

# Pork-Barrel Politics and Polarization

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## Abstract

This paper theoretically explores how pork-barrel spending shapes the ideological composition of elected officials in Congress. Relative to the classic median voter theorem, this paper analyzes multiple legislative districts and modifies preferences to include a desire for local earmarks in addition to ideology. I show that competition among politicians to “bring home the bacon” substantially reduces Congressional polarization.

**Keywords:** Elections; Polarization; Earmarks; Ideology; Voting

**JEL Classification Numbers:** D72, E62, D78, H41

## 1 Introduction

An abundance of research, not to mention casual observation, suggests that political polarization has increased dramatically in the United States over the past few decades.<sup>1</sup> Putting aside any high-minded concerns regarding this development, there is ample reason to believe that increasing polarization poses problems for the policy-making process and the economy more broadly. For example, Mian, Sufi and Trebbi (2014) provide evidence from a large sample of countries showing that, following a financial crisis, heightened ideological polarization weakens ruling coalitions and

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<sup>1</sup>For example, see Boxell, Gentzkow and Shapiro (2017), Gentzkow, Shapiro and Taddy (2017), Autor, Dorn, Hanson and Majlesi (2017), and Martin and Yurukoglu (2017).

creates legislative gridlock that hampers reform efforts. Furthermore, Baker, Bloom, Canes-Wrone, Davis and Rodden (2014) attribute a substantial rise in U.S. policy uncertainty to political polarization. Demonstrating economic harm, Azzimonti (2017) establishes that higher partisan conflict has depressed U.S. aggregate investment.

Recently, a smattering of voices from across the political spectrum has blamed some of the partisan sniping in Washington, DC on the earmark ban that was instituted in 2011 and which remains in effect today. Even President Trump reminisced on the pre-ban days of when lawmakers “went out to dinner at night, and they all got along, and they passed bills.” By contrast, the number of bills passed into law immediately following the moratorium dropped to its lowest level in twenty years.<sup>2</sup> There are, naturally, plenty of reasons why voters expressed their indignation about lawmakers’ pet projects, like the \$400 million “Bridge to Nowhere” which ended up never being built because of the ensuing uproar. However, by banning earmarks, Congress also removed one of its major sources of leverage to enforce party discipline, as described in Grossman and Helpman (2005). In the absence of this pork-barrel funding, there is less that the leadership in either political party can do to temper the ideological extremes in their caucuses.

This paper explores the theoretical relationship between pork-barrel spending and Congressional polarization. I consider an environment with multiple districts where voters have a preference both for ideological compatibility with their elected legislator and for greater earmark spending in their district. Once elected, legislators who are closer to the ideological mean of *Congress* receive a greater share of pork-barrel funding, regardless of the overall distribution of voter ideologies. The median voter in each district balances ideology with the ability to “bring home the bacon” when selecting the winning political candidate, taking as given what happens elsewhere. I tractably characterize the equilibrium and show that earmarks significantly compress the ideological distribution of Congress relative to that of the population.

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<sup>2</sup>A deeper analysis is required to determine whether this correlation represents causation.

## 2 The Model

Consider an environment with  $n$  legislative districts,  $\{1, 2, \dots, n\}$ , where the median voter in district  $i$  has ideology  $\mu_i \in [0, 1]$  in a one-dimensional issue space. As in the classic median voter theorem, voters care about how closely the ideology of their elected official,  $x_i$ , aligns with their own views. However, voters also value earmarks spent in their district,  $t_i$ . I assume that  $t_i$  is the *net transfer* to district  $i$ , which implies that  $t_i$  may be either positive or negative. Voter preferences over ideology and pork-barrel funds are given by

$$U(x_i, t_i; \mu_i) = \beta t_i - (1 - \beta)(x_i - \mu_i)^2, \quad (1)$$

where  $\beta \in [0, 1]$  is the relative weight placed on earmarks.

### 2.1 Competition for Earmarks

After an election, earmarks are awarded disproportionately to elected officials who are closest to the unweighted ideological mean of the legislature,  $\bar{x}$ , regardless of the allocation of voters to legislative districts.<sup>3</sup> For example, in the United States federal government, the population of each state impacts its representation in the House but not in the Senate. In addition, I impose two other restrictions on earmarks. First, because earmarks are the net fiscal transfer to each district, they must sum to zero, i.e.  $\sum_i t_i(\{x_j\}_{j=1}^n) = 0$ . Second, I assume that identical districts are treated identically, i.e.  $t_i(x_i, \mathbf{x}_{-i}; \bar{x}) = t_j(x_j, \mathbf{x}_{-j}; \bar{x})$  whenever  $x_i = x_j$ , where  $\mathbf{x}_{-i} \equiv \{x_k\}_{k \neq i}$ . To be concrete, I assume the following function:

$$t_i(\mathbf{x}; \bar{x}) = \frac{1}{n-1} \sum_{j \neq i} (x_j - \bar{x})^2 - (x_i - \bar{x})^2, \quad (2)$$

