaling Tool: The Case of US Environmental Policy

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Research question

Is signaling a driving force behind pre-electoral pork barrel spending?

An application to the political economy of US environmental policy
Outline

Introduction
  Background
  The paper

The Theoretical Model
  Summary of Model
  Summary of Results

Empirical Analysis
  Empirical Strategy
  Results: Environmental Expenditure Deviations
  Results: Other Hypotheses

Conclusion
Motivation

- Pre-electoral changes in spending take place in many economies
- These manipulations constitute efficiency losses (Hicken and Simmons, 2008)
- Understanding the mechanism behind them is therefore important
- Environmental policy is particularly prone to political pressure due to intensity of preferences
- Catering to lobbies but also voters
- If it is dependent on political cycles environmental policy is less efficient

↓

Signaling preferences for the environment and pre-electoral pork barrel
**Some concepts**

**Pork Barrel:** Assignment of benefits to particular groups in exchange for votes → expenditure occurring in election years in excess of what the politician’s choice without election would be

**Signaling:** Conveying of preferences (true or not) through enacted policies
The paper

- Two period model of electoral competition, with rational forward-looking voters and politicians that are both policy and office motivated
- Unknown variable is the politician’s preference for particular issues: signal extraction
- Conditions under which pork barrel results rationally from signaling of preferences
- Empirical analysis of US state level environmental policy
- Evidence suggests environmental expenditures are in fact subject to pre-electoral pork barrel with signaling purposes
Summary of Model Setup

- Population: three groups of equal size $i = 1, 2, 3$, divided by issues they care about, continuum of citizens
- Two time periods, $t = 1, 2$, with an election at the end of $1$
- Incumbent politician divides fixed budget:
  - Bundle of national public goods
  - "Extra" expenditure on three issues, for which each of the three groups cares more about (eg. environmental protection)
- Politicians have preferences that are unknown to voters
- Voters are forward-looking: maximize expected utility
- All agents have ideological preferences (preferences for non-fiscal issues) more or less dispersed for different groups
Incumbent Politician

Before the election, incumbent chooses expenditure to maximize two-period utility function, which depends on:

- Period 1 utility: maximized by expenditure in favorite issue
- Probability of re-election: depends on voter’s beliefs regarding her preference

Pork Barrel: spending in excess of own preference to increase re-election probability
Equilibrium

**Definition**

Pork barrel takes place and is *effective* (credible) if:

\[
\pi_{q_t}^{PB} - \pi_{q_t}^{\bar{PB}} > 0
\]

and that this is enough to offset the loss in period 1 utility.

**Pork Barrel incentive:**

Depends positively on the preferences for extra expenditure and negatively on the dispersion of the group receiving extra expenditure → target groups with *higher densities, stronger preferences*;

Higher the higher the *discount factor, office payoff, and own valuation* of favorite expenditure are.
Implications

1. Pork barrel might occur in equilibrium for signaling purposes in majoritarian systems
2. Pork barrel for signaling purposes occurs less towards the preference group with the most heterogeneous ideology
3. Pork barrel with signaling purposes occurs less when a politician is a "lame duck" and when the politician’s discount factor is high
Testing the Implications

1. Is there evidence of pork barrel policies in environmental expenditures in US states?

2. Less pork barrel in environmental expenditures when environmentally biased voters are more ideologically dispersed.

3. Compare distortions when incumbent is "lame duck" and when there is a term limit imposed in the state (even if not binding for next elections) - discount factor.
Variable Measurement: Pork Barrel

Pork Barrel Environmental Expenditure

- Excess expenditure in environment that occurs in election years as compared to politician’s preference (average)
  - Relative difference from politician mean in state $i$ year $t$:
    
    \[ \text{deviation}_{ipt} = \frac{\text{envexp}_{ipt} - \text{average}_{ip}}{\text{average}_{ip}} \]

Variable Measurement: Ideological Dispersion

- Include surveys that have both environmental preferences and ideology: 1983/2006/2007
- Respondents: 4824 representative at state level (weighted)
- Index of environmental preference created from survey reply $envbias_i \rightarrow$ Positively correlated with percentage of population member environmental organizations

