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ABSTRACT

We study budget formation in a model featuring separation of powers. In our model, the legislature designs a budget bill that can include a cap on total spending and earmarked allocations to designated public projects. Each project provides random benefits to one of many interest groups. The legislature can delegate spending decisions to the executive, who can observe the productivity of all projects before choosing which to fund. However, the ruling coalition in the legislature and the executive serve different constituencies, so their interests are not perfectly aligned. We consider settings that differ in terms of the breadth and overlap in the constituencies of the two branches, and associate these with the political systems and circumstances under which they most naturally arise. Earmarks are more likely to occur when the executive serves broad interests, while a binding budget cap arises when the executive's constituency is more narrow than that of the powerful legislators.

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1 Introduction

Separation of powers implies a division of labor among the branches of government. Most notably, this doctrine calls for the legislature to legislate and the executive to execute. The U.S. Constitution is structured this way, vesting authority for lawmaking with the Houses of Congress while charging the President to “take care that the laws be faithfully executed.” A similar division of responsibilities is common to many other presidential systems of government. And even in parliamentary systems, where legislative and executive powers typically are fused, institutions may exist that give some independent decision-making authority to the legislature and primary responsibility for enforcing laws to the agencies. Conflict between the authors and the implementers of the laws can readily arise in parliamentary systems when politics are ruled by coalition or minority governments.

The separation of powers confronts legislators with an important dilemma. The lawmaking body can write detailed statutes that leave little discretion to the agencies and thereby ensure close adherence to its intentions and desires, or it can use more ambiguous language to provide those who enact the laws with latitude to respond to perceived conditions. In other words, a legislature must decide on the optimal degree of *delegation*: Should it exercise its lawmaking powers strictly and rigidly by tailoring specific policies and procedures or should it delegate some aspects of policy making to bureaucrats, who may have greater expertise and access to more current and complete information?

A rich literature has developed that treats theoretically and (to a lesser extent) empirically the legislature’s choice of how much to delegate and in what circumstances. Especially notable are the contributions of Epstein and O’Halloran (1994, 1996, 1999), who formulated a canonical model of delegation that has set the stage for much of what has followed. In their model, the legislature faces a dichotomous choice between delegating authority or not in the formation of some abstract policy. If the legislature chooses to delegate, it sets a baseline policy and a permissible degree of discretion in the face of some unresolved uncertainty. Then the agency, which has a different ideal outcome from the legislature, learns the state of the world and sets policy within the bounds allowed by the law. In the absence of delegation, the legislature directly sets the policy behind a veil of ignorance. This framework has been extended by Ting (2001,2002), Gailmard (2002), Volden (2002), McCarty (2004) and others to include legislative information gathering, executive appointment of bureaucrats, legislative control of agency budgets, executive veto authority, and possible subversion by agencies, among other considerations.¹ In most of this literature, the policy space is treated as unidimensional and the legislature’s and executive’s preferences are described by quadratic losses that result from departures of the policy from their ideal outcomes.²

¹For a survey of the literature on political delegation, see Bendor, Glazer and Hammond (2001).

²An exception is Bender and Meirowitz (2004), who keep the spatial structure of Epstein and O’Halloran,

In this paper, we apply the central ideas of the literature on separation of powers to a particular but important policy problem. Here, we focus on the formation of “the budget,” by which we mean the level of federal spending and its allocation among public projects. By modeling the budgetary process in a stylized but more detailed manner, we are able to derive predictions that go beyond those obtainable by Epstein and O’Halloran and others who have followed their approach. In particular, we treat the budget bill as a law that specifies a maximum amount that the executive can spend and that lists a set of “earmarks,” which are projects to which the executive is bound to devote resources. The various possible projects benefit different “groups” in society, which may be defined by geographic regions of residence or by other shared interests. The legislature and executive have different “constituencies,” which are the sets of groups that they seek to serve with their budget decisions. The amount and allocation of spending is decided by the executive, subject to the constraints imposed by the budget bill, and is financed by a broadly-based poll tax. The executive is assumed to know the productivity of the different possible projects by the time she must decide the actual level of spending and allocate resources, whereas the legislature must formulate its budget bill behind a veil of ignorance.

Our stylized model of the budget process abstracts from important differences in the ways budgets are formed in different polities. For example, a variety of rules and practices govern the timing and sequencing of budget votes; the legislature may first vote on the size of the budget and subsequently consider its composition, or it may vote directly on appropriations, leaving overall budget size to be determined residually (see Ferejohn and Krehbiel, 1987). Rules also may differ on the possibilities and procedures for amending budget proposals (see Baron and Ferejohn, 1989, and Baron, 1991). And the executive branch may play a more or less active role in formulating a budget proposal. We do not wish to minimize the importance of such institutional variation. Indeed, Alesina and Perotti (1999) show, in their survey of the literature on budget institutions, that they do matter for budget outcomes. Rather, we choose to hold constant the budget-setting rules so that we can compare outcomes across political regimes that differ in the extent and nature of the conflict in the objectives of the executive and the legislature. We believe that this is an important source of variation across regimes—although of course not the only such source—and its role can best be assessed by holding other features constant.

In keeping with the approach of O’Halloran and Epstein (1999), Bendor and Meirowitz (2004), and others, we treat the budget bill as an incomplete political contract. That is, we assume that the legislature cannot write a contingent plan that specifies a spending rule for all the different states of the world. This assumption captures the idea that many contingencies are possible and that the legislature cannot enumerate all of the possible eventualities that

but expand the number of policy dimensions, the manner in which uncertainty affects outcomes, and form of the utility functions.

will influence where public funds will be most productively spent. The incompleteness of the contract creates the usual trade-off for the legislature in designing its budget law: By writing a more detailed bill that specifies a long list of earmarked projects and a tight budget cap, the legislature can ensure that government spending targets only its own constituents; but this comes at the cost of making the pattern of spending less responsive to the circumstances that arise. By being explicit about the parameters of the policy statute, we are able to make predictions about whether and in what circumstances a budget cap is likely to bind and whether earmarks will force spending on projects that otherwise would go unfunded.

We associate the interests of the politicians with the welfare of the groups that they seek to represent. While we do not derive these constituencies endogenously, it would be possible to append an electoral stage to our model in order to do so. Notwithstanding the absence of such a link to voting, our approach affords us an opportunity for comparative political analysis. As Huber and Shipan (2002) have emphasized, the political setting and institutional context play important roles in determining the degree of conflict between the legislature and the executive, which in turn colors the incentives for detailed versus flexible legislation. They (like Epstein and O'Halloran) note that divided government is an obvious and empirically important source of policy conflict in presidential systems, whereas the coalitional status of the government affects the degree of such conflict in parliamentary systems. In our analysis, we shall identify the breadth or narrowness of constituencies and the degree of overlap in the groups represented by the different branches as important political variables that shape the contours of budget legislation. We distinguish settings in which the executive's constituency is a subset of the legislature's constituency, and vice versa, as well as situations in which the constituencies overlap. The executive may represent more narrow interests than the legislature in a parliamentary system with a coalition government, as the parliament may act on behalf of all parties included in the coalition, while a minister may pursue primarily his own party's interests. Alternatively, the executive may represent a broader set of interests than the legislature in a presidential system, if the executive is elected nationally, the legislature is elected by region or district, and if a limited set of districts commands the attention and concern of the majority delegation to the legislature (see, for example, Persson and Tabellini, 2000, ch. 10). Finally, overlapping interests is a common outcome in presidential systems when the electoral outcome features a divided government. Then the president from one party and the majority legislative delegation from the other may serve certain groups in common, while catering differentially to other groups that are of political interest to only one party or the other.

The remainder of the paper is organized as follows. In Section 2, we lay out a simple model of the budget process. In this model, the government collects poll taxes and allocates spending to projects that benefit particular groups in society. For simplicity, we assume that each project provides benefits to a single group. The productivity of spending on each

group is random, and the legislature must design the budget bill before the resolution of uncertainty. The law prescribes a minimum level of spending (or minimal set of projects) for each group in society as well as a maximum total size of the budget. Once the budget bill has been passed, uncertainty is resolved and the executive allocates spending subject to the constraints imposed by the law. The legislature seeks to maximize welfare for a set of groups L , while the executive serves a (possibly) different set of groups E .

