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ARTICLE

Budget flexibility, government spending and welfare

Sezer Yaşar

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TED University Turkey

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Q4 Sezer Yaşar, Department of Economics, TED University, Ankara, 06420, Turkey (sezer.yasar@tedu.edu.tr).

A growing literature in economics provides a theory of budget negotiations relying on the Baron and Ferejohn model of legislative bargaining. This literature assumes that legislators decide on all dimensions of government spending once and for all in a period during budget negotiations. However, legislators leave allocation decision of some funds to the executive authority and let it adjust government spending according to changing priorities in a year under certain restrictions. In this paper, we develop a legislative-bargaining model to investigate the effects of budget flexibility on government spending and welfare. In addition, we analyze how legislators choose the level of flexibility. We show that if legislators decide on all dimensions of government spending, high polarization leads to greater government spending. However, if the executive authority allocates government resources, high polarization leads to lower government spending. Besides, when the executive authority allocates government resources under high polarization, legislators cannot use their political power to induce overprovision of their preferred public good. When legislators can choose the level of budget flexibility, if the probability of polarization is high, they prefer to control all dimensions of government spending. We show that budget flexibility benefits society only under high probability of polarization.

1 | INTRODUCTION

Government budgets are composed of mandatory and discretionary spending. While mandatory spending is determined by regulations in law, discretionary spending is determined by annual appropriation bills—that is, the acts that enable the executive authority to spend money for specific purposes. Appropriation bills are approved by the legislators through negotiations. Therefore, it is important to understand the details of these negotiations for government spending and welfare.

A growing literature, including Baron (1991, 1993) and Persson (1998), provides a theory of budget negotiations relying on the legislative-bargaining approach of Baron and Ferejohn (1989). Papers in this literature assume that during budget negotiations legislators decide on all dimensions of government spending once and for all in a period. However, legislators prepare government budgets at different levels of detail and leave the allocation decision of some funds to the executive authority (OECD, 2014; Tommasi, 2007). In addition, government budgets are revised in a year—for example, by transferring funds between the spending items—as political priorities change (Anessi-Pessina, Sicilia, & Steccolini, 2012, 2013).

This type of flexibility can have important effects on the size and composition of government spending and its efficiency implications. However, no formal model is proposed in the literature to understand these effects and how the level of budget flexibility is determined. In this paper, we aim to fill this gap in the literature. To this end, we develop a model of budget negotiations combining Baron–Ferejohn's legislative-bargaining approach with the approaches to budget flexibility in public-administration literature. Thus, our paper also contributes to the literature on budget flexibility by providing a formal model to analyze flexibility's welfare effects.

In the public-administration literature, budget flexibility is discussed from two different perspectives. One strand of literature, including Anessi-Pessina et al. (2013) and Tommasi (2007), focuses on the opportunity that it provides for adjusting government spending to changing priorities in a year. They advocate for flexibility claiming that it increases efficiency of budget execution. The changes in priorities may stem from, for example, natural disasters, unplanned military operations or changes in the international environment.[1] On the other hand, Banks and Straussman (1999) point out that flexibility can cause a conflict between the executive and legislative authorities: Adjustments in the government spending will be made according to the policy preferences of the executive, and the legislature's control over the budget will weaken. They illustrate such a conflict with the 1996 U.S. defense budget and show how President Clinton funded Bosnia operations using the flexibility of the federal budget despite opposition in Congress.

Before explaining how our model combines a legislative-bargaining approach with approaches to budget flexibility, let us explain the institutions that determine budget flexibility more precisely. We consider three institutions in our paper.[2] The first is the number of line-item appropriations. Line-item appropriations are the most detailed spending levels in an appropriation bill. A smaller number of line-item appropriations gives more flexibility to the executive authority. The second institution is the maximum amount of funds that the executive authority can transfer between the spending items in an appropriation bill. These two institutions can be determined by the legislature while writing an appropriation bill. The third institution allows the executive authority transfer funds between the spending items after getting approval of the legislature, which is actually allowed in many governments. An appropriation bill with a small number of line items gives an unrestricted flexibility to the executive authority compared to a bill with a large number of line items. Whereas, the other two institutions give restricted flexibility to the executive authority.

To analyze these institutions, we construct a two-period model in which there are two groups and two public goods. We also assume that there are two states of the world, no-polarization and polarization. A legislature consists of the representatives of both groups. Executive authority is determined differently in presidential and parliamentary regimes (Persson, Roland, & Tabellini, 2000). We present our results first for a presidential regime and then we consider a parliamentary regime. Thus, we also have a president that represents one of the groups in the society. In our main model, the legislators first decide on a budget. They can choose either a one-item budget, which only specifies the total provision of the two public goods, or a two-item budget, which specifies the provision of each public good separately. After the budget is selected, nature determines the state of the world. While both groups enjoy the first public good in a no-polarization state, one of the groups enjoys the second public good in a polarization state. After nature determines the state of the world, the president decides on the provision of both public goods under the constraint of the legislature's budget. Under a one-item budget, government resources can be allocated for the provision of public goods according to the president's own preferences. However, under a two-item budget allocations for the public goods are specified in the budget. Thus, a one-item budget gives an unrestricted flexibility to the executive.

To study institutions giving restricted flexibility to the executive authority, we extend our model to analyze flexible two-item budgets and legislature-approved transfers. In a flexible two-item budget, legislators specify the provision of both public goods separately but let the president transfer government resources between the two public goods less

[1] See, for example, GAO (2015), Tyszkiewicz and Daggett (1998), and Fisher (1974).

[2] For a discussion of budgetary institutions in different countries, see Tommasi (2007) and OECD (2014), and in Italian municipalities see Anessi-Pessina et al. (2013).

than a certain amount. Under a legislature-approved transfer system, legislators specify the provision of both public goods separately but the president can transfer government resources between the two public goods after nature determines the state of world if the legislature approves the transfer request. We also extend our model to analyze presidential line-item veto, which gives the president veto flexibility.