Voters’ Ideological Dispersion at state level: $totdisp_i$

- Dispersion index at state level created from questions on voters self classification into conservative/moderate, does not think in these terms/liberal
- Use standard deviation

Environmental Voters’ Ideological Dispersion at state level: $envdisp_i$

- Classify voters into environmentally or non-environmentally biased and calculate dispersion index for each: $disp_i = \frac{envdisp_i}{totdisp_i}$
Variable Measurement: Ideological Dispersion Index
Basic Empirical Specification

\[ \text{deviation}_{ipt} = \alpha_1 + \delta \text{elyear}_{it} + \alpha_2 X_{it} + \rho_t + \eta_i + \epsilon_{it} \]

- \text{deviation}_{ipt}: Relative deviation from politician mean in state \( i \) year \( t \)
- \text{elyear}_{i}: Dummy equal to 1 if election year in state \( i \)
- \( X_{it} \): Vector of economic and demographic variables in year \( t \) state \( i \) affecting environmental expenditures (includes tax revenues, income, population under 17 and over 65, and total state population)
- \( \eta_i \): State individual effect
- \( \rho_t \): Year fixed effects
- \( \epsilon_{it} \): Error term
### Table: Basic Model Results

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) OLS</th>
<th>(2) FE</th>
<th>(3) FE</th>
<th>(4) FE</th>
<th>(5) GMM</th>
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<td>deviation&lt;sub&gt;it&lt;/sub&gt;</td>
<td>0.419***</td>
<td>0.528***</td>
<td>0.0466</td>
<td>0.0486</td>
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<td>65&lt;sub&gt;it&lt;/sub&gt;</td>
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<td>0.0320</td>
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<td>pop&lt;sub&gt;it&lt;/sub&gt;</td>
<td>-0.0533</td>
<td>-0.0305</td>
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<td>Constant</td>
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<td>-0.0879***</td>
<td>-0.173</td>
<td>-0.335</td>
<td>-0.0492</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Observations</td>
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<td>1,488</td>
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<td>1,440</td>
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<td>R-squared</td>
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<td>0.066</td>
<td>0.079</td>
<td>0.240</td>
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<td>AR1</td>
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<td>AR2</td>
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<td>p-value</td>
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<td>Hansen</td>
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<td>p-value</td>
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</table>

Robust standard errors clustered by state in parentheses. Dependent variable $\text{deviation}_{it}$. Significance level at which the null hypothesis is rejected: ***1%, **5%, *10%.
Table: Restricted Sample

<table>
<thead>
<tr>
<th>Sample</th>
<th>(1)</th>
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<tbody>
<tr>
<td>Sample</td>
<td>Full</td>
<td>Restricted</td>
<td>Dem</td>
<td>No Ideo</td>
<td>Competition</td>
</tr>
<tr>
<td>e\text{year}_{it}</td>
<td>0.0386***</td>
<td>0.0686***</td>
<td>0.0626***</td>
<td>0.0361***</td>
<td>0.0335***</td>
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<tr>
<td></td>
<td>(0.00855)</td>
<td>(0.0153)</td>
<td>(0.0145)</td>
<td>(0.00853)</td>
<td>(0.0108)</td>
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<tr>
<td>Time Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>State Time Trend</td>
<td>Yes</td>
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<td>Observations</td>
<td>1,488</td>
<td>514</td>
<td>821</td>
<td>1,466</td>
<td>929</td>
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<tr>
<td>R-squared</td>
<td>0.135</td>
<td>0.112</td>
<td>0.142</td>
<td>0.076</td>
<td>0.100</td>
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<td>Number of states</td>
<td>48</td>
<td>37</td>
<td>48</td>
<td>48</td>
<td>48</td>
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</table>

Robust standard errors clustered by state in parentheses. Dependent variable deviation$_{it}$

Significance level at which the null hypothesis is rejected: ***1%, **5%, *10%.
### Table: Dispersion, Re-election and Discounting