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<sup>3</sup>This assumption is consistent with a wide body of theoretical and empirical work summarized in Alexander, Berry and Howell (2016).

where the coefficient  $\frac{1}{n-1}$  ensures that net transfers sum to zero.<sup>4</sup>

Intuitively, this formula states that legislators who deviate substantially from the average position of their colleagues receive fewer pork-barrel funds, perhaps because they have less influence or do not “go along to get along.” To reiterate, this arrangement stands in contrast to one in which legislators are punished for straying from the mainstream of *voters*. Here, a conservative (liberal) Congress would not punish members simply for sitting ideologically to the right (left) of the population at large.

## 2.2 Election Outcomes

Given  $k_i$  candidates, the median voter in district  $i$  chooses the winner by solving

$$\max_{x_i \in \{x_i^1, x_i^2, \dots, x_i^{k_i}\}} U(x_i, t_i(\mathbf{x}; \bar{x}); \mu_i) \quad (3)$$

Note that, in general, the presence of a finite number of candidates makes this problem discrete and not amenable to solving with first-order conditions. However, if candidates are first able to choose their position and only care about winning, then in a subgame perfect equilibrium, the winner stakes their ideological claim exactly where the median voter’s first-order condition is satisfied.

## 3 Results

This section solves for the electoral equilibrium and analyzes how earmarks affect the ideological composition of Congress. For general  $U_i(x_i, t_i; \mu_i)$  and  $t_i(\mathbf{x}; \bar{x})$ , the first-order condition of the median voter is

$$0 = \frac{\partial U}{\partial x_i} + \frac{\partial U}{\partial t_i} \left( \frac{\partial t_i}{\partial x_i} + \frac{1}{n} \frac{\partial t_i}{\partial \bar{x}} \right), \quad (4)$$

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<sup>4</sup>An equivalent formulation of the earmark function is  $t_i(\mathbf{x}; \bar{x}) = \text{var}(\mathbf{x}) - \frac{n}{n-1}(x(i) - \bar{x})^2$ . Also, none of the results change if transfers sum to a constant other than zero.

where the  $1/n$  term comes from the impact of changes to  $x_i$  on the legislator mean  $\bar{x}$ .

For specific functions (1) and (2), the terms in (4) become

$$\begin{aligned}\frac{\partial U}{\partial x_i} &= -2(1 - \beta)(x_i - \mu_i) \\ \frac{\partial U}{\partial t_i} &= \beta \\ \frac{\partial t_i}{\partial x_i} &= -2(x_i - \bar{x}) \\ \frac{\partial t_i}{\partial \bar{x}} &= \frac{-2 \sum_{j \neq i} x_j}{n - 1} + 2x_i\end{aligned}$$

Substituting these terms into (4) gives the final first-order condition,

$$0 = -2(1 - \beta)(x_i - \mu_i) + \beta \left\{ -2(x_i - \bar{x}) + \frac{1}{n} \left[ \frac{-2 \sum_{j \neq i} x_j}{n - 1} + 2x_i \right] \right\}.$$

A bit of algebra gives the ideological position of the winner in district  $i$ :

$$x_i = \left( \frac{1 - \beta}{1 - \beta + \beta \left( \frac{n-2}{n} \right)} \right) \mu_i + \left( \frac{\beta \left( \frac{n-2}{n} \right)}{1 - \beta + \beta \left( \frac{n-2}{n} \right)} \right) \bar{x}_{-i}, \quad (5)$$

where  $\bar{x}_{-i}$  is the ideological average of the elected officials outside district  $i$ .

Note that  $x_i = \mu_i$  if voters only care about ideology (i.e.  $\beta = 0$ ), as one would expect. Similarly, if voters only value earmarks, then  $x_i = \bar{x}_{-i}$ . Therefore, pork-barrel spending causes the elected official from district  $i$  to have an ideology in between that of the median voter in district  $i$  and the average of the other legislators. Before discussing the Nash equilibrium in section 3.2, the analysis can be simplified by examining the limit case with infinitely many legislative districts.

### 3.1 Limit Analysis

As  $n \rightarrow \infty$ , the median voter's choice of winning candidate simplifies to

$$x_i = (1 - \beta)\mu_i + \beta\bar{x}, \quad (6)$$

where  $\overline{x_{-i}} = \bar{x}$  in the limit.

From this equation, the legislator mean  $\bar{x}$  must satisfy

$$\bar{x} = (1 - \beta)\bar{\mu} + \beta\bar{x},$$

which readily implies that  $\bar{x} = \bar{\mu}$ .