We can summarize our main results as follows. The preceding literature on the theory of budget negotiations assumes that legislators choose a two-item budgeting rule and there is no uncertainty in the state of the world. We show that these assumptions have important effects on model's positive and normative predictions. In particular, while a high polarization leads to a larger government size under two-item budgeting, it leads to a smaller government under one-item budgeting. Besides, under one-item budgeting and a high polarization, legislators cannot enjoy their political power in the sense that they cannot provide overprovision of their preferred public good. If the state of the world is uncertain, even though it is with a small probability, the model's efficiency implications may reverse compared to a model with no uncertainty. By including uncertainty, we show that while legislators can prefer a one-item budget under a low probability of polarization, they prefer a two-item budget under a high probability of polarization. Thus, a high probability of polarization stimulates the legislature to increase its control over government policies.

In terms of the welfare effects of budget flexibility, we get the following results. If the probability of polarization is low, none of the flexibility institutions increases the utility of both groups in the society. They can benefit the group that holds the executive power, but they hurt the other one. If the probability of polarization is high, while unrestricted flexibility given to executive hurts both groups, restricted flexibility benefits them. So, our results support the view that budget flexibility benefits society only under a high probability of polarization and only if the flexibility given to executive is restricted.

The remainder of the paper is organized as follows. In Section 2, we summarize the related literature. In Section 3, we present our model. In Section 4, we look at a social planner's solution. In Section 5, we present our results for a presidential regime. In Section 6, we present our results specific to a parliamentary regime. Finally, Section 7 concludes.

2 | RELATED LITERATURE

A large literature provides a theory of budget negotiations based on the legislative-bargaining model of Baron and Ferejohn (1989). Some early examples of these papers are Baron (1991, 1993) and Persson (1998). These papers assume that the legislative authority decides on all dimensions of government policy once and for all in a period. However, this assumption ignores the role of the executive authority in government spending. In our model, we relax this assumption and provide a theory of budget negotiations that incorporates the interaction of the legislative and the executive authority into budget negotiations. Some recent papers in this literature are Leblanc, Snyder, and Tripathi (2000), Volden and Wiseman (2007), and Battaglini and Coate (2007).

There is a vast literature on the provision of public goods under political-economy frictions as surveyed in Persson and Tabellini (2002). A subset of this literature analyzes the effects of different political institutions on the provision of public goods. For example, Persson et al. (2000), Lizzeri and Persico (2001), and Milesi-Ferretti, Perotti, and Rostagno (2002) analyze the provision of public goods under different electoral systems. Bowen, Chen, and Eraslan (2014) investigate the provision of a public good under two budgetary institutions: mandatory versus discretionary spending programs. Our paper adds to this literature by focusing on budget flexibility.

A growing literature analyzes the determinants and effects of the limits on executive power. A recent paper in this literature that is relevant to ours is Besley, Persson, and Reynal-Querol (2016). They analyze an infinite-horizon model in which the executive power determines provision of a public good in each period, group-specific transfers and limits of executive power occur in the next period. They show that a higher probability of losing office leads to stronger executive constraints and this increases the provision of the public good. We add to this literature by analyzing the constraints on executive power induced by the structure of the government budget. The Besley et al. (2016) model does not allow consideration of the effects of polarization on the provision of public goods. We show that constraints on executive power increase the provision of public goods only when the probability of polarization is high. Other papers in this literature are Lagunoff (2001), Aghion, Alesina, and Trebbi (2004), Maskin and Tirole (2004), Ticchi and Vindigni (2010), Acemoglu, Robinson, and Torvik (2013), Robinson and Torvik (2013), and Karakas (2017).

A growing theoretical and empirical literature analyzes the effects of polarization on economic outcomes. For example, on the theoretical side, Alesina, Baqir, and Easterly (1999) show that polarization decreases the provision of public goods if allocation of tax revenue is decided after the tax is collected, Azzimonti (2011) shows that polarization decreases investment and increases government spending, and Azzimonti and Talbert (2014) show that polarization increases macroeconomic fluctuations. On the empirical side, Lindqvist and Östling (2010) state that polarization is associated with lower government spending in strong democracies, and Alt and Lassen (2006) state that, among advanced economies, electoral cycles are larger in more polarized countries. Our paper connects to this literature by theoretically analyzing the effects of the probability of polarization on government spending and budget flexibility in a legislative-bargaining model.

3 | MODEL

In this section, we present the core of our legislative-bargaining model that allows budget flexibility. As we describe it formally in the following sections, we develop a two-period model in which the policy-proposing legislator alternates between the periods. Instead of a one-shot bargaining game, we utilize a two-period framework as it lets us to identify the source of political power—namely, being the final proposer—in our setting more easily.

3.1 | Economic environment

Q5 The society is separated into two groups of citizens, each with unit mass and indexed by $i \in \{1, 2\}$. Each citizen has an endowment of one unit of labor denoted by l. There is a consumption good denoted by z, and two public goods denoted by g and indexed by $j \in \{1, 2\}$. All goods are produced with the technology $f(l) = l$.

There are two states of the world denoted by $s \in \{\mathrm{N}, \mathrm{P}\}$; N stands for *no polarization* and P for *polarization* as we explain in the following. While a citizen's utility function in Group 1 is given by

$$z + h(g_1)$$

at all states s, in group 2 it is given by

$$z + h(g_1)$$

if the state is N, and by

$$z + h(g_2)$$

if the state is P. Thus, in state P, there is polarization between the two groups about the public goods.[3]

Public goods can represent, for example, infrastructure and recreational facilities. If there is no natural disaster, one group in the society may prefer investment in infrastructure over recreational facilities while another group can have opposite preferences. However, if there is a flood that destroys roads, power supplies, etc., infrastructure investment can be a priority for all groups in the society. Another example of public goods can be defense expenditures on readiness of the military for a war with another country and overseas military operations. A group in the society may think that a conflict in an oversea region should be ceased by a military action, but the other group may think that the priority of

[3] As an alternative way of modeling, we could assume that both legislators take utility from the two public goods with a positive probability and independently. This complicates the analysis but does not provide additional insights.

the government should be to invest in the readiness of the army for an external war. However, if a peace agreement is be achieved by the conflicting groups in the oversea region, for both groups investing in the readiness of the army can be a better option.

