# Pork-Barrel Politics and Polarization

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March 6, 2018

### 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.[1] 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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[1]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 (2018) 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.[2] 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.
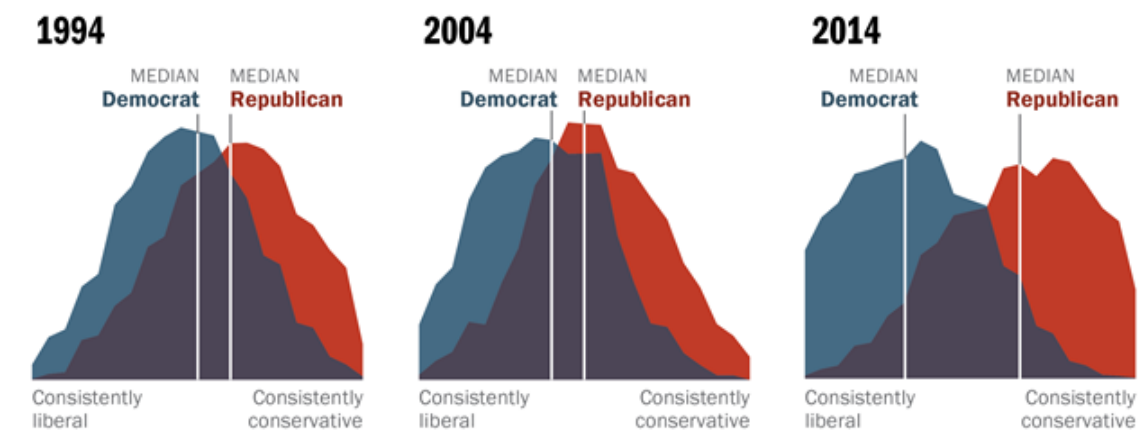
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[2]A deeper analysis is required to determine whether this correlation represents causation.

# 2 Empirical Trends



## Democrats and Republicans More Ideologically Divided than in the Past

*Distribution of Democrats and Republicans on a 10-item scale of political values*

**1994**     **2004**     **2014**

MEDIAN **Democrat**   MEDIAN **Republican**

Consistently liberal    Consistently conservative

Source: 2014 Political Polarization in the American Public
Notes: Ideological consistency based on a scale of 10 political values questions (see Appendix A). The blue area in this chart represents the ideological distribution of Democrats; the red area of Republicans. The overlap of these two distributions is shaded purple. Republicans include Republican-leaning independents; Democrats include Democratic-leaning independents (see Appendix B).

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Figure 1: Evidence of rising voter polarization over the past two decades.

A recent Pew Research study by Dimock, Doherty, Kiley and Oates (2014) documents the increasing polarization of the American electorate. As seen in figure 1, the amount of overlap between Democratic and Republican voters has fallen dramatically since the mid-1990s. Back in 1994, 36% of Republicans were to the political left of the median Democrat, and 30% of Democrats were to the right of the median Republican. In 2004, those measures of ideological overlap fell to 8% and 6%, respectively. Furthermore, the data shows that polarization has *accelerated* over the past decade.

This heightened polarization has also crossed over into legislatures. Figure 2 shows the time series for DW-NOMINATE, which is a commonly used index of polarization used by political scientists stemming from the work of Poole and Rosenthal (1984). At the federal level, the left panel shows that ideological polarization has increased in both the U.S. House and Senate, with a notable acceleration over the past 15 years.
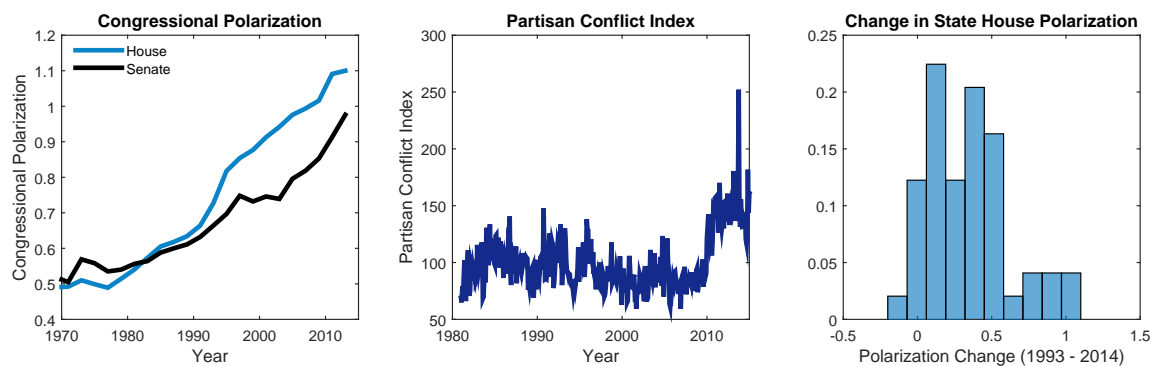
Figure 2: (Left) Partisan DW-NOMINATE spread. (Middle) Philadelphia Fed partisan conflict index. (Right) Change in Shor-McCarty state polarization 1993–2014.