Section 3 sets the stage for the subsequent analysis by considering how the budget process plays out when there is no conflict between the branches of government. This situation, which may describe a parliamentary system with a majority government, gives rise to full delegation, as has been noted by Epstein and O'Halloran (1999), Bendor and Meirowitz (2004), and others. In our context, this means that the budget cap is set large enough so that it never binds and the list of earmarks, if any, is short enough that it too never binds. In Section 4, we take up the case of “narrow executive interests,” which might arise in a parliamentary system with a coalition or minority government. We show that the legislature designs a budget with a spending cap that binds in some states of nature, but it never imposes particular projects on the executive, except possibly some that she would undertake anyway.

The opposite case of “broad executive interests” is addressed in Section 5. We argue that this case may represent a presidential system with a nationally elected executive and locally elected legislature. Now the budget bill may include earmarked projects that constrain the executive in some states of nature and the legislature never leaves the executive full flexibility to spend as much and how she prefers in all states of nature. We show that the equilibrium budget bill is completely inflexible when the executive’s constituency is much broader than that of the legislature, but it always leaves some discretion to the executive when her constituency is only slightly wider. Section 6 treats the case of overlapping interests. An important consideration in this case is whether the executive or legislature serves a larger set of interests. When the legislature serves a larger constituency, the executive prefers to spend more than the legislature on groups of common concern, whereas the opposite is when the executive’s constituency is larger. When the executive prefers to spend more on these groups, the legislature will opt to constrain the size of the overall budget. When she prefers to spend less, the legislature will induce extra spending in some states of nature with a list of earmarks.

The final section contains some concluding remarks.

2 A Model of the Budget Process

The polity comprises N groups of citizens distinguished by their preferences over the allocation of public spending. The government undertakes a set of projects and finances its spending with a poll tax. Each project benefits the members of one and only one group. We

can think of the groups as electoral districts, although our model can be interpreted more broadly as applying to spending that benefits particular interest groups, such as workers in the steel industry, owners of oil reserves, or the elderly.

The government consists of a legislative branch and an executive branch, each with a distinct role in the budgetary process. The legislature’s job is to design a budget bill, which the executive and the agencies under her control then must implement. A budget bill includes a spending limit and obliges the executive to undertake certain designated projects. Within the discretion left by the law, the executive decides how much to spend and how to spend it. We treat the bill as an incomplete contract; that is, it cannot specify state-contingent spending rules. The legislature may, however, choose to leave flexibility to the executive to respond to contingencies that arise.

We assume that the legislature and executive each represent certain interests. For example, the majority delegation in the legislature may comprise representatives of a particular set of geographic districts. Then the legislature may act to enhance the well-being of residents of those districts. The executive may represent the same interests, or a broader or narrower set of interests, or simply a different set of interests. We let $E \subseteq N$ denote the set of groups represented by the executive e and $L \subseteq N$ the set of groups represented by those with decision-making power in the legislature l . The decision makers in the legislature tailor the budget law to maximize the aggregate expected welfare of members of L , while the executive implements the law to maximize the aggregate welfare of members of E .³

The alignment of L and E reflects the political system. For example, in parliamentary systems, the legislature or its ruling coalition often chooses the prime minister. When a majority party rules the parliament, this may mean that the objectives of the legislature and the executive are closely aligned or perhaps even the same. With a coalition government, the prime minister may share the objectives of one party in the coalition, which may be narrower than those of the coalition as a whole. In a presidential system, the executive may be nationally elected and beholden to a broader constituency than that of the legislative majority. Although the correspondence between the political system and the alignment of interests between executive and legislature is not exact, we believe that there are sufficient regularities to warrant our treating the different relationships between L and E as proxies for different political institutions and environments.

Every group $i \in N$ has a utility function

$$u_i = \theta_i v(g_i) - t ,$$

³We do not specify the legislature’s decision-making process, which may have a bearing on which groups are included in L . Thus, political institutions can affect the determination of which interests will be served by the legislative process. Henceforth, we will use the “legislature’s constituency” to mean whatever (narrow or broad) set of interests are served by those with decision-making power in the legislature.

where $g_i \geq 0$ is spending on projects that benefit members of group i , $v(\cdot)$ is a twice continuously differentiable, strictly increasing, and concave function of g_i , t is a poll tax that is common to all groups and used to finance government spending, and θ_i is a random shock to the productivity of spending on projects that benefit group i .⁴ The random shocks are governed by a joint cumulative distribution function $F(\boldsymbol{\theta})$, where $\boldsymbol{\theta} = (\theta_1, \theta_2, \dots, \theta_n)$ is the vector of shocks and n is the total number of groups. We assume that $F(\cdot)$ is continuous, symmetric⁵, and strictly positive on the support $S = \prod_{i=1}^n [\theta_{\min}, \theta_{\max}]$, where $0 < \theta_{\min} < \theta_{\max} < \infty$. We also assume that $\lim_{g \rightarrow 0} v'(g) = \infty$, which implies that the marginal productivity of the first bit of spending on any group i is extremely high in every state of nature.

The budgetary process plays out as follows. First, l designs a budget bill to maximize the expected sum of utilities for groups in L . The bill, which must be passed before the realization of uncertainty, contains two components. First, it imposes a spending limit G that caps the total size of the budget. Second, it delineates a set of projects (“earmarks”) that the executive must carry out. These earmarks impose minimum spending levels by group; i.e., e must spend at least \bar{g}_1 on projects that benefit group 1, \bar{g}_2 on projects that benefit group 2, and so on. Let $\bar{\mathbf{g}} = (\bar{g}_1, \bar{g}_2, \dots, \bar{g}_n)$. Of course, the legislature allows e maximum flexibility by setting $G = \infty$ (or, at least as high as what e will choose to spend when $\boldsymbol{\theta} = (\theta_{\max}, \theta_{\max}, \dots, \theta_{\max})$) and $\bar{\mathbf{g}} = (0, 0, \dots, 0)$. The budget bill must be internally consistent in the sense that $G \geq \sum_{i \in N} \bar{g}_i$.

After the budget bill has been passed, the random shocks to productivity are realized. Then e chooses a spending program $\mathbf{g} = (g_1, g_2, \dots, g_n)$ and a tax rate t to maximize $\sum_{i \in E} u_i$. These choices must be consistent with the provisions of the bill; that is, $g_i \geq \bar{g}_i$ for all $i \in N$ and $\sum_{i \in N} g_i \leq G$. Also, the executive’s budget must balance, so that the tax levy on each group is $t = (\sum_{i \in N} g_i) / n$. Clearly, the spending program in state $\boldsymbol{\theta}$ that maximizes the executive’s objective is

$$\mathbf{g}^e(\boldsymbol{\theta}, \bar{\mathbf{g}}, G) = \arg \max_{\mathbf{g}} \left[\sum_{i \in E} \theta_i v(g_i) - \alpha^e \sum_{i \in N} g_i \right] \quad (1)$$

subject to $\mathbf{g} \geq \bar{\mathbf{g}}$ and $\sum_{i \in N} g_i \leq G$,

where $\alpha^e = (\sum_{i \in E} 1) / n$ is the fraction of the n groups that is part of the executive’s constituency, E .

The legislature anticipates the spending behavior of e , as represented in (1). It chooses

⁴The utility function omits a constant that represents the gross income of the group.

⁵By symmetry, we mean that $F(\theta_1, \dots, \theta_i, \dots, \theta_j, \dots, \theta_n) = F(\theta_1, \dots, \theta_j, \dots, \theta_i, \dots, \theta_n)$, for all i and j .

the provisions of the budget bill to satisfy

$$\begin{aligned} (\bar{\mathbf{g}}^l, G^l) = \arg \max_{\bar{\mathbf{g}}, G} \mathcal{E} \left[\sum_{i \in L} \theta_i v [g_i^e(\boldsymbol{\theta}, \bar{\mathbf{g}}, G)] - \alpha^l \sum_{i \in N} g_i^e(\boldsymbol{\theta}, \bar{\mathbf{g}}, G) \right] \quad (2) \\ \text{subject to } \bar{\mathbf{g}} \geq \mathbf{0} \text{ and } \sum_{i \in N} \bar{g}_i \leq G, \end{aligned}$$

where $\mathcal{E}(\cdot)$ is the expectations operator and $\alpha^l = (\sum_{i \in L} 1) / n$ is the fraction of groups that is part of the legislature's constituency, L .