There is a competitive labor market. Therefore, the assumption on the production technology of the consumption good implies that the wage rate is equal to 1.

3.2 | Government policies

A government policy is described by a triple (τ, l_1, l_2), where τ is the income tax rate and l_j is the amount of labor allocated for the production of public good j. The set of feasible government policies is given by

$$P = \left\{ (\tau, l_1, l_2) \in [0,1] \times \left\{ 0, \frac{1}{n}L, \frac{2}{n}L, \ldots, L \right\}^2 : l_1 + l_2 = 2\tau \quad \text{and} \quad l_1 + l_2 \leq L \right\},$$

where $n \in \{2, 3, \ldots\}$ and L is the maximum amount of labor that can be hired for the production of public goods.[4] Feasibility requires $L \leq 2$, which is the total endowment of labor in the economy. We assume that, for production of a public good, labor can only be hired at discrete levels.[5] We also assume that tax revenue can only be spent for production of public goods and not wasted.

We will make two assumptions on the utility functions and government policies. For this purpose, we define a set of functions to which h can belong. Let

$$H_0 = \left\{ g \in \mathcal{H} : \frac{1}{2n}L > g\left(\frac{2}{n}L\right) - g\left(\frac{1}{n}L\right) \right\},$$

$$H_m = \left\{ g \in \mathcal{H} : g\left(\frac{m+1}{n}L\right) - g\left(\frac{m}{n}L\right) > \frac{1}{2n}L > g\left(\frac{m+2}{n}L\right) - g\left(\frac{m+1}{n}L\right) \right\}$$

for each $m = 1, \ldots, n-2$ and

$$H_{n-1} = \left\{ g \in \mathcal{H} : g(L) - g\left(\frac{n-1}{n}L\right) > \frac{1}{2n}L \right\},$$

where $\mathcal{H}$ is the set of increasing and strictly concave functions from $\mathbb{R}_+$ to $\mathbb{R}_+$. As the index of the set that h belongs to increases, the value of public goods increases. The expression on the left of the inequality in H_m denotes the benefit of increasing the labor allocated for production of a public good from $\frac{m}{n}L$ to $\frac{m+1}{n}L$, and the expression on the right denotes the same benefit if we increase the labor from $\frac{m+1}{n}L$ to $\frac{m+2}{n}L$. The expression in the middle is the cost, that is, a citizen's tax burden of any such increase. Therefore, for example, if $h \in H_m$, it is optimal for Legislator 1 to allocate $\frac{m+1}{n}L$ labor for production of g_1 for any $m = 1, \ldots, n-1$ by strict concavity of h.

Assumption 1. As the value of public goods increases, the utility of the minimum provision of a public good also increases; specifically, if $h \in H_m$, then $h(\frac{1}{n}L) > \frac{m+2}{2n}L$ for each $m \in \{0, \ldots, n-1\}$.

Assumption 1 states that as the index of the set that h belongs to increases, the utility from the minimum provision of a public good also increases. We make this assumption to be able to obtain closed-form solutions for our equilibrium.

Assumption 2. Any two different government policies give different utilities. Specifically,

$$1 - \tau + (1-p)h(l_1) + ph(l_2) \neq 1 - \tau' + (1-p)h(l'_1) + ph(l'_2)$$

for any $(\tau, l_1, l_2), (\tau', l'_1, l'_2) \in P$ with $(\tau, l_1, l_2) \neq (\tau', l'_1, l'_2)$ and $p \in [0, 1]$.

[4] Aidt and Dutta (2017) also employ a similar upper bound on government expenditures by restricting the taxes.

[5] We make this assumption for tractability. It is a common assumption in models with legislative-decision making and more than one public good (Ferejohn, Fiorina, & McKelvey, 1987; Lockwood, 2002, 2004).

We make this assumption to avoid nongeneric cases that complicate the statement and proof of our results.

We can summarize an economic environment with government policies that satisfy Assumptions 1–2 by

$$\Gamma = (L, n, m).$$

4 | SOCIAL PLANNER'S SOLUTION

Before examining the equilibrium, we will look at which policies a social planner would choose to maximize the sum of the citizens' utilities.

If the state is N, the social planner's problem is

$$\max_{l_1} 2 - 2\tau + 2h(l_1)$$

$$\text{s.t. } (\tau, l_1, 0) \in P.$$

It is easy to show that the social planner would choose l_1 such that

$$h\left(l_1 + \frac{1}{n}L\right) - h(l_1) < \frac{1}{2n}L < h(l_1) - h\left(l_1 - \frac{1}{n}L\right)$$

which implies that $l_1 = \frac{m+1}{n}L$ if $h \in H_m$.

If the state is P, social planner's problem is

$$\max_{l_1, l_2} 2 - 2\tau + h(l_1) + h(l_2)$$

$$\text{s.t. } (\tau, l_1, l_2) \in P.$$

In this case, social planner chooses l_i such that

$$h\left(l_i + \frac{1}{n}L\right) - h(l_i) < \frac{1}{n}L < h(l_i) - h\left(l_i - \frac{1}{n}L\right)$$

for each $i \in \{1, 2\}$. Assuming that $h \in H_m$, we will have $l_i < \frac{m+1}{n}L$ for each i due to the strict concavity of h. So, the optimal total government spending in state P can be less or greater than its value in state N.[6]

5 | PRESIDENTIAL REGIME

Appointment of the executive and legislative authorities differs in presidential and parliamentary regimes. In particular, in presidential regimes, executive authority is appointed independently of the legislative authority as in the United States. However, in parliamentary regimes, executive authority is chosen out of the legislature as in many European countries. In such a system, disapproval of the budget may trigger a government crisis, which may cause a change in executive authority (Persson et al., 2000). Therefore, we conduct our analysis for the two regimes separately.