Based on the work of Azzimonti (2018), the Philadelphia Federal Reserve maintains a measure of U.S. political disagreement called the "Partisan Conflict Index," which exhibits a notable rise starting in the late 2000s. State legislatures have not been immune to these political winds either. Using data from the Project Vote Smart National Political Awareness Test (NPAT), Shor and McCarty (2011) develop a state-level index of polarization. The right panel of figure 2 plots the histogram of changes in this index across the states between 1993 and 2014, and in the overwhelming majority of states, polarization has increased. Using a different methodology, Andris, Lee, Hamilton, Martino, Gunning and Selden (2015) show that partisan division has increased in the U.S. Congress while cross-party collaboration has fallen. Figure 3 gives a visual representation of these striking trends.

As polarization has gone up, measures of federal legislative productivity have fallen. As documented in figure 4, the number of bills passed by the U.S. Senate has exhibited a downward trend since the 1970s, and McCarty (2016) shows that legislative delays for appropriations bills have risen substantially. McCarty (2016) also runs counterfactuals and predicts that, had polarization remained constant, the passage of Mayhew laws—a measure of landmark legislation—would have been considerably higher over the past twenty years. In each of these cases, the decline in legislative productivity appears to have accelerated in the late 2000s.
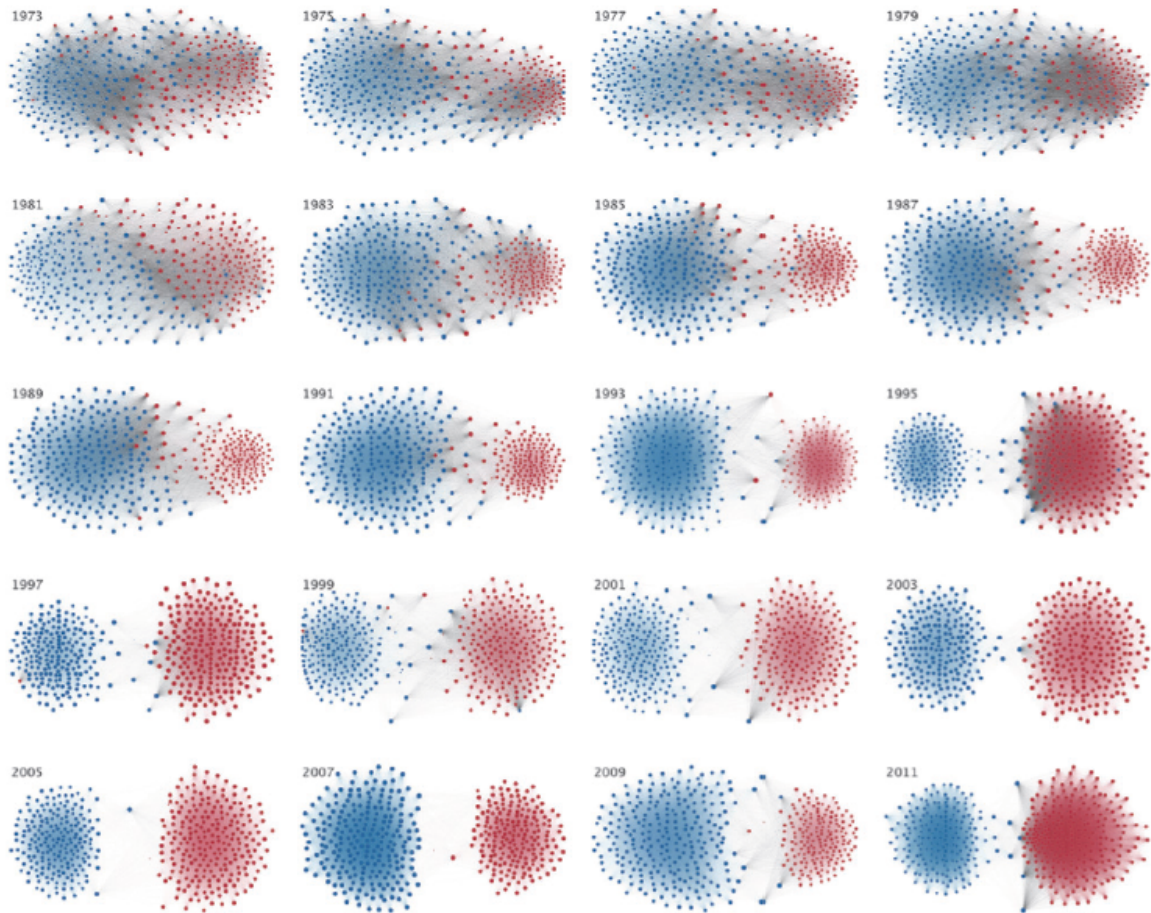
Figure 3: Partisan division in the U.S. Congress. Source: Andris et al. (2015).
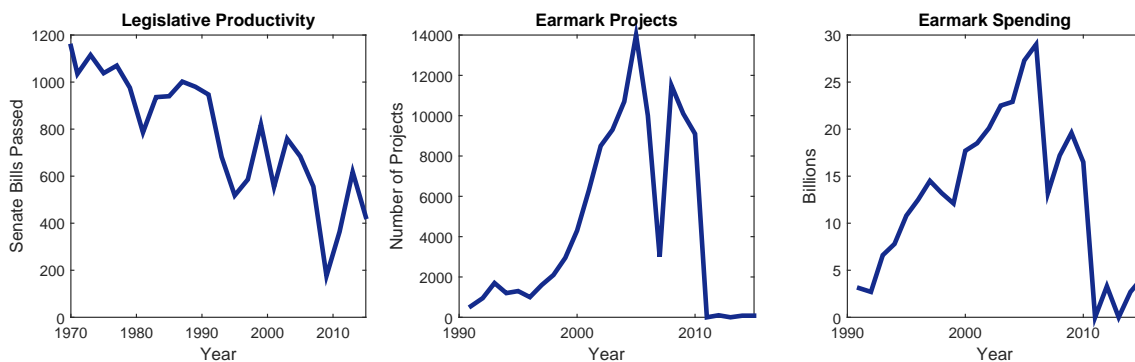
Figure 4: (Left) Number of bills passed by the US Senate. (Middle) CAGW measure of earmark project count. (Right) CAGW measure of earmark spending.