Therefore, legislator ideology in district  $i$  is

$$x_i = (1 - \beta)\mu_i + \beta\bar{\mu}. \tag{7}$$

In words, the ideology of district  $i$ 's elected official is a weighted average of the median voter in district  $i$  and the average of median voters across all of the districts. Thus, while pork-barrel spending has no impact on *average* legislator ideology, theorem 1 shows that it reduces ideological *variance* relative to the population.

**Theorem 1 (Earmarks Reduce Partisanship)** *A preference for pork-barrel spending, i.e.  $\beta > 0$ , reduces ideological variance in Congress:*

$$\frac{\text{var}(x)}{\text{var}(\mu)} = (1 - \beta)^2 < 1. \tag{8}$$

**Proof.** The result follows directly from equation 7. ■

### 3.2 The Finite Case

With a finite number of legislative districts, the election outcome is determined by the static Nash equilibrium of the game where each of the  $n$  median voters select their preferred candidate according to equation (4), taking as given what occurs in the districts outside their own. Mathematically, the vector of legislator ideologies  $\mathbf{x}$

solves the following system of equations:

$$\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} = (1 - \alpha(n)) \begin{bmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_n \end{bmatrix} + \alpha(n) \begin{bmatrix} \frac{1}{n-1} \sum_{j \neq 1} x_j \\ \frac{1}{n-1} \sum_{j \neq 2} x_j \\ \vdots \\ \frac{1}{n-1} \sum_{j \neq n} x_j \end{bmatrix} \quad (9)$$

where  $1 - \alpha(n)$  is the coefficient on  $\mu_i$  in equation (5). Theorem 2 explicitly solves for the equilibrium given arbitrary  $n$ .

**Theorem 2 (Electoral Equilibrium)** *The equilibrium vector of legislator ideologies is given by*

$$\mathbf{x} = (1 - \theta)\boldsymbol{\mu} + \frac{\theta}{n-1} (\mathbf{P} - \mathbf{I}) \boldsymbol{\mu}, \quad (10)$$

where  $\theta = \frac{(n-1)\alpha(n)}{n-1+\alpha(n)} = \frac{\beta(n-2)(n-1)}{n(n-1-\beta)}$ ,  $\mathbf{P}$  is an  $n \times n$  matrix of ones, and  $\mathbf{I}$  is the  $n \times n$  identity matrix.

**Proof.** The expression (9) can be written in matrix form as

$$\mathbf{x} = (1 - \alpha(n))\boldsymbol{\mu} + \left( \frac{\alpha(n)}{n-1} \right) (\mathbf{P} - \mathbf{I})\mathbf{x}.$$

Collecting all the  $\mathbf{x}$  terms gives

$$\left[ \frac{-\alpha(n)}{n-1} \mathbf{P} + \left( 1 + \frac{\alpha(n)}{n-1} \right) \mathbf{I} \right] \mathbf{x} = (1 - \alpha(n))\boldsymbol{\mu},$$

which, after some algebra, is equivalent to

$$[b\mathbf{P} + (a - b)\mathbf{I}] \mathbf{x} = (n-1)(1 - \alpha(n))\boldsymbol{\mu},$$

where  $b = -\alpha(n)$  and  $a = n - 1$ .

Inverting the matrix on the left gives the equilibrium legislator ideologies,

$$\mathbf{x} = [b\mathbf{P} + (a - b)\mathbf{I}]^{-1} (n-1)(1 - \alpha(n))\boldsymbol{\mu},$$

where it can be shown that

$$[b\mathbf{P} + (a - b)\mathbf{I}]^{-1} = \frac{-b}{(a - b)(nb + a - b)}\mathbf{P} + \frac{1}{a - b}\mathbf{I}.$$

Substituting this expression into the previous equation gives

$$\mathbf{x} = \left[ \frac{\alpha(n)}{n - 1 + \alpha(n)}\mathbf{P} + \frac{(n - 1)(1 - \alpha(n))}{n - 1 + \alpha(n)}\mathbf{I} \right] \mu.$$

Lastly, defining  $\theta = \frac{(n-1)\alpha(n)}{n-1+\alpha(n)}$  and doing some algebra completes the proof. ■

The scalar representation of equation (10) makes it clear that the ideology of each legislator is the the convex combination of the ideology of the median voter in their district and the average of the ideologies of the median voters everywhere else:

$$x_i = (1 - \theta)\mu_i + \theta\overline{\mu}_{-i}. \quad (11)$$

### 3.3 A Numerical Example

To provide further intuition, I simulate some numerical examples with  $n = 435$  legislative districts, just as in the U.S. House of Representatives. Figure 1 shows different scenarios for the equilibrium ideological distribution of Congress compared to that of voters. In the top row, I randomly draw voter ideologies from a truncated normal distribution and compute the electoral equilibrium. In the left panel, I consider the case where voters place a relatively low weight on earmarks,  $\beta = 0.33$ . Even in this scenario, the presence of earmarks compresses the ideological distribution of Congress. In the right panel, I increase the weight to  $\beta = 0.67$ , which markedly squeezes the Congressional ideological distribution still further. In the bottom row, I repeat the exercise for a bimodal voter distribution, and similar lessons emerge.