Two obvious features of the equilibrium budget bill and spending program follow immediately from (1) and (2). First, l imposes no spending requirements for groups that are not part of its constituency; i.e.,

$$\bar{g}_i^l = 0 \text{ for all } i \notin L.$$

Second, e undertakes no projects to benefit groups that are neither in its own constituency nor that of the legislature; i.e.,

$$g_i^e(\boldsymbol{\theta}, \bar{\mathbf{g}}^l, G^l) = 0 \text{ for all } i \notin (L \cup E).$$

3 No Conflict between Legislature and Executive

The simplest scenario to analyze is one in which the legislature and executive serve identical interests; i.e., $E = L$. Arguably, this situation can arise in a parliamentary system when a single party controls a majority in the legislature and the ruling party selects the prime minister. In this setting, the legislature has no reason to constrain the actions of e and the executive can use any discretion left to her to target spending to where it is most productive. This serves not only her own interests but also those of l . Accordingly, the equilibrium budget bill leaves maximum flexibility.

To state this more formally and to set the stage for what follows, let us define $g_{\min} = \arg \max_{g_i} \theta_{\min} v(g_i) - \alpha^e g_i$ and $g_{\max} = \arg \max_{g_i} \theta_{\max} v(g_i) - \alpha^e g_i$. These are respectively the expenditures that an unconstrained executive would devote to projects that benefit a group $i \in E$ if $\theta_i = \theta_{\min}$ and if $\theta_i = \theta_{\max}$. Clearly, the executive will choose $g_i \in [g_{\min}, g_{\max}]$ unless the budget bill mandates higher spending on group i or a budget cap binds. When the legislature and executive serve identical interests, the equilibrium budget bill can now be characterized as follows.

Proposition 1 *Let $E = L$. Then $\bar{g}_i^l = 0$ for all $i \notin L$, $\bar{g}_i^l \leq g_{\min}$ for all $i \in L$, and $G^l \geq \alpha^l n g_{\max}$.*

The proposition implies that neither the list of required projects nor the overall spending cap binds the executive's choices in any state of nature. The proof is simple. The legislature's most preferred spending in state θ is $\arg \max_{\mathbf{g}} [\sum_{i \in L} \theta_i v(g_i) - \alpha^l \sum_{i \in N} g_i]$. But when $E = L$ (and thus $\alpha^e = \alpha^l$), this is exactly equal to $\arg \max_{\mathbf{g}} [\sum_{i \in E} \theta_i v(g_i) - \alpha^e \sum_{i \in N} g_i]$, the choice that the executive would make if unconstrained. Thus, l maximizes its objective state-by-state by leaving maximal flexibility to e . It fares worse by imposing binding constraints.

One simple budget bill that satisfies Proposition 1 is $(\bar{\mathbf{g}}^l, G^l) = (\mathbf{0}, \infty)$; i.e., the legislature insists on no projects and imposes no limit to the size of the budget. But this is not the only possibility. It could equally well specify a set of earmarked projects for groups in l as long as these projects would anyway be undertaken by the executive in the "worst" state of nature for group i ; i.e., $\bar{g}_i^l \leq g_{\min}$. And it could set a finite budget limit as long as the limit equals or exceeds the maximum that e would spend in the "best" state of nature for all groups in E ; i.e., $G^l \geq \alpha^l n g_{\max}$.

4 Narrow Executive Interests

We now consider a situation in which the executive serves a narrower set of interests than those favored by the legislature. Such a situation can arise, for example, in a parliamentary system with a coalition government. Then the agencies that have responsibility for and discretion in designing spending programs may seek to satisfy only groups favored by their own parties. But these may be a subset of the groups collectively served by all parties in the coalition. Or it may arise in a parliamentary system with a minority government, because then the interest of the cabinet is narrower than any majority in the parliament.

Formally, we assume that E is a proper subset of L . This implies that there is at least one group in L that is not in E and therefore that $\alpha^l > \alpha^e$. We use the notation L/E to denote the set of groups $L \cap (\sim E)$. The executive will not spend voluntarily on projects that benefit groups not in E , because such spending increases the tax burden for her constituency without generating any gains for these groups. Accordingly, for $i \in L/E$, $g_i^e = \bar{g}_i^l$. If the legislature wants these groups to be served by any public spending, it must specify the desired projects in the budget bill. Spending on these groups, then, is invariant to the state of nature.

We can rewrite the spending program for an executive with narrow interests. She spends exactly what is required by the budget bill on groups not in E while choosing for her own constituents a vector \mathbf{g}^{eE} (with $\alpha^e n$ elements) such that

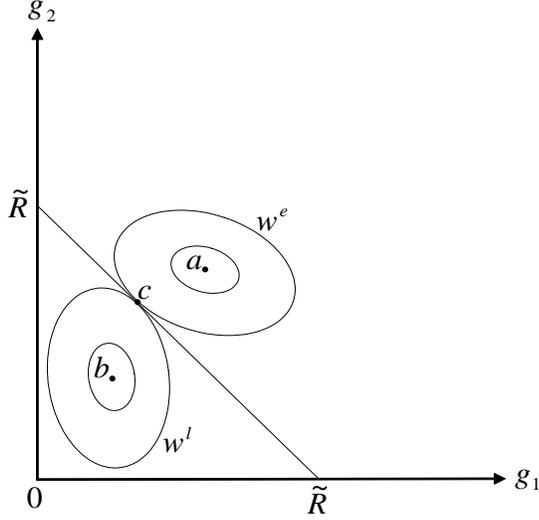


Figure 1: Composition of spending with narrow executive interests

$$\mathbf{g}^{eE}(\boldsymbol{\theta}, \bar{\mathbf{g}}^l, G^l) = \arg \max_{\mathbf{g}^E} \sum_{i \in E} \theta_i v(g_i) - \alpha^e \sum_{i \in E} g_i$$

$$\text{subject to } \mathbf{g}^E \geq \bar{\mathbf{g}}^{lE} \text{ and } \sum_{i \in E} g_i \leq G^l - \sum_{j \in E/L} \bar{g}_j^l.$$

We will show that, anticipating this behavior by e , the legislature never requires the executive to spend more than she would anyway like to on groups in E , but always passes a budget cap that binds in some states of nature. More formally, the equilibrium budget bill is characterized as follows.

Proposition 2 *Let $E \subset L$. Then (i) $\bar{g}_i^l = 0$ for all $i \notin L$, $\bar{g}_i^l = \arg \max_{g_i} [\hat{\theta}v(g_i) - \alpha^l g_i] > 0$ for all $i \in L/E$, and $\bar{g}_i^l \leq g_{\min}$ for all $i \in E$, where $\hat{\theta} = \mathcal{E}[\theta]$; and (ii) $G^l < \sum_{i \in L/E} \bar{g}_i^l + \alpha^e n g_{\max}$.*

To prove the proposition, we proceed in stages, building intuition in the process. Figure 1 depicts a case in which E consists of two groups, $E = \{1, 2\}$. The curve w^e represents an indifference curve for the executive for a given realization of $\boldsymbol{\theta}$. Another such curve (with higher welfare for e) is represented by the elliptical curve that is contained in w^e . Along any of the executive's indifference curves, $W^e = \sum_{i \in E} \theta_i v(g_i) - \alpha^e \sum_{i \in E} g_i$ is constant. Point a in the figure represents the executive's optimal, unconstrained choice of spending on the two groups when the state of nature is $\boldsymbol{\theta}$.

Line $\tilde{R}\tilde{R}$ depicts combinations of g_1 and g_2 such that $g_1 + g_2 = G - \sum_{i \in L/E} \bar{g}_i$. These are the spending combinations that are feasible for e given the budget cap G and the mandated spending on groups not in E , $\sum_{i \in L/E} \bar{g}_i$. For large enough values of G , the budget line passes above point a , in which case the executive would choose the allocation of spending represented by point a , assuming, as we will for the moment, that no minimum spending requirements bind for the groups in E . When $\tilde{R}\tilde{R}$ passes below point a , as drawn, the executive's optimal spending on the two groups is represented at point c , where the indifference curve w^e is tangent to $\tilde{R}\tilde{R}$. At this point, $\theta_1 v'(g_1) = \theta_2 v'(g_2)$.