In this section, we focus on a presidential regime. In this regime, there is an executive authority consisting of a president, and a legislature formed by representatives of both groups in the society. The president can represent one of the two groups in the society; we call him President i depending on which group is represented, $i \in \{1, 2\}$. The legislature decides on the government budget, and the president on government policy under the constraint of the legislature's

[6] Under our assumptions, we cannot obtain the social planner's solution in a closed form when the state is P. Similarly, we cannot characterize optimal spending if the social planner has to decide on the provision of public goods before the state of the world is realized unless $p \in \{0, 1\}$.

budget. There are two kinds of budgets, one and two item that differ in their levels of detail. A one-item budget, l, specifies only the total labor that will be hired for the production of the two public goods, while a two-item budget, (l_1, l_2), specifies the labor that will be hired for the production of each public good $i \in \{1, 2\}$ separately. Thus, we have

$$l \in \left\{0, \frac{1}{n}L, \frac{2}{n}L, \dots, L\right\},$$

and

$$(l_1, l_2) \in \left\{0, \frac{1}{n}L, \frac{2}{n}L, \dots, L\right\}^2$$

such that $l_1 + l_2 \leq L$.

The political process is given by the following:

1. In the first period, one of the legislators is appointed to offer a budget.
2. The proposer offers either a one-item budget, l, or a two-item budget, (l_1, l_2); we denote this offer by b_1.
3. If the other legislator approves b_1, nature selects the state of the world such that state N has a probability $1 - p$.[7] Then the president chooses a government policy under the constraint of b_1 and the process ends. Specifically, if b_1 is a one-item budget, l, the president chooses labor that will be hired for the provision of the two public goods taking the tax rate equal to $\frac{1}{2}l$—that is, he chooses (l_1, l_2) such that $(\frac{1}{2}l, l_1, l_2) \in P$. If b_1 is a two-item budget, (l_1, l_2), the president simply implements the legislature's labor-hiring decision setting the tax rate equal to $\frac{1}{2}(l_1 + l_2)$. If the other legislator rejects b_1, the process moves to the second period.
4. In the second period, the legislator different than the one appointed in Stage (1) is appointed to propose a budget.[8] He offers either a one- or two-item budget; we denote his offer by b_2.
5. If the other legislator approves b_2, nature selects the state of the world with the same probabilities in Stage (1). Then the president chooses a government policy under the constraint of b_2, as in Stage (3), and the process ends. If the other legislator rejects b_2, no tax is collected, no public good is provided and the process ends.

The political process we described above defines a sequential game and we will consider its subgame-perfect equilibria. To decrease the number of equilibria, we assume that if a proposer is indifferent between two budgets, one that will be approved and another one that will be rejected by the other legislator, he offers the budget that will be approved. Similarly, if a responder is indifferent between approving and rejecting a budget, it is approved.

At his point, we can ask if budget constraints are really effective in restricting the spending decisions of an executive authority. For a developed country like the United States, we see that they do. Schick (2008) explains the punishment strategies that the U.S. Congress can use in case the spending agencies do not follow the budget, and he states that in most cases the Congress does not need to use these strategies as the agencies follow the budget. Banks and Straussman (1999) also reveals the concerns of the U.S. president in "maintaining accountability to Congress and the budget process" while funding the Bosnia Peace Force. Thus, we can expect that the legislature can effectively restrict the executive authority using the budget in countries where accountability is strong.

5.1 | Exogenous budgeting rule

Before analyzing the equilibria of the political process above, in this section, we fix the number of budget items, and investigate the effects of one- and two-item budgets on government spending and welfare.

The formal proofs of the following results are given in Appendix A.

[7] Gennaioli and Voth (2015) employ a similar sequence for a resolution of uncertainty in a dictatorial regime.

[8] A more desirable approach would be random recognition of the second-period proposer. However, we can get results under this rule.

Proposition 1. *Let Assumptions 1–2 hold. For any economic environment, Γ, and the number of budget items, there exists a unique equilibrium in a presidential regime.*

Proposition 1 is easy to prove under Assumptions 1–2 since we allow only a finite number of labor-hiring policies. To state our remaining results, we will define two terms: *a high probability of polarization* and *a low probability of polarization*. For this purpose, let us take an economic environment, $\Gamma = (L, n, m)$. There exists $\underline{p}, \bar{p} \in (0, 1)$ such that $\underline{p} < \bar{p}$, $(1 - p)h \in H_m$ for all $p \in [0, \underline{p}]$ and

$$(1 - p)h\left(\frac{1}{n}L\right) < \frac{1}{2n}L$$

for all $p \in [\bar{p}, 1]$. If $p \in [0, \underline{p}]$, we say that we have a low probability of polarization, and if $p \in [\bar{p}, 1]$, a high probability of polarization. We can characterize our equilibrium in a closed form if and only if we have a low or a high probability of polarization. Thus, in the remaining propositions, we focus on these two situations.

Proposition 2. *Let Assumptions 1–2 hold. In the presidential regime with a low probability of polarization, at the equilibrium, we have the following results.*

- **i)** *Under one-item budgeting, the first-period legislator proposes $l = \frac{m+1}{n}L$ and the proposal is accepted.*
- **ii)** *Under two-item budgeting, the first-period legislator offers $(l_1, l_2) = (\frac{m+1}{n}L, 0)$ and the proposal is accepted.*

If the probability of polarization is low, Legislator 2 receives utility from the first public good and the utility functions of both legislators will be the same with a high probability. Thus, as given in Proposition 2, under one-item budgeting legislators accept each others' offers in the first period. Under two-item budgeting, the proposing legislator allocates the whole labor for the first public good since he has to specify the provision of each good separately and both legislators value Public Good 1 more. Although, the two budgeting rules lead to the same government size, the composition of government spending may differ between them. This is due to the flexibility one-item budgeting offers the president. In particular, if the state is P and we have President 2, while he will allocate all labor for g_2 under one-item budgeting, he has to allocate it for g_1 under two-item budgeting. Thus, under a low probability of polarization, while one-item flexibility benefits the group that holds the executive authority, it hurts the other group.