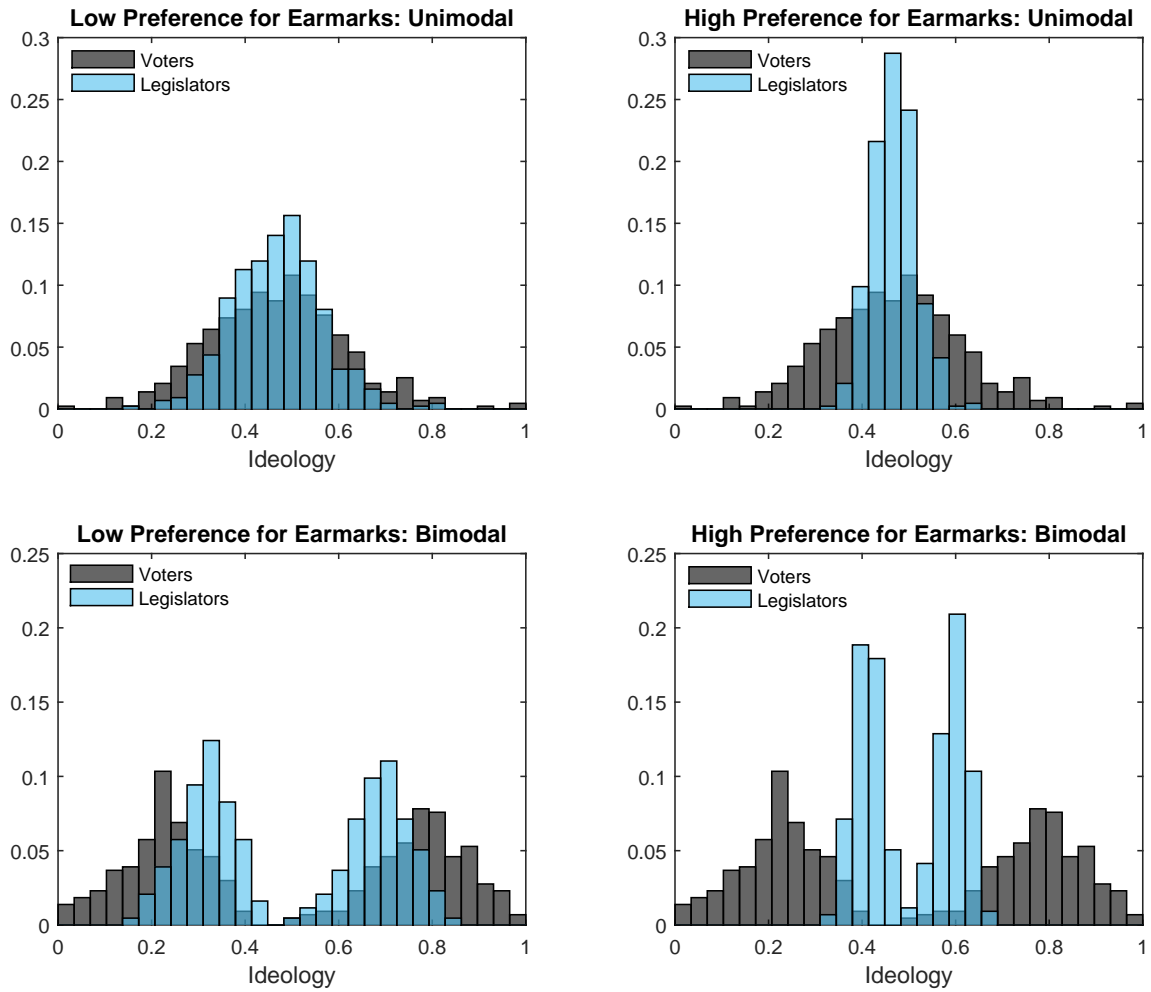


Figure 1: (Left Column) Weight  $\beta = 0.33$ . (Right Column) Weight  $\beta = 0.67$ .

## 4 Conclusions

By creating competition for “pet project” funding between elected officials across legislative districts, the earmarking process has the potential to reduce ideological polarization in Congress. However, there are several issues I abstract from in this analysis—particularly regarding the details of political institutions—that caution against making any policy recommendations. For example, the presence of two dominant political parties possessing well-established institutional power may produce different outcomes than would a parliamentary system in which numerous small parties continuously jockey for control. I leave this issue and others for future work.

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