Curve w^l depicts one of the legislature's indifference curves that is relevant for the same realization of θ . Along this curve, $W^l = \sum_{i \in E} \theta_i v(g_i) - \alpha^l \sum_{i \in E} g_i$ is constant. Another indifference curve is represented by the ellipse contained in w^l , while point b represents the legislature's preferred spending on groups 1 and 2 when the state is θ . Note that point b lies to the southwest of a , because e and l perceive the same benefits from spending on groups 1 and 2, but l has a broader constituency than e and thus perceives a greater cost. Note too that w^l is tangent to $\tilde{R}\tilde{R}$ at point c , because the marginal rate of substitution of spending on groups 1 and 2 is the same for the legislature as it is for the executive. In fact, this is true for every spending line that passes below point a ; for a given *level* of spending on groups in E , the executive and legislature share the same preferences over the *composition* of spending on those groups. Finally, note that the same argument applies when there are more than two groups in E . The executive and legislature agree that spending in state θ should be allocated so that $\theta_i v'(g_i) = \theta_j v'(g_j)$ for every i and j in E . Their conflict concerns only the desired level of spending, with e preferring to spend more than l , for any given realization of θ .

Since e allocates a given residual budget among groups in E exactly as l would want her to in all states of nature, the legislature can only lose by constraining this aspect of the executive's decision. Accordingly, the mandated spending on each group in E should be set low enough that it never binds in any state of nature. But the profligate tendencies of the executive, as perceived by the legislature, motivate its choice of an optimal spending limit.

To see that the legislature chooses a spending limit G^l that binds in some states of nature consider the set of "best" states for e ; i.e., those in which $\theta_i = \theta_{\max}$ for all $i \in E$.⁶ Suppose that the budget does not bind in any of these states. Then the executive would choose $g_i^e = g_{\max}$ for all $i \in E$ in such states and indeed would choose her first-best level of spending on groups in E for all $\theta \in S$, because her desired total spending on groups in E is highest when the productivity of that spending is maximal. Now consider a small reduction in the size of the budget to a level just below $G = \alpha^e n g_{\max} + \sum_{i \in L/E} \bar{g}_i^l$. This induces a reduction in the executive's spending on groups in her constituency when $\theta_i = \theta_{\max}$ for all $i \in E$, but leaves her behavior unchanged in all other states. But note that the legislature prefers to

⁶We refer to a "set" of best states because we do not restrict the realizations of θ_i for $i \notin E$.

spend less than the executive on groups in E for any given realization of θ , because $\alpha^l > \alpha^e$. Therefore, a reduction in the budget cap from $G = \alpha^e n g_{\max} + \sum_{i \in L/E} \bar{g}_i^l$ to something a bit smaller has a beneficial effect on the legislature's welfare in those (few) states in which it binds, and no effect on expected welfare in other states.⁷

Finally, the proposition specifies the required spending for groups in L/E . The legislature fixes spending for these groups at the level that it regards as optimal for the mean value of θ_i .⁸ Since the executive will not devote discretionary spending to groups outside its constituency, the legislature must pre-specify a fixed set of projects and does so with the mean productivity level in mind.

5 Broad Executive Interests

In a presidential system, the executive often is chosen in a national campaign, whereas individual legislators may be elected locally. In such circumstances it is reasonable to assume that the executive's constituency will be broader than that of the majority delegation in the legislature. Indeed, this is often said of the United States, where, for example, the president often takes a broader view about trade and industrial policies than the Congress. We now examine the budget process in a setting in which the executive represents a broader set of interests than the legislature; in particular, we assume that L is a proper subset of E .

Clearly, the legislature will not insist on earmarks for groups that are not part of its constituency. But l must anticipate that, if left with discretion, e will always opt to spend on groups in E/L , because from her point of view the first bit of spending on such groups yields high marginal return. The legislature may wish to constrain the budget tightly to avoid such spending on these groups. And it may wish to earmark spending for groups that are in both

⁷More formally, we have

$$\left. \frac{dU^l(G, \bar{\mathbf{g}}^l)}{dG} \right|_{G=\alpha^e n g_{\max} + \sum_{i \in L/E} \bar{g}_i^l} = \left[\sum_{i \in E} \theta_{\max} v'(g_{\max}) - \alpha^l \right] f(\theta_{\max}^E) \left(\frac{1}{\alpha^e n} \right)$$

where $U^l(G, \bar{\mathbf{g}}^l)$ is defined as the expected welfare of the legislature when the budget is any G and the vector of mandated spending levels $\bar{\mathbf{g}}^l = (\bar{g}_1^l, \dots, \bar{g}_n^l)$ is as specified in Proposition 2. Here, $f(\theta_{\max}^E)$ denotes the joint density of all realizations of θ that have $\theta_i = \theta_{\max}$ for all $i \in E$ and we make use of the fact that the spending cut falls equally on all of the groups in E (and only these groups) in all such states. But $\theta_{\max} v'(g_{\max}) = \alpha^e$, $\alpha^e < \alpha^l$, and $f(\theta_{\max}^E) > 0$. Therefore,

$$\left. \frac{dU^l(G, \bar{\mathbf{g}}^l)}{dG} \right|_{G=\alpha^e n g_{\max} + \sum_{i \in L/E} \bar{g}_i^l} = (\alpha^e - \alpha^l) f(\theta_{\max}^E) < 0.$$

⁸Considering that the executive will not devote discretionary spending to groups in L/E , the legislature's expected welfare can be written as the sum of a component that depends on its mandated spending on these groups and a component that depends on anticipated spending on groups in E . The former component is $\mathcal{E} \left[\sum_{i \in L/E} \theta_i v(\bar{g}_i) - \alpha^l \bar{g}_i \right]$ from which it follows that the optimal required level of spending on each such group is $\bar{g}_i^l = \arg \max_{g_i} \hat{\theta} v(g_i) - \alpha^l g_i$.

L and E , because with $\alpha^l < \alpha^e$, it always prefers to spend more on these groups than the executive does. As we shall see, the legislature has two very different strategies that may be optimal, depending on the distribution $F(\cdot)$ and the benefit function $v(\cdot)$.

At one extreme, the legislature might dictate spending $\bar{g}_i^l = \bar{g}^l$ for all groups $i \in L$, while at the same time capping total outlays at $G^l = \alpha^l n \bar{g}^l$. Such a budget bill leaves the executive with no discretionary spending. By locking in the budget allocation, l can ensure a relatively high level of spending on its favorite groups and avoid the tax bill that would result from projects aimed at groups that are not part of its constituency. We shall refer to this approach as a *rigid* strategy (and the associated bill as a rigid budget).

Alternatively, the legislature may leave some (or much) discretion to the executive. A *flexible* strategy is one that allows e to choose some aspects of the spending program in at least some states of nature. The executive has such flexibility whenever $G^l > \alpha^l n \bar{g}^l$. The potential attraction for the legislature from following such a strategy is that the executive can allocate spending among the groups in L according to the realized productivity of the various projects. The disadvantage, of course, is that the executive may spend the unencumbered funds on groups in E that are not in L , and it may choose to spend less on groups in L than the legislature would want in some states of nature. We call a budget bill *fully flexible* if $G^l \geq \alpha^e n g_{\max}$ and $\bar{g}^l \leq g_{\min}$. A fully flexible budget bill gives the executive a large enough budget to spend on each group as much as she would wish for all $\theta \in S$ and it does not require her to spend on any group more than she would wish for any $\theta \in S$.

But, in fact, the legislature never opts for such a bill when the executive has broader interests. In other words, we assert

Proposition 3 *Let $L \subset E$. Then an equilibrium budget bill never is fully flexible; i.e., either $G^l < \alpha^e n g_{\max}$ or $\bar{g}_i^l = \bar{g}^l > g_{\min}$ for all $i \in L$.*

To see why this is so, suppose to the contrary that $G \geq \alpha^e n g_{\max}$ and $\bar{g}_i = \bar{g} = g_{\min}$ for all $i \in L$. By raising \bar{g} slightly, the legislature would affect spending only on groups in L (since spending on groups in E/L never is constrained when $G \geq \alpha^e n g_{\max}$) and only in states in which θ_i is very close to θ_{\min} for some $i \in L$. In such states, the contribution of spending on group i to the expected welfare of the legislature is $\theta_{\min} v(g_i) - \alpha^l g_i$ times the density of the unconditional distribution of θ_i at $\theta_i = \theta_{\min}$, which we denote by $f_i(\theta_{\min})$. Thus, the marginal welfare effect of increasing that spending slightly is $[\theta_{\min} v'(g_{\min}) - \alpha^l] f_i(\theta_{\min}) d\bar{g}$. But $\theta_{\min} v'(g_{\min}) = \alpha^e$, by the definition of g_{\min} . Therefore, the increased spending induced by an increase in \bar{g} has a marginal effect on the legislature's expected welfare of $\alpha^l n (\alpha^e - \alpha^l) f_i(\theta_{\min}) d\bar{g} > 0$. Intuitively, the legislature wants more spending for groups in L than the executive does in every state of nature, because e internalizes a greater tax burden from such spending than l . If the budget were fully flexible, the legislature could certainly benefit by insisting on slightly more spending than an unconstrained executive would choose

in the state with lowest productivity. That would move the spending in that state closer to the legislature's *desideratum* without any offsetting cost. Indeed, with $G^l \geq \alpha^e n g_{\max}$, the legislature earmarks spending for each group in L at a sufficiently high level so as to ensure that there exist states which, if realized, would cause the legislature to regret having demanded so much.