Proposition 3. *Let Assumptions 1–2 hold. In the presidential regime with a high probability of polarization, at the equilibrium, we have the following results.*

- **i)** *Under one-item budgeting, no public good is provided.*
- **ii)** *Under two-item budgeting, if the first-period proposer is Legislator 1, he offers $(l_1, l_2) = (\frac{1}{n}L, \frac{m+1}{n}L)$. If the first-period proposer is Legislator 2, he offers $(l_1, l_2) = (\frac{m+1}{n}L, \frac{1}{n}L)$. Both legislators' proposals are accepted.*

If the probability of polarization is high, under one-item budgeting, no public good is provided as stated in Proposition 3 because the legislator who does not share the president's preferences with a high probability will not want to give the control of any funding to the president. This reflects the conflict that budget flexibility causes between the legislative and executive authorities and Banks and Straussman (1999) emphasize. In contrast, under two-item budgeting, both public goods are provided because their provision is determined at the budgeting stage. Therefore, under a high probability of polarization, one-item flexibility decreases the utility of both legislators. Our results show that budget flexibility provided to the executive authority without any restriction never benefits both groups in the society. These results cast doubt on the view that budget flexibility provided to the executive authority beforehand benefits society, as stated, for example, by Tommasi (2007).

As we see in part (ii) of Proposition 3, being the second-period proposer is more advantageous, in the sense that one's preferred public good is provided at a larger amount. This is because the second-period proposer makes the final offer. Thus, to gain approval, the first-period proposer offers a budget allocating more labor for the public good that the second-period proposer values more.

The literature on the theory of budget negotiations, such as Baron (1993) and Persson (1998), assumes no uncertainty in the state of the world and the budgeting rule is two-item budgeting. We now look at the effects of these assumptions from a positive and normative perspective. First, we assume no uncertainty and concentrate on the effects of assuming two-item budgeting. From a positive perspective, if both legislators take utility from g_1—that is, $p = 0$,—the two budgeting rules lead to the same government policy. However, if the legislators enjoy different public goods—that is, $p = 1$,—government policy differs sharply between the two budgeting rules. Two-item budgeting results in both public goods being provided and higher government spending than under no-polarization case. However, one-item budgeting leads to no public good being provided and lower government spending than under no-polarization case. This result indicates the importance of budget flexibility for government spending in a legislative-bargaining model. Besides, a growing literature, such as Lindqvist and Östling (2010) and Azzimonti (2011), analyzes the effects of polarization on government spending. This literature can find both negative and positive relations between the two variables. Our model provides an explanation for these findings from a budgeting-rule perspective.

To investigate the effects of two-item budgeting from a normative perspective, we focus on the following two corollaries, where we consider the social planner's solution as the socially optimal government spending.

Corollary 1. *Let Assumptions 1–2 hold. In the presidential regime, if $p = 0$, government policies are socially optimal under both one- and two-item budgeting.*

In Corollary 1, we focus on the case in which both legislators enjoy the first public good. In this case, it is clear that under both budgeting rules, all labor will be allocated for Public Good 1. However, a concern for obtaining the socially optimal level of public good with the political process can be that while the social planner internalizes the benefit of the public good for both groups, the proposing legislator internalizes its benefit only for his own group. Yet, because the social planner also internalizes the cost of public good for both groups, the level of public-good provision is socially optimal under the political process. So, assuming two-item budgeting does not affect the normative conclusions of the model. However, as we state in Corollary 2, if the legislators enjoy different public goods, we lose this result.

Corollary 2. *Let Assumptions 1–2 hold. In the presidential regime, if $p = 1$, we have the following results:*

i) *Under one-item budgeting there is underprovision of both public goods.*

ii) *Under two-item budgeting, if the first-period proposer is Legislator 1, there is underprovision of g_1 and overprovision of g_2. If the first-period proposer Legislator 2, there is overprovision of g_1 and underprovision of g_2.*

When legislators enjoy different public goods, if, following the preceding literature, we assume two-item budgeting, one public good will always be underprovided and the other will be overprovided. Particularly, as we state in Corollary 2, because the second-period proposer has the advantage of making the final offer, the public good that he enjoys will be overprovided. However, under one-item budgeting, both public goods will be underprovided. This is because one-item budgeting allows the president to allocate the total government resources according to his own preferences. Therefore, the legislator who enjoys the public good not favored by the president does not accept giving the president the control of any funding. Thus, no public good is provided under one-item budgeting, while, for the socially optimal outcome, both public goods should be provided at a positive level. Besides, in contrast to the prediction of the approach in the literature, the second-period proposer cannot enjoy the final-proposer advantage under one-item budgeting.

In the next two corollaries, we investigate the effects of the no-uncertainty assumption from a normative perspective.[9] First, we concentrate on the case of a low probability of polarization.

Corollary 3. *Let Assumptions 1–2 hold. In the presidential regime with two-item budgeting and a low probability of polarization, we have the following results:*

i) *If the state is N, provision of both public goods is socially optimal.*

[9] From a positive perspective, this assumption does not affect our results under two-item budgeting.

ii) *If the state is P, there is overprovision of g_1 and underprovision of g_2.*

Let us focus on two-item budgeting and compare the following two cases to investigate how the no-uncertainty assumption distorts the model's normative predictions. In the first case, as in the preceding literature, there is no uncertainty in the state of the world and both legislators enjoy the first public good. In the second case, there is a low probability of polarization. In both situations, the legislators allocate all labor for the first public good at the equilibrium. Under the latter situation, if the state turns out to be unpolarized, as we state in the first part of Corollary 3, provision of each public good is socially optimal, which is also the result under no uncertainty. Therefore, the approach of the preceding literature does not affect the normative predictions of the model. However, under uncertainty, legislators can also enjoy different public goods, if only with a low probability. In this case, in contrast to the prediction of the preceding literature's model, we will have overprovision of g_1 and underprovision of g_2. Since a socially optimal outcome requires provision of both public goods at a positive and equal level.