In fact, from the mid-1990s to the mid-2000s, legislative productivity actually temporarily stabilized. According to data from the organization Citizens Against Government Waste, figure 4 shows that spending on earmark projects escalated dramatically during this interlude. However, in response to voter backlash, Congress eventually instituted a one-year moratorium on earmarks in 2007 followed by a ban in 2011 that remains in effect today.

The next section formalizes a model where competition over pet project funding moderates the ideological distribution of elected officials relative to the voter population. However, if voter preferences change over time in a way that places more weight on ideology over elected officials' ability to "bring home the bacon," earmarks lose their salience and legislative polarization rises. In this sense, the outcry over earmarks and subsequent ban is a natural consequence of more ideological voting.

# 3 The Model

Consider an environment with $n$ legislative districts, $\{1, 2, \ldots, n\}$, 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

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

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

## 3.1   Competition for Earmarks

After an election, earmarks are awarded disproportionately to elected officials who are closest to the unweighted ideological mean of the legislature, $\overline{x}$, regardless of the allocation of voters to legislative districts.[3] 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. $t_i(x_i, \mathbf{x}_{-i}; \overline{x}) = t_j(x_j, \mathbf{x}_{-j}; \overline{x})$ whenever $x_i = x_j$, where $\mathbf{x}_{-i} \equiv \{x_k\}_{k \neq i}$. To be concrete, I assume the following function:

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

where the coefficient $\frac{1}{n-1}$ ensures that net transfers sum to zero.[4]

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

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

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

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.

## 3.2 Election Outcomes

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

$$\max_{x_i \in \{x_i^1, x_i^2, \ldots, x_i^{k_i}\}} U(x_i, t_i(\mathbf{x}; \overline{x}); \mu_i) \tag{3}$$

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.

# 4 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 $t_i(\mathbf{x}; \overline{x})$, the first-order condition of the median voter is

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

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

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

$$\frac{\partial U}{\partial x_i} = -2(1 - \beta)(x_i - \mu_i)$$

$$\frac{\partial U}{\partial t_i} = \beta$$

$$\frac{\partial t_i}{\partial x_i} = -2(x_i - \overline{x})$$

$$\frac{\partial t_i}{\partial \overline{x}} = \frac{-2\sum_{j \neq i} x_j}{n - 1} + 2x_i$$

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

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

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

$$x_i = \left( \frac{1 - \beta}{1 - \beta + \beta(\frac{n-2}{n})} \right) \mu_i + \left( \frac{\beta(\frac{n-2}{n})}{1 - \beta + \beta(\frac{n-2}{n})} \right) \overline{x_{-i}}, \tag{5}$$

where $\overline{x_{-i}}$ 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 $x_i = \overline{x_{-i}}$. 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 4.2, the analysis can be simplified by examining the limit case with infinitely many legislative districts.