Let us further consider the remaining alternatives of a rigid budget and a (somewhat) flexible budget, to shed light on the relative attractiveness of each to the legislature. Suppose first that the budget is rigid. Then l chooses \bar{g} to maximize

$$\begin{aligned} \mathcal{E} W_R^l &= \mathcal{E} \int_{\theta \in S} \sum_{i \in L} \theta_i v(\bar{g}) dF(\theta) - \alpha^l (\alpha^l n \bar{g}) \\ &= \alpha^l n [\hat{\theta} v(\bar{g}) - \alpha^l \bar{g}] . \end{aligned}$$

It follows that the legislature's optimal rigid rule for spending on groups in L is \bar{g}_R , where \bar{g}_R satisfies

$$\hat{\theta} v'(\bar{g}_R) = \alpha^l . \quad (3)$$

Note that $\bar{g}_R > g_{\min}$, because $\hat{\theta} > \theta_{\min}$ and $\alpha^e > \alpha^l$. Thus, if the legislature adopts a rigid budget, it insists on spending for each group in L that exceeds what the executive would spend on that group if the productivity of spending were at its minimum. Indeed, the legislature might insist on spending for each group in L that exceeds what the executive would spend on the group if realized productivity were at the maximum; this will be the case if $\alpha^e / \alpha^l \geq \theta_{\max} / \hat{\theta}$.

Now consider the alternative legislative strategy that allows the executive to respond to the realization of uncertainty. Let G_F^l denote the budget cap in an optimal flexible strategy and let \bar{g}_F^l be the mandated spending per group in L in such a strategy, with $G_F^l > \alpha^l n \bar{g}_F^l$. We first observe that the legislature never chooses G_F^l close to $\alpha^l n \bar{g}_F^l$. In other words, if the budget bill includes a discretionary budget, the portion of the budget that exceeds the mandated spending never is small. To see why this is so, suppose to the contrary that the legislature were to leave the executive with discretion to allocate only a small amount, $G^l - \alpha^l n \bar{g}$. The marginal benefit to e from spending these funds on a group in E/L is at least $\theta_{\min} v'(0) - \alpha^e$. But this magnitude is positive and necessarily greater than $\theta_{\max} v'(\bar{g}) - \alpha^e$, the most that the executive's marginal benefit could be from spending the funds to benefit a group in L . Thus, l anticipates that a small discretionary budget always will be spent and always on groups that are not part of its constituency. Such spending would reduce the legislature's welfare compared to a rigid law with $G = \alpha^l n \bar{g}$. It follows that if the legislature pursues a flexible strategy, it always leaves a discretionary budget that is sufficiently large to induce extra spending on groups in L in at least some states of nature.

Next we observe that when the budget bill admits flexibility, the legislature never mandates spending on a group in L as large as what e would allocate to that group when spending is most productive; i.e., $\bar{g}_F^l < g_{\max}$. If the legislature were to set $\bar{g} \geq g_{\max}$, there would exist no realization of θ in which e would devote discretionary spending to any group in L . Accordingly, with $\bar{g} \geq g_{\max}$, the legislature would gain by eliminating all discretionary spending and setting the budget cap at $\alpha^l n \bar{g}$. By doing so, it would reduce the expected tax bill for its constituents without forfeiting any of their pet projects.

The alternative strategies of rigidity and flexibility may represent local optima in the legislature's choice of a spending cap and list of earmarked projects. A global comparison of these alternatives is difficult in general, but some sufficient conditions that tilt the choice to one option or the other can be found. First, we show that the legislature prefers a rigid budget when the size of its constituency is small relative to that of the executive or when the range of random productivities is small.

Proposition 4 *Let $L \subset E$. If $\alpha^e/\alpha^l > \theta_{\max}/\theta_{\min}$, the equilibrium budget bill is $G^l = G_R$ and $\bar{g}_i^l = \bar{g}_R$ for all $i \in L$, where $\bar{g}_R = \arg \max_g \hat{\theta}v(g) - \alpha^l g$ and $G_R = \alpha^l n \bar{g}_R$.*

The proof is straightforward. Suppose to the contrary that l chooses a flexible budget with $\bar{g} = \bar{g}_F^l$ and $G = G_F^l > \alpha^l n \bar{g}_F^l$. If $\alpha^e/\theta_{\max} > \alpha^l/\theta_{\min}$, l prefers to spend more on a group $i \in L$ when $\theta_i = \theta_{\min}$ than the spending that e would like to allocate to that same group when $\theta_i = \theta_{\max}$.⁹ But we have just observed that, if a flexible strategy is optimal, \bar{g}_F^l is never as large as g_{\max} , because otherwise the executive would not devote discretionary spending to a group in L in any state of nature. It follows that l prefers more spending on group i than \bar{g}_F^l in every $\theta \in S$. The legislature can improve on the hypothesized flexible budget by mandating spending of \bar{g}_F^l on every group $i \in L$ and setting a rigid budget $G = \alpha^l n \bar{g}_F^l$. It can do even better by choosing the *optimal* rigid spending plan, $\bar{g}_i^l = \bar{g}_R$ for all $i \in L$ and the *optimal* rigid budget, $G^l = G_R = \alpha^l n \bar{g}_R$. This contradicts the supposition that (G_F^l, \bar{g}_F^l) is optimal for the legislature.

The legislature adopts a rigid budget when α^l is small relative to α^e , because in such circumstances the executive perceives a much greater cost per unit of spending on groups in L than does the legislature and so she is inclined to spend much less on these groups in any given state of nature than the legislature would like. In order to compel a high level of spending, the legislature must earmark sufficient funds in the budget. But once it does so, it will not wish to leave any discretionary budget to the executive, because it will anticipate that she would spend any such funds to benefit groups in E/L .

⁹The legislature's optimal spending on group i when $\theta_i = \theta_{\min}$ solves $v'(g) = \alpha^l/\theta_{\min}$. The executive's optimal spending on group i when $\theta_i = \theta_{\max}$ solves $v'(g) = \alpha^e/\theta_{\max}$. The latter is larger when $\alpha^e/\theta_{\max} < \alpha^l/\theta_{\min}$, because $v'' < 0$.

A small range for θ also favors rigidity, because the potential gains to l from allowing e to respond to fluctuations in productivity then are small. If the legislature cannot gain much from having high spending in states with above average productivity, it will not be willing to bear the cost of allowing the executive to spend on groups that are in her constituency but not its own.

Next we show that the legislature adopts a flexible budget when the fraction of the population that is served by e but outside its own constituency is sufficiently small. In particular, we have

Proposition 5 *Let $L \subset E$. If α^e/α^l is close to 1, the equilibrium budget bill leaves some discretion to e ; i.e., $G^l > \alpha^l n \bar{g}^l$, where $\bar{g}_i^l = \bar{g}^l$ for all $i \in L$.*

Note that in the limit, as α^e approaches α^l , the legislature's problem becomes one of coincident interests, in which (by Proposition 1), a fully flexible budget is optimal. Not only that, but when $\alpha^l = \alpha^e$ the legislature's expected welfare from a fully flexible budget is strictly greater than the expected welfare it can achieve with the best rigid budget, (G_R, \bar{g}_R) . And the expected welfare levels under both a rigid strategy and a fully flexible strategy are continuous functions of the parameters α^e and α^l . So, full flexibility continues to dominate the best rigid budget from the legislature's perspective when α^e is greater than α^l but the difference is small. Proposition 3 states that the full flexibility is not optimal for l when $\alpha^e > \alpha^l$. Therefore, the legislature's preferred budget must yield higher expected welfare than the fully flexible budget and hence than the rigid budget as well.