<table>
<thead>
<tr>
<th>Sample</th>
<th>(1) Full</th>
<th>(2) Democrats</th>
<th>(3) Full</th>
<th>(4) No Lame</th>
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<tr>
<td>$elyear_{it}$</td>
<td>0.0292</td>
<td>0.121***</td>
<td>0.0412***</td>
<td>0.0347**</td>
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<td></td>
<td>(0.0275)</td>
<td>(0.0394)</td>
<td>(0.0104)</td>
<td>(0.0149)</td>
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<td>$disp_i \times elyear_{it}$</td>
<td>0.0119</td>
<td>-0.0619*</td>
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<tr>
<td></td>
<td>(0.0276)</td>
<td>(0.0362)</td>
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<td>$lame_{it}$</td>
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<td>0.0704***</td>
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<td></td>
<td></td>
<td>(0.0209)</td>
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<td>$lame_{it} \times elyear_{it}$</td>
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<td>-0.00409</td>
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<tr>
<td></td>
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<td>(0.0173)</td>
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<td>$limit_{it}$</td>
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<td></td>
<td>-0.0316</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0283)</td>
<td></td>
</tr>
<tr>
<td>$lame_{it} \times elyear_{it}$</td>
<td></td>
<td></td>
<td>0.0262</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0207)</td>
<td></td>
</tr>
</tbody>
</table>

Time Effects: Yes, Yes, Yes, Yes
Observations: 1,488, 821, 1,488, 1,100
R-squared: 0.080, 0.143, 0.102, 0.097
Number of states: 48, 48, 48, 47

Robust standard errors clustered by state in parentheses.
Significance level at which the null is rejected: ***1%, **5%, *10%.
Conclusion

- Simple electoral competition model rationalizing pork barrel as a preference signaling tool
- Conditions under which electoral pork occurs in equilibrium
- Empirical evidence suggests pork barrel with signaling purposes occurs in US state environmental policy
- Implications for theoretical models of electoral competition
- New insights into the political economy of environmental expenditures
- Expenditures might be increasing without efficiency or real commitment towards environmental stringency; unnecessary volatility in environmental policy.
Thanks!

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Literature

Pork Barrel and Electoral Competition

▶ Full commitment & forward looking voters (Lizzeri and Persico, 2001; Persson and Tabellini, 2000)
▶ No commitment & backward looking voters (Persson and Tabellini, 2000)
▶ Signaling:
  ▶ Competence (Rogoff and Sibbert, 1988; Rogoff, 1990)
  ▶ Preferences (Drazen and Eslava, 2012; Morelli and Van Weelden, 2013)

Political Economy of Environmental Spending

▶ Secondary policy issues & electoral incentives, all term (List and Strum, 2006)
▶ Politicians office or policy motivated (Friedksson et al 2011)
Voters derive utility from the national level good, and their favorite issue.

\[ U_{i,t}(q_t^i) = \mu_i g_{i,t} + \nu(G_t), g_i = \{1, 0\} \]

Voters have **ideological preferences** \((\delta + \sigma^j)\)

- \(\delta\) is the general popularity of the challenger; \(\delta \sim U \left[-\frac{1}{2Z}, \frac{1}{2Z}\right]\).
- \(\sigma^j\) is the individual ideology of voter \(j\) of group \(i\); \(\sigma^j \sim U \left[-\frac{1}{2}d^i + \overline{\sigma}, \frac{1}{2}d^i + \overline{\sigma}\right]\).
Incumbent Politician

Politician of type $k$ chooses policy to maximize two-period utility function, which depends on:

- **Period 1 utility**

  \[ U_{k,t}^I(q_t^I) = u_{k,t}^I(q_t^I) + \gamma = \mu_k g_{k,t} + \nu(G) + \gamma, \quad g_k = \{1, 0\} \]

- **On probability of re-election $\pi$**

- **Expected utility in 2 if Challenger elected**: $E \left[ u(q_{t+1}^C) \right]$
Voting behavior

Voters want to maximize period 2 utility; so vote for the politician that is more likely to be of their type, conditional on ideological bias. Voter \( j \) in group \( i \) votes for

\[
E \left[ U_i(q^I) \right] \geq E \left[ U_i(q^C) \right] - (\delta + \sigma^j)
\]

Voters’ beliefs

- Prior probability politician is of \( i \) type: \( \lambda_i^P, P = I, C. \)
- Bayesian updating
Ideological Distribution