Corollary 4. *Let Assumptions 1–2 hold. In the presidential regime with two-item budgeting and a high probability of polarization, we have the following results:*

i) *If the state is N and the first-period proposer is Legislator 1, there is underprovision of g_1 and overprovision of g_2. If the first-period proposer is Legislator 2, there is overprovision of g_2.*

ii) *If the state is P and the first-period proposer is Legislator 1, there is underprovision of g_1 and overprovision of g_2. If the first-period proposer is Legislator 2, there is overprovision of g_1 and underprovision of g_2.*

In Corollary 4, we investigate the effects of the no-uncertainty assumption on the normative predictions of the two-item-budgeting model under a high probability of polarization. In particular, we compare the following two cases. In the first, as the in the preceding literature, there is no uncertainty in the state of the world and the legislators enjoy different public goods. In the second, there is a high probability of polarization. In the former situation, the public good enjoyed by the first-period legislator is underprovided and the other public good is overprovided. In the latter situation, if the legislators end up enjoying different public goods, we have the same normative result as from the approach in the preceding literature. However, if the legislators enjoy the same public good and the first-period proposer is Legislator 2, we will have overprovision of the public good that the first-period proposer enjoys. Thus, the no-uncertainty assumption in the preceding literature will distort the normative predictions of the model.

We discussed the effects of polarization on government spending above. One may ask how an increase in the probability of polarization affects welfare in our original model with uncertainty. As we noted above, a high probability of polarization decreases both legislators' utilities under one-item budgeting. Under two-item budgeting, we can summarize the results thus. If we compare low, p', and high, p'', probabilities of polarization symmetrically, in the sense that $1 - p' = p''$, we can also show that a high probability of polarization decreases the utility of both legislators. However, in the case of a moderate level of low polarization and a very large level of high polarization, Legislator 2 can have a higher utility under a high probability of polarization. A more concrete discussion of this issue is given in Appendix B.

5.2 | Endogenous budgeting rule

In this section, we look at the equilibria of the political process described in Section 5. First we focus on equilibria under a low probability of polarization in Proposition 4.

Proposition 4. *Let Assumptions 1–2 hold. In the presidential regime, if the probability of polarization is low, at the equilibrium, we have the following results:*

i) *If we have President 1, the first-period proposer offers either the one-item budget $l = \frac{m+1}{n}L$ or the two-item budget $(l_1, l_2) = (\frac{m+1}{n}L, 0)$, and the proposal is accepted.*

ii) *If we have President 2 and the first-period proposer is Legislator 1, he proposes the one-item budget* $l = \frac{m+1}{n}L$ *and the proposal is accepted. If the first-period proposer is Legislator 2, he proposes the two-item budget* $(l_1, l_2) = (\frac{m+1}{n}L, 0)$ *and the proposal is accepted.*

Under a low probability of polarization and two-item budgeting, the legislators will allocate the whole tax revenue for g_1. Besides, if we have President 1, one- or two-item budgeting does not make a difference, since the president will allocate the whole labor for g_1. Thus, with President 1, legislators are indifferent between a one- and two-item budget. However, if we have President 2, Legislator 2 prefers a one-item budget, to provide the president the opportunity of choosing public-good provision according to the state of the world. Legislator 2 will achieve this goal when making the final offer—that is, Legislator 1 is the first-period proposer. When Legislator 2 is the first-period proposer, a two-item budget will be adopted as Legislator 1 has the power of making the final offer and wants to guarantee the allocation of whole labor for g_1.

The equilibrium under a high probability of polarization is given in Proposition 5.

Proposition 5. *Let Assumptions 1–2 hold. In the presidential regime, if the probability of polarization is high and the first-period proposer is Legislator 1, at the equilibrium, he proposes the two-item budget* $(l_1, l_2) = (\frac{1}{n}L, \frac{m+1}{n}L)$ *and the proposal is accepted. If the first-period proposer is Legislator 2, he proposes the two-item budget* $(l_1, l_2) = (\frac{m+1}{n}L, \frac{1}{n}L)$ *and the proposal is accepted.*

Under a high probability of polarization, since a one-item budget results in no provision of public goods, the legislators offer a two-item budget. The allocation of labor depends on the first-period proposer as given in the proposition. We should note that in the presidential regime, at the equilibrium, the first-period proposals are always accepted; this is a result that will not hold in the parliamentary regime as given in Section 6. Banks and Straussman (1999) state that an important approach in public management calls for a reform in government budgets in favor of more flexibility. Our result shows that if the probability of polarization is high, legislators can avoid such a reform.[10]

When the budgeting rule is endogenous, the effect of polarization on legislators' utility is similar to what we discussed in the previous section. So, we skip this discussion here.

The reader may ask how the results would change if instead of analyzing a model with uncertainty, we analyze a model with just high and low polarization.[11] In such a model, we cannot capture the advantage of a one-item budget. So, under a low probability of polarization with President 2, if the first-period proposer is Legislator 1, he will be indifferent between a one- and two-item budget. Therefore, we will not have a one-item budget as the unique equilibrium outcome in any case, losing the sharpness of our results.

5.3 | Transfers

Authority for transferring funds between the spending items can be given in different forms to the executive authority (Anessi-Pessina et al., 2013; OECD, 2014; Tommasi, 2007). One form is preparing the budget in a less detailed way, or decreasing the number of line-item appropriations, which we considered in the preceding sections. In this section, we consider two other common types of transfer authorities that can be given to an executive authority. We call them *flexible two-item budget* and *legislature-approved transfers.* Although they do not affect total government spending, they have important effects on legislators' utilities as we explain in the propositions below.