Perfectly-Correlated Productivity Shocks

Until now, we have not assumed anything in particular about the correlation of shocks to the productivity of the various spending projects. We can, however, say a bit more about the outcome of the budget process with broad executive interests for the special case in which public spending is equally valuable to all groups in a given state of nature; that is, when the θ_i 's are perfectly correlated.

We let $\theta_i = \theta$ for all $i \in E$ and denote the cumulative distribution function of θ by $F(\theta)$. The legislature still faces a choice between a rigid budget bill and a (not fully) flexible bill. The former option continues to feature the mandated spending $\bar{g}_R = \arg \max_g \hat{\theta}v(g) - \alpha^l g$ on all groups in L and $G = G_R = \alpha^e n \bar{g}_R$. We consider further the latter option.

Suppose that the legislature earmarks spending for each group $i \in L$ at level \bar{g} , the determination of which we will discuss shortly. Then, in states with low productivity of public projects, the executive will devote all discretionary spending to groups in E/L . The marginal product of such spending is $\theta v'(g_i)$, for $i \in E/L$ which exceeds the marginal product of spending additional funds on groups in L as long as $g_i < \bar{g}$. Indeed, the first $(\alpha^e - \alpha^l)n\bar{g}$ dollars of discretionary spending will be targeted to groups in E/L , if the level of productivity

justifies her spending that much. Only when spending has been equalized across groups in her broad constituency might the executive contemplate additional spending for groups that the legislature cares about. It follows that it is never optimal for l to set a budget cap $G > \alpha^l n \bar{g}$ in the range from $\alpha^l n \bar{g}$ to $\alpha^e n \bar{g}$, because with a cap in this range no discretionary funds ever are spent to benefit the legislature's constituency.

Consider then the expected marginal benefit to the legislature from increasing the budget cap from a level that exceeds $\alpha^e n \bar{g}$ to something higher, but such that $G < \alpha^e n \bar{g}_{\max}$. In states with low productivity of public goods, the budget constraint does not bind and giving the executive the opportunity to spend more will not affect her decisions. In states with high productivity, by contrast, the executive will opt to spend at least part of the incremental funds. But since spending on each group is equally productive and $v''(g) < 0$, she will spread the spending evenly among all groups in E . Thus, in all states in which the budget cap binds, $dg_i/dG = 1/\alpha^e n$ for all $i \in E$.

How does this increased spending affect the legislature's expected welfare? The welfare of l in a given state of nature is $W^l = \theta \sum_{i \in L} v(g_i) - \alpha^l \sum_{i \in N} g_i$. When the budget constraint binds, $\sum_{i \in N} g_i = G$, so

$$\frac{dW^l}{dG} = \theta \sum_{i \in L} v'(g_i) \frac{dg_i}{dG} - \alpha^l.$$

But g_i is the same for all $i \in E$ when $G > \alpha^e n \bar{g}$ and we have just observed that $dg_i/dG = 1/\alpha^e n$ in such circumstances. Also, $\theta v'(g_i) > \alpha^e$ in all states in which the budget constraint binds, because otherwise e would allocate her first-best level to each group and not spend the full amount allowed by the law. Therefore

$$\frac{dW^l}{dG} > \sum_{i \in L} \alpha^e \left(\frac{1}{\alpha^e n} \right) - \alpha^l = (\alpha^l n) \alpha^e \left(\frac{1}{\alpha^e n} \right) - \alpha^l = 0.$$

We conclude that if the legislature finds it desirable to set a spending cap above $\alpha^e n \bar{g}$, it gains from each incremental increase in G and so should set the cap high enough that it never binds. Intuitively, a larger cap allows the executive discretion to spend more in high productivity states. With perfectly correlated shocks, when e is willing to spend additional funds on projects benefiting all groups in its constituency, l concurs with this decision, because the legislature garners a fraction α^l/α^e of the benefits while bearing only the fraction α^l of the costs.

We now discuss the optimal choice of \bar{g} in a flexible budget. We know already that $\bar{g}_F^l > g_{\min}$, because full flexibility is never optimal. And we have seen that $\bar{g}_F^l < g_{\max}$, because if it were not so, the legislature would have no reason to allow discretionary spending. Let us define θ_c as the value of θ at which the executive views the constraint $g_i \geq \bar{g}$ for $i \in L$ to be marginally binding; i.e., $\theta_c = \alpha^e/v'(\bar{g})$. For $\theta < \theta_c$, the executive spends $\bar{g} = \tilde{g}(\theta_c)$

on groups in L and $\tilde{g}(\theta)$ on groups in E/L , where $\tilde{g}(\cdot)$ is the executive's first-best choice of spending on a group when the productivity of spending is θ .¹⁰ For $\theta \geq \theta_c$, the executive spends at her first-best level on all groups in E , because we have already seen that the optimal flexible budget never constrains the executive's total spending. We can convert the legislature's maximization problem to one of choosing θ_c to maximize

$$U_F^l = \int_{\theta_{\min}}^{\theta_c} \left\{ \alpha^l n \theta v[\tilde{g}(\theta_c)] - \alpha^l \left[\alpha^l n \tilde{g}(\theta_c) + (\alpha^e n - \alpha^l n) \tilde{g}(\theta) \right] \right\} dF(\theta) \\ + \int_{\theta_c}^{\theta_{\max}} \left\{ \alpha^l n \theta v[\tilde{g}(\theta)] - \alpha^l [\alpha^e n \tilde{g}(\theta)] \right\} dF(\theta) .$$

From this, we calculate

$$\frac{\partial U_F^l}{\partial \theta_c} = \alpha^l n \tilde{g}'(\theta_c) \int_{\theta_{\min}}^{\theta_c} \left[\theta v'[\tilde{g}(\theta_c)] - \alpha^l \right] dF(\theta) \\ = \alpha^l n \tilde{g}'(\theta_c) \int_{\theta_{\min}}^{\theta_c} \left(\theta \frac{\alpha^e}{\theta_c} - \alpha^l \right) dF(\theta) , \quad (4)$$

where the second line follows from the definition of θ_c . It follows that, if there exists a $\theta_c \in (\theta_{\min}, \theta_{\max})$ at which the first-order condition $\partial U_F^l / \partial \theta_c = 0$ is satisfied, then the second-order condition $\partial^2 U_F^l / \partial (\theta_c)^2 < 0$ also is satisfied at that θ_c . Moreover, if such an interior solution exists for the legislature's favorite choice of θ_c , it satisfies

$$\mathcal{E}[\theta \mid \theta < \theta_c] = \theta_c \frac{\alpha^l}{\alpha^e} . \quad (5)$$

Equation (5) determines θ_c^l (if such an interior solution exists) as a function of α^l / α^e and properties of the distribution function $F(\cdot)$. Notice that the properties of the utility function $v(\cdot)$ do not affect the solution. The level of mandated spending per group, \bar{g}_F^l , in a possible equilibrium with a flexible budget then is given by $\bar{g}_F^l = g(\theta_c^l)$.

We can summarize the discussion in

Proposition 6 *Let $L \subset E$ and suppose the productivity shocks θ_i for $i \in E$ are perfectly correlated. Then either $\bar{g}_i^l = \bar{g}_R$ for all $i \in L$ and $G^l = \alpha^l n \bar{g}_R$, or $\bar{g}_i^l = \tilde{g}(\theta_c^l)$ for all $i \in L$ and $G^l \geq \alpha^e n g_{\max}$.*

In other words, with perfectly correlated shocks the equilibrium budget is either rigid or it has positive earmarked spending on every group in L and no effective cap on total spending.

As an example, consider the uniform distribution $F(\theta) = (\theta - \theta_{\min}) / (\theta_{\max} - \theta_{\min})$ for

¹⁰That is, $\tilde{g}(\theta)$ is defined implicitly by $\theta v'[\tilde{g}(\theta)] \equiv \alpha^e$.