Figure: Ideological Distribution of Voters

Closer to Incumbent’s Ideology  Closer to Challenger’s Ideology
Definition:

A Perfect Bayesian Equilibrium in this setting satisfies the following conditions:

(a) In the first period, the incumbent decides on the fiscal policy \( q^I_t \) that maximizes her two period utility given by (4), subject to the belief system given by the priors and bayesian updating, her expected popularity, and the optimal strategies of voters;

(b) At the voting stage, voters in each group \( i \) maximize their expected utility, subject to the belief system and the incumbent’s first period decisions, and therefore vote for the incumbent if \( E[U_i(q^I_{t+1})] > E[U_i(q^C_{t+1})] + (\delta + \sigma^j) \);

(c) Beliefs are consistent on the equilibrium path.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Expenditures</td>
<td>27.058</td>
<td>16.983</td>
<td>6.119</td>
<td>168.297</td>
<td>1488</td>
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<tr>
<td>Fish &amp; Game</td>
<td>6.836</td>
<td>6.697</td>
<td>0.515</td>
<td>52.086</td>
<td>1488</td>
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<tr>
<td>Forests</td>
<td>11.522</td>
<td>6.712</td>
<td>0.560</td>
<td>58.666</td>
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<tr>
<td>Other Environmental Deviation</td>
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<td>0.164</td>
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<td>Governor Average Environmental Taxes</td>
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<td>16.145</td>
<td>7.741</td>
<td>131.845</td>
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<td>Taxes in State</td>
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<td>0.219</td>
<td>0.316</td>
<td>1.731</td>
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<td>Personal Income</td>
<td>12.914</td>
<td>2.537</td>
<td>6.745</td>
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<td>Total Expenditures</td>
<td>1.454</td>
<td>0.393</td>
<td>0.669</td>
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<td>State Population in millions</td>
<td>4.956</td>
<td>5.191</td>
<td>0.334</td>
<td>34.002</td>
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<tr>
<td>Percentage between 5-17</td>
<td>0.209</td>
<td>0.029</td>
<td>0.071</td>
<td>0.304</td>
<td>1488</td>
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<tr>
<td>Percentage over 65</td>
<td>0.118</td>
<td>0.02</td>
<td>0.04</td>
<td>0.188</td>
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<td>Election</td>
<td>0.277</td>
<td>0.448</td>
<td>0</td>
<td>1</td>
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<td>Lame Duck</td>
<td>0.261</td>
<td>0.439</td>
<td>0</td>
<td>1</td>
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<td>Term Limits</td>
<td>0.606</td>
<td>0.489</td>
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<td>Democrat</td>
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<td>Democratic vote</td>
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<td>State Ideological Dispersion</td>
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<td>0.748</td>
<td>0.773</td>
<td>5.581</td>
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</tbody>
</table>

Sources: List and Sturm (2006) and ICPSR.
Monetary variables expressed in real \textit{per capita} dollars.
Deviations and Election Years

![Graph showing deviations and election years]

- Relative Deviation
- Elections

Year:
- 1970
- 1980
- 1990
- 2000

Relative Deviation:
- 0
- 10
- 20
- 30
- 40

Elections:
- −1
- −.5
- 0
- .5
- 1

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Robustness: Other Variables

Table: Robustness: Different Dependent Variable

<table>
<thead>
<tr>
<th>Sample</th>
<th>Deviation Percentage</th>
<th>Total Expenditures</th>
<th>Environment Percentage</th>
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<td>elyear_{it}</td>
<td>0.0548*</td>
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<td>-0.000922</td>
</tr>
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<td></td>
<td>(0.0302)</td>
<td>(0.0348)</td>
<td>(0.00373)</td>
</tr>
<tr>
<td>Time Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>821</td>
<td>514</td>
<td>821</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.079</td>
<td>0.069</td>
<td>0.912</td>
</tr>
<tr>
<td>Number of states</td>
<td>48</td>
<td>37</td>
<td>48</td>
</tr>
</tbody>
</table>

Robust standard errors clustered by state. P-values in parentheses. Significance level at which the null is rejected: ***1%, **5%, *10%.