In a flexible two-item budget, the maximum amount of funds that can be transferred between the spending items is specified in the legislature's budget negotiations. After the budget is approved, a president can transfer funds between the spending items staying in this limit. To analyze this type of a budget, we fix the number of budget items at two, but add another dimension to the budget that specifies the maximum amount of labor that can be transferred from one public good to other.

[10] There is in fact a large literature in economics on the timing of reforms as surveyed in Hwang and Möllerström (2017). Our paper connects to this literature from a budget-reform perspective.

[11] We thank an anonymous referee for bringing this question into our attention.

Proposition 6. *Let Assumptions 1–2 hold. In the presidential regime with a flexible two-item budget and a low probability of polarization, if we have President 2 and the first-period proposer is Legislator 1, Legislator 2's utility increases and Legislator 1's decreases compared to two-item budgeting. Otherwise, the legislators' utilities are the same under the two budgeting rules.*

If there is a low probability of polarization, the flexible two-item budget benefits one of the legislators but hurts the other as stated in Proposition 6. In particular, let us assume we have President 2 and the first-period proposer is Legislator 1. When the flexible two-item budget is available, using the final-proposer power, Legislator 2 induces Legislator 1 to make a budget offer in which the whole labor can be transferred between the production of the two public goods. Thus, in state P, President 2 allocates the whole labor for g_2. Clearly, this increases the utility of Legislator 2 and decreases Legislator 1's, compared to two-item budgeting under which the whole labor is allocated for g_1.

Proposition 7. *Let Assumptions 1–2 hold. In the presidential regime with a flexible two-item budget and a high probability of polarization, if we have President 2 and the first-period proposer is Legislator 1, the utility of each legislator increases compared to two-item budgeting. Otherwise, the legislators' utilities are the same under the two budgeting rules.*

Proposition 7 shows that if the probability of polarization is high, the flexible-two item budget benefits both groups in the society. It never decreases any legislator's utility. Moreover, if we have President 2 and Legislator 1 is the first-period proposer, Legislator 1 offers a budget under which the president can transfer labor between the two public goods while providing g_1 at all states. Thus, if the state is N, the president can allocate the whole labor for g_1 and both legislators can achieve a higher utility compared to two-item budgeting. So, our analysis suggests that the flexible two-item budget can increase social welfare, as advocates of budget flexibility suggest, but only under certain conditions. It may even hurt one of the groups if there is a low probability of polarization.

In a budget with legislature-approved transfers, the executive authority can request permission from the legislature to transfer funds between the spending items during a year. To analyze this type of a transfer in our model, we fix the number of budget items at two and let a president request permission from the legislature to transfer labor from one public good to another after nature chooses the state of the world. If both legislators approve the request, the president chooses government policy in accord with the requested transfer. Otherwise, government policy is as originally specified in the budget.

Proposition 8. *Let Assumptions 1–2 hold. In the presidential regime with two-item budget allowing legislature-approved transfers and a high probability of polarization, if the state is N, the utility of each legislator increases compared to two-item budgeting. Otherwise, legislators' utilities are the same under the two budgeting rules.*

As we state in Proposition 8, legislature-approved transfers never decreases the utility of legislators. This is intuitive, since a transfer can only be applied if it is approved by both legislators. Moreover, if there is a high probability of polarization and the state is N, legislature-approved transfers increase both legislators' utility because, in this case, the president can transfer labor allocated for g_2 to g_1, ensuring no labor is wasted for the production of a public good that benefit no legislator. Thus legislature-approved transfers support the view that budget flexibility can improve welfare by providing adjustment of government spending to changing conditions, as stated from example by Tommasi (2007) and Anessi-Pessina et al. (2013). However, we show that this view is true only under certain conditions.

Notice that, in the model without uncertainty, flexible two-item budget and legislature-approved transfers lose their roles. They do not affect government policies or welfare. Thus, there is no reason for the president and the legislature to employ them. However, both transfer methods are used by many governments in the world. Therefore, allowing uncertainty is crucial to understanding their effects.

5.4 | Line-item veto

The line-item veto right exists in the United States for many state governors. It allows a governor to reject a single item in a budget. There is a large empirical literature on the effects of the line-item veto right on government spending.[12]

[12] See Carter and Schap (1990) for a survey.

However, there are few theoretical models that analyze the line-item veto right (see, for example, Carter & Schap, 1987, Carter & Schap, 1990; Dearden & Husted, 1993).

To analyze the line-item veto in our model, we assume two-item budgeting. After a budget is approved by the legislature, the president can approve or reject each item separately in the budget. If he approves at least one item, the approved items are implemented. Otherwise, no public good is provided.

Proposition 9. *Let Assumptions 1–2 hold. In the presidential regime with two-item budgeting and presidential line-item veto, we have the following results:*

i) *If the probability of polarization is low, an equilibrium labor allocation is given as* $(l_1, l_2) = (\frac{m+1}{n}L, 0)$.

ii) *If the probability of polarization is high, there is no provision of public goods.*

Comparing the second parts of Propositions 3 and 9, we see that allowing the line-item veto right changes the equilibrium substantively under a high probability of polarization. In particular, when the line-item veto right is not allowed, both public goods are provided at a positive level, whereas when it is allowed, public-good provision is zero. To understand why, note that, because the probability of polarization is high, the president rejects the provision of the public good that will he will not enjoy with a high probability. However, this is also the public good that is valuable for one of the legislators. Thus, this legislator rejects any budget with a positive provision of any public good.