$\theta \in [\theta_{\min}, \theta_{\max}]$. In this case $\mathcal{E}[\theta \mid \theta < \theta_c] = (\theta_c + \theta_{\min})/2$ for $\theta_c \in [\theta_{\min}, \theta_{\max}]$, which implies

$$\mathcal{E}[\theta \mid \theta < \theta_c] > \theta_c \alpha^l / \alpha^e$$

for all $\alpha^l / \alpha^e < \hat{\theta} / \theta_{\max}$. Therefore, if $\alpha^l / \alpha^e < \hat{\theta} / \theta_{\max}$, there is no interior solution for \bar{g}_F^l . Rather, the legislature's optimal spending requirement for groups in L conditional on there being no spending cap is $\bar{g}_i = g_{\max}$ for all $i \in L$. But then the legislature does better by imposing a rigid budget with $\bar{g}_i^l = \bar{g}_R^l$ for all $i \in L$ and $G^l = \alpha^l n \bar{g}_R$.¹¹

If, on the other hand, $\alpha^l / \alpha^e > \hat{\theta} / \theta_{\max}$, then

$$\theta_c^l = \frac{\theta_{\min}}{\frac{2\alpha^l}{\alpha^e} - 1},$$

$\bar{g}_F^l = \tilde{g}(\theta_c^l)$, and the equilibrium budget is either $\bar{g}_i^l = \bar{g}_R$ for all $i \in L$ and $G^l = \alpha^l n \bar{g}_R$, or $\bar{g}_i^l = \tilde{g}(\theta_c^l)$ for all $i \in L$ and $G^l \geq \alpha^e n g_{\max}$, whichever yields higher expected welfare for the legislature.

The case of broad executive interests presents in stark contrast the trade-off facing the legislature between delegating budgeting responsibilities to the executive and not. On the one hand, a rigid strategy is available that ensures that there will be no funds devoted to projects that do not serve the legislature's political aims. On the other hand, a flexible alternative is available that allows spending to be targeted to groups with greater need. But in order to enjoy the fruits of such flexibility, the legislature must be prepared to accept the tax burden associated with discretionary spending on groups in the executive's constituency that are not part of its own. Since the executive devotes the first dose of discretionary funds to groups in E/L , the expected cost to the legislature of creating a small discretionary budget is large. The legislature will never choose such an option, but instead will consider leaving a large discretionary budget, especially in situations where the difference between α^e and α^l is small and the degree of uncertainty is large.

6 Overlapping Interests

The remaining case of interest arises when some groups are served by both the legislature and the executive, while others are part of the constituency of just one branch or the other.¹² Such situations can arise, for example, in presidential systems with "divided government" — when

¹¹The legislature fares better by setting $G = \alpha^l n g_{\max}$ when $\bar{g} = g_{\max}$ than it does by setting $G \geq \alpha^e n g_{\max}$. It fares even better by choosing the *optimal* rigid budget.

¹²In principle, there is another case that can arise when the executive and legislature serve non-overlapping interests. However, this case seems empirically unlikely. Moreover, it has an obvious equilibrium; the legislature mandates spending according to the average productivity for its own constituency and leaves no discretion to the executive.

the executive hails from one political party and the legislature is controlled by another. We let $B = L \cap E$ (for “both”) denote the overlap set between E and L , which contains a fraction α^b of the n groups. In this section we consider the case in which $0 < \alpha^b < \min \{\alpha^l, \alpha^e\}$; i.e., the set B is not empty and is a proper subset of both L and E .

Our previous analysis extends readily to the case with overlapping interests in which $\alpha^e > \alpha^l$; i.e., the executive serves a greater number of interest groups than the legislature. First, the legislature must look after the $(\alpha^l - \alpha^b)n$ groups in L/B with earmarked spending. The spending on these groups cannot be made responsive to the realization of θ , because the executive will not spend discretionary funds on these groups. So, the legislature requires spending on these groups at the level that it deems optimal for the average productivity level. As concerns the remaining groups, the legislature faces a problem identical to that addressed in Section 5 for the case of broad executive interests. There are $\alpha^b n$ groups in B about which both e and l care and $(\alpha^e - \alpha^b)n$ groups that are of concern only to the executive. Moreover, the executive prefers to spend less on any group $i \in B$ than the legislature does, because the tax burden bears more heavily on her larger constituency than it does on the smaller constituency of the legislature. The legislature designs a budget that does not give e full flexibility to decide spending on the groups in E and that might or might not be fully rigid. We summarize these findings in

Proposition 7 *Let $B = L \cap E$ be non-empty, and suppose that $\alpha^e > \alpha^l > \alpha^b$. Then $\bar{g}_i^l = \hat{g} = \arg \max_g \theta v(g) - \alpha^l g$ for all $i \in L/B$. Moreover, either (i) $\bar{g}_i^l = \bar{g}_R$ for all $i \in B$ and $G^l = \alpha^b n \bar{g}_R + (\alpha^l - \alpha^b) n \hat{g}$, or (ii) $\bar{g}_i^l = \bar{g}_F \geq 0$ for all $i \in B$, $\alpha^b n \bar{g}_F + (\alpha^l - \alpha^b) n \hat{g} \leq G^l \leq \alpha^e n g_{\max} + (\alpha^l - \alpha^b) n \hat{g}$, and either $G^l < \alpha^e n g_{\max} + (\alpha^l - \alpha^b) n \hat{g}$ or $\bar{g}_F > g_{\min}$.*

Some new issues arise when there are overlapping interests and $\alpha^e < \alpha^l$. Again the legislature must mandate spending (at level \hat{g}) for groups in its own constituency that are not of concern to the executive. And again the legislature must be wary of the executive’s inclination to spend on groups in E/L , because such spending will raise the tax bill for its constituents without generating any benefits for them. But as concerns the groups in B , now it is the executive that is inclined to spend more extravagantly.

We note first that, when $\alpha^b < \alpha^e < \alpha^l$, the budget cap must bind in some states of nature. A budget cap that never binds means that $G \geq (\alpha^l - \alpha^b) n \hat{g} + \alpha^e n g_{\max}$. But when G is so large, the legislature could reduce the spending limit to a level just below $(\alpha^l - \alpha^b) n \hat{g} + \alpha^e n g_{\max}$, which would bind only when $\theta_i = \theta_{\max}$ for all i in E . The executive would respond to such a cut in the budget cap by shaving outlays in this state equally for all groups in its constituency. The resulting reduction in spending on groups in E/L represents a pure tax savings for the constituents of L . And the cut in spending on groups in B also benefits l , because $g_{\max} > \arg \max_g [\theta_{\max} v(g) - \alpha^l g]$.

Next observe that a rigid budget bill may be optimal in these circumstances, as may a bill that allows the executive discretion in some states. Suppose, for example, that α^b is small and α^e is large. Then the legislature will perceive only a small expected benefit from allowing spending on groups in B to respond to productivity shocks, but a large expected cost of allowing the executive to spend on groups in E/L . The legislature adopts a rigid budget in this situation. In contrast, if $\alpha^e - \alpha^b$ and $\alpha^l - \alpha^e$ are small compared to α^b , the interests of the executive and legislature nearly coincide. Then the expected cost to the legislature of discretionary spending on groups in E/L will be small, and the benefits of flexibility will dominate.

We can say a bit more about the special case in which the shocks to productivity are perfectly correlated across groups. Then either the legislature sets a rigid budget or its earmarks for groups in B will not bind in any states of nature. To prove this assertion, let \bar{g}_B denote the level of spending mandated by the legislature for groups $i \in B$ in a budget that allows the executive some discretion. Note that the legislature never would set a budget cap that falls in the range between $(\alpha^l - \alpha^b) n\hat{g} + \alpha^b n\bar{g}_B$ and $(\alpha^l - \alpha^b) n\hat{g} + \alpha^e n\bar{g}_B$, for if it did so, the executive would devote all discretionary spending to groups in E/L . Now consider the legislature's optimal choice of \bar{g}_B . As before, we may think of the legislature as choosing θ_c , the highest realization of the productivity shock for which the spending mandates bind. For $\theta \in [\theta_{\min}, \theta_c]$ the executive spends $\tilde{g}(\theta)$ on groups in E/L and $\bar{g}_B = \tilde{g}(\theta_c)$ for groups in B . For $\theta \in [\theta_c, \theta_G]$ the executive spends $\tilde{g}(\theta)$ on all groups in E , where θ_G is the lowest realization of θ for which the spending cap binds.¹³ And for $\theta \in [\theta_G, \theta_{\max}]$, the executive divides the discretionary budget, $G - (\alpha^l - \alpha^b) n\hat{g}$, equally among the $\alpha^e n$ groups in E . The legislature therefore chooses θ_c and θ_G to maximize

$$\begin{aligned} U_F^l &= \int_{\theta_{\min}}^{\theta_c} \left\{ \alpha^b n \theta v [\tilde{g}(\theta_c)] - \alpha^l \left[\alpha^b n \tilde{g}(\theta_c) + (\alpha^e - \alpha^b) n \tilde{g}(\theta) \right] \right\} dF(\theta) \\ &\quad + \int_{\theta_c}^{\theta_G} \left\{ \alpha^b n \theta v [\tilde{g}(\theta)] - \alpha^l [\alpha^e n \tilde{g}(\theta)] \right\} dF(\theta) \\ &\quad + \int_{\theta_G}^{\theta_{\max}} \left\{ \alpha^b n \theta v [\tilde{g}(\theta_G)] - \alpha^l \alpha^b n \tilde{g}(\theta_G) \right\} dF(\theta) , \end{aligned}$$

where the first term on the right-hand side represents l 's benefits and costs from spending on groups in E for states in which the spending mandates bind but the budget cap does not, the second term represents benefits and costs from spending on groups in E in states in which neither the spending mandates nor the budget cap binds, and the final term represents benefits and costs from spending on groups in E for states in which the budget cap binds