## 4.1 Limit Analysis

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

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

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

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

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

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

Therefore, legislator ideology in district $i$ is

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

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:*

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

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

## 4.2 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 **x**

solves the following system of equations:

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

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*

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

*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

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

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

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

which, after some algebra, is equivalent to

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

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

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

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

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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:

$$x_i = (1-\theta)\mu_i + \theta\overline{\mu_{-i}}. \tag{11}$$

## 4.3   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 5 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.
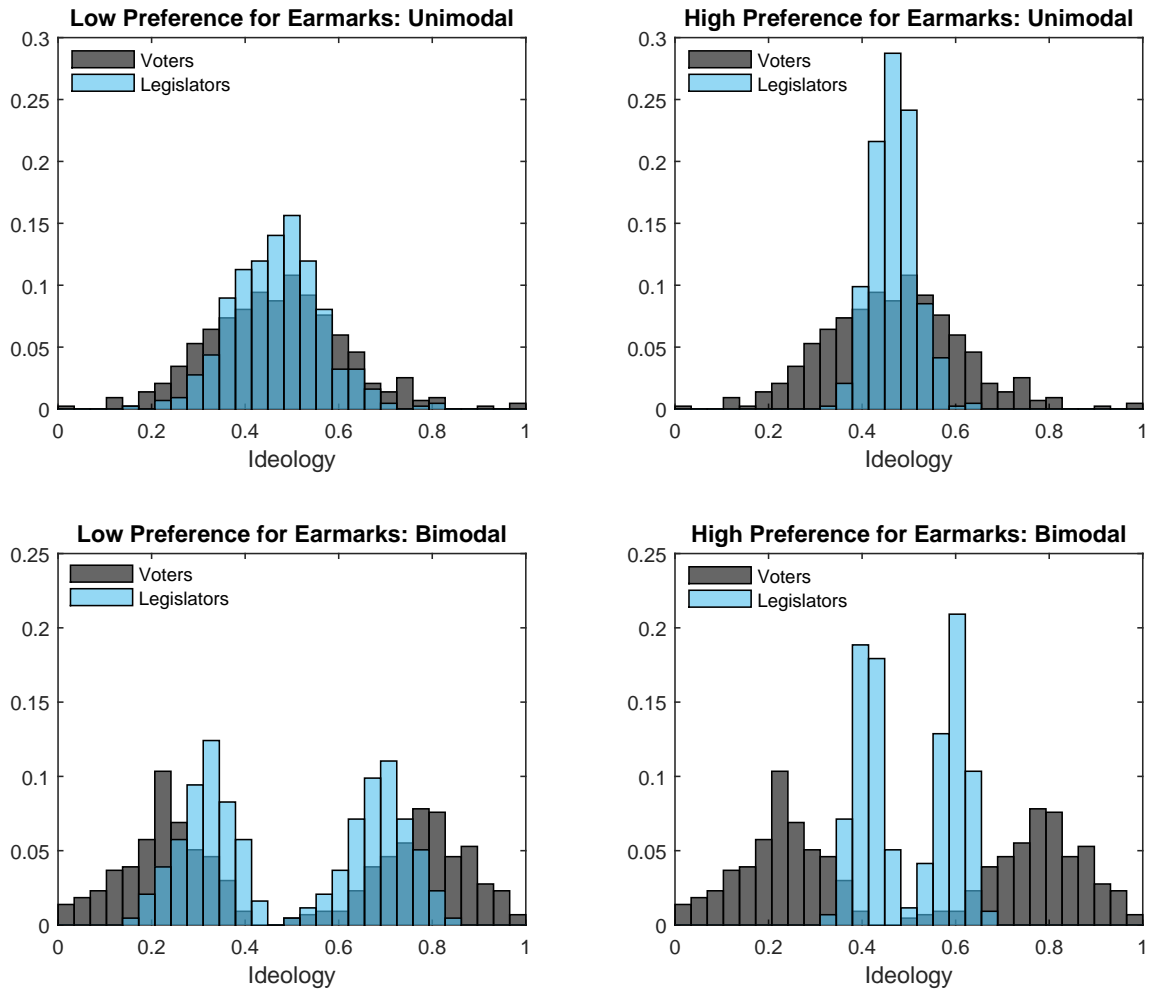
Figure 5: (Left Column) Weight $\beta = 0.33$. (Right Column) Weight $\beta = 0.67$.

# 5 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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