¹³Note that $\bar{g}_B = \tilde{g}(\theta_c)$ and that $G_F > (\alpha^l - \alpha^b) n\hat{g} + \alpha^e n\bar{g}_B$. It follows that the budget cap does not bind at $\theta = \theta_c$. The lowest value of θ at which the budget cap binds is defined by $G = (\alpha^l - \alpha^b) n\hat{g} + \alpha^e n\tilde{g}(\theta_G)$. Therefore $\theta_G > \theta_c$.

but the minimum spending requirements do not.¹⁴ Now we can calculate the effect on the legislature's welfare of a marginal change in θ_c . We find

$$\begin{aligned}\frac{\partial U_F^l}{\partial \theta_c} &= \alpha^b n \tilde{g}'(\theta_c) \int_{\theta_{\min}}^{\theta_c} [\theta v'[\tilde{g}(\theta_c)] - \alpha^l] dF(\theta) \\ &= \alpha^b n \tilde{g}'(\theta_c) \int_{\theta_{\min}}^{\theta_c} \left(\theta \frac{\alpha^e}{\theta_c} - \alpha^l \right) dF(\theta) < 0,\end{aligned}$$

where the inequality follows from the fact that $\mathcal{E}[\theta \mid \theta < \theta_c] < \theta_c$ and $\alpha^e < \alpha^l$. In short, the legislature benefits from reducing θ_c whenever $\theta_c > \theta_{\min}$. Therefore, if the legislature passes a (partially) flexible budget, it will never choose a minimum spending requirement for groups in B that binds in any state of nature. Intuitively, the earmarks for groups in B can only bind in states in which the budget cap does not. But, in these states, the executive is inclined to spend more on groups in B than the legislature would like. The legislature can only lose by forcing her to spend even more than she wishes on these groups. So we conclude that $\theta_c = \theta_{\min}$ and therefore $\bar{g}_B \leq g_{\min}$. Under these circumstances

$$\begin{aligned}\frac{\partial U_F^l}{\partial \theta_G} &= n \tilde{g}'(\theta_G) \int_{\theta_{\min}}^{\theta_{\max}} [\alpha^b \theta v'[\tilde{g}(\theta_G)] - \alpha^l \alpha^e] dF(\theta) \\ &= \alpha^e n \tilde{g}'(\theta_G) \int_{\theta_{\min}}^{\theta_{\max}} \left(\theta \frac{\alpha^b}{\theta_G} - \alpha^l \right) dF(\theta) \\ &= \alpha^e n \tilde{g}'(\theta_G) \left(\hat{\theta} \frac{\alpha^b}{\theta_G} - \alpha^l \right).\end{aligned}$$

If $\theta_{\min} \geq \hat{\theta} \alpha^b / \alpha^l$, then this derivative is non-positive for all θ_G in the support of the distribution. This implies that the legislature's welfare is maximized for $\theta_G = \theta_{\min}$ and that the equilibrium budget bill is rigid. Alternatively, if $\theta_{\min} < \hat{\theta} \alpha^b / \alpha^l$, then the legislature leaves some discretion to the executive, but the spending cap binds in some states of nature, because $\theta_G = \hat{\theta} \alpha^b / \alpha^l < \theta_{\max}$.

We have proven

Proposition 8 *Let $B = L \cap E$ be non-empty, and suppose that $\alpha^l > \alpha^e > \alpha^b$. Then $\bar{g}_i^l = \hat{g} = \arg \max_g \hat{\theta} v(g) - \alpha^l g$ for all $i \in L/B$. If the productivity shocks θ_i are perfectly correlated, then either (i) $\bar{g}_i^l = \bar{g}_R$ for all $i \in B$ and $G^l = \alpha^b n \bar{g}_R + (\alpha^l - \alpha^b) n \hat{g}$, or (ii) $\bar{g}_i^l \leq g_{\min}$ for all $i \in B$ and $G^l = \sum_{i \in L/B} \bar{g}_i^l + \alpha^e n \tilde{g}(\theta_G) < \sum_{i \in L/B} \bar{g}_i^l + \alpha^e n g_{\max}$, where $\theta_{\min} < \theta_G = \hat{\theta} \alpha^b / \alpha^l < \theta_{\max}$.*

¹⁴The legislature has additional costs and benefits from spending on groups in L/B , but these are constant given the mandatory spending level $\bar{g}_i = \hat{g}$ for every $i \in L/B$.

7 Concluding Remarks

We have studied the determination of overall budget size and the allocation of pork-barrel spending in a stylized model of the budgetary process. Our model features a separation of powers between the legislative and executive branches of government. The legislature designs the budget bill, which can include a cap on total spending and earmarked allocations to designated projects. The executive implements the bill by deciding which projects to undertake within the constraints imposed by the law. The executive has the benefit of more current information about the productivity of the different possible spending projects. In this setting, we have focused on conflict of interest between the legislature and the executive as a source of variation in the budget outcome. Such conflict, we assume, arises from differences in the set of interest groups that comprise the constituencies of the executive, on the one hand, and of the powerful decision makers in the legislature, on the other.

We have identified the relative sizes of the different constituencies as an important determinant of the type of budget bill that is passed. When the executive serves a broader set of interests than those served by the decision makers among the legislators, the executive will perceive a greater cost of each pork-barrel project than the legislature. But the executive will also regard more projects as being potentially beneficial. The former consideration indicates that the legislature will choose to earmark spending for favored constituents. The latter suggests that those with power in the legislature may wish to foreclose spending on the many groups that are only of concern to the executive. Such an outcome could be achieved by their enacting a rigid budget bill, but at the cost of making spending on their favorite groups unresponsive to the resolution of uncertainty. If the set of groups in E but not in L is not too large, then the legislature's concern about insufficient spending on groups in $B = E \cap L$ may outweigh its concern about excessive spending on groups in E/L , in which case it may elect to impose no cap on total spending and thereby leave the executive with complete discretion once she fulfills the minimum spending mandated for the groups in L .

The situation is quite different when the relative sizes of the two constituencies is reversed. When the number of groups in L is greater than in E , the executive perceives a smaller cost of public funds than the legislature. Then the budget bill always includes a spending cap that binds in some states of nature. The cap restrains the executive in (at least) the states with the highest productivity of public spending, because the executive does not spend discretionary funds on groups in L/E and the spending she would like to devote to groups in E/L and to groups in B exceeds what the legislature would like to see spent. The budget bill may not include any earmarks for groups in B , because the executive and legislature have no conflict about the composition of spending on these groups in a given state of nature, and the executive will want to spend more on these groups than the legislature in most states of nature, unless there are many groups in E/L that attract the executive's discretionary funds.

Our comparative political analysis of the budget process is only a start. First, we have compared regimes with different kinds of conflicts between the executive and the legislature for a common (and stylized) set of lawmaking procedures. In reality, fiscal institutions vary greatly and these institutional differences are likely to be at least as important for budget outcomes as the differences that we have highlighted here. In particular, parliamentary and presidential systems are likely to differ not only in the breadth of the interests represented by each branch of government, but also in the role that the executive branch plays in drawing up a budget proposal, in the consequences of ex post disagreement about spending priorities, and in the types of budget bills that can be considered. To fully capture the differences in these alternative systems and their many variants, it will be necessary to examine the combined influence of particular institutional and procedural differences and differences in the objective functions of the two branches of government. Second, we have taken the objectives of the executive and ruling coalition in the legislature to be exogenous. But these too are likely to reflect institutional features of the political regime. In short, we have taken only a small step toward a better understanding of how differences across political regimes result in different government spending policies.

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