6 | PARLIAMENTARY REGIME

As we mentioned in Section 5, in a parliamentary regime, the executive is not independent of the legislative authority; he is chosen from the legislature. In such a regime, disapproval of the budget may trigger a government crisis and cause a change in executive power (Persson et al., 2000). Therefore, to analyze budget flexibility in a parliamentary regime, we redefine our political process as following:

1. In the first period, one of the legislators is appointed to offer a budget.
2. The proposer offers either a one- or two-item budget; we denote this offer by b_1.
3. If the other legislator approves b_1, nature selects the state of the world such that state N has a probability $1 - p$. Then the proposer chooses a government policy under the constraint of the budget b_1 and the process ends. If the other legislator rejects b_1, the process moves to the second period.
4. In the second period, the legislator different than the one appointed in Stage (1) is appointed to propose a budget. He offers either a one- or two-item budget; we denote his offer by b_2.
5. If the other legislator approves b_2, nature selects the state of the world with the same probabilities in Stage (1). Then the proposer chooses a government policy under the constraint of the budget b_2 and the process ends. If the other legislator rejects b_2, no tax is collected, no public good is provided and the process ends.

So, in the parliamentary regime, if a legislator's budget offer is approved, he is also appointed as the executive authority automatically. Our results under the parliamentary regime is similar to those in presidential regime.[13] However, under one-item budgeting and when we have an endogenous budgeting rule, we get results specific to the parliamentary system. We state them here.

Proposition 10. *Let Assumptions 1–2 hold. In the parliamentary regime with one-item budgeting, at the equilibrium, we have the following results:*

[13] We do not present these results in the paper to save space. They are available from the author upon request.

i) *If the probability of polarization is low, any first-period proposal is rejected. In the second period, the proposer offers* $l = \frac{m+1}{n}L$ *and the proposal is accepted.*

ii) *If the probability of polarization is high, no public good is provided.*

As we state in Proposition 10, in the parliamentary regime with one-item budgeting and a low probability of polarization, an agreement on a budget will be achieved only in the second period. Because, in the parliamentary regime, by rejecting a budget offer in the first period, a legislator may gain the executive power in the second period. Considering that there is uncertainty in the state of the world, both legislators will want to use this opportunity to choose government policies according to their own preferences.

Besides, as we state in Proposition 11, the delay in budget agreement may persist even if the budgeting rule is endogenous.

Proposition 11. *Let Assumptions 1–2 hold. In the parliamentary regime with an endogenous budgeting rule, if the probability of polarization is low, at the equilibrium, we have the following results:*

i) *If the first-period proposer is Legislator 1, the proposal is rejected. In the second period, Legislator 2 proposes the one-item budget* $l = \frac{m+1}{n}L$ *and the proposal is accepted.*

ii) *If the first-period proposer is Legislator 2, he proposes the two-item budget* $(l_1, l_2) = (\frac{m+1}{n}L, 0)$ *and the proposal is accepted.*

When we have an endogenous budgeting rule and a low probability of polarization, if the first-period proposer is Legislator 1, Legislator 2 rejects the proposal to get the executive authority in the second period. However, if the first-period proposer is Legislator 2, he offers a two-item budget allocating the whole labor for g_1. Therefore, with no advantage to gaining the executive power, Legislator 1 will approve Legislator 2's proposal.

7 | CONCLUSION

In this paper, we analyze a budget-negotiations model that allows budget flexibility. We consider institutions that give flexibility to the executive authority with and without restrictions. We show that if the executive authority has unrestricted flexibility, model's predictions differ from those obtained under the assumptions of the preceding literature substantially. In particular, while polarization decreases government spending in the model with unrestricted flexibility, it increases government spending in the model without flexibility. Besides, under a high polarization, the legislators cannot use their political power for the overprovision of their preferred public good. In addition, we show that budget flexibility benefits the whole society only under a high probability of polarization and when the executive authority has restricted flexibility.

Several extensions of our model seem interesting for future research. First, we assume that citizens are either polarized or not, and labor can only be hired in discrete levels. It would be interesting to remove these assumptions. Moreover, we characterize our equilibrium only when nature chooses the states of the world with a probability close to either zero or one. How does the equilibrium look for other values of the nature's choice probabilities?

Another direction for future research can be extending our model to more than two legislators and public goods. Although there are papers in the literature that analyze legislative bargaining models of public finance with more than two legislators (e.g., Battaglini & Coate, 2007; Persson et al., 2000), they either assume there is only one public good or all dimensions of the government policy are determined by the legislative authority.

Finally, it would also be interesting to extend our model to infinite horizon with random recognition of the budget proposers to consider long-run dynamics.

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ORCID

Sezer Yaşar http://orcid.org/0000-0002-5704-101X

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APPENDIX A: PROOF OF PROPOSITIONS AND COROLLARIES

A.1 Proof of Proposition 1

The proof follows from Assumptions 2 and the finite number of labor hiring policies. ■

A.2 Proof of Proposition 2

Fix $\Gamma = (m, n, L)$. Take $\underline{p}$ as defined in Section 5.1 and $p \in [0, \underline{p}]$.

Part (i): Fix the budgeting rule as one-item. In the second period, whoever the legislator is, it is optimal for him to offer

$$l = \frac{m+1}{n}L$$

by Assumption 2, and the other legislator accepts it by Assumption 1. Given the second-period equilibrium, the first period proposer also offers

$$l = \frac{m+1}{n}L$$

and the other legislator accepts it.

Part (ii): Fix the budgeting rule as two-item. In the second period, whoever the legislator is, it is optimal for him to offer

$$(l_1, l_2) = \left(\frac{m+1}{n}L, 0\right)$$

Assumption 2, and the other legislator accepts it by Assumption 1. Given the second-period equilibrium, the first period proposer also offers

$$(l_1, l_2) = \left(\frac{m+1}{n}L, 0\right)$$

and the other legislator accepts it. ■

A.3 Proof of Proposition 3

Fix $\Gamma = (m, n, L)$. Take $\bar{p}$ as defined in Section 5.1 and $p \in [\bar{p}, 1]$.

Part (i): Fix the budgeting rule as one-item. In the second period, if the proposer and the president are from different groups, it is optimal for the proposer to offer

$$l = 0$$

by Assumption 2, and the other legislator clearly accepts it. If the responder and the president are from different groups, the only budget that the responder will accept is

$$l = 0.$$

Given the second-period equilibrium, any first-period proposer offers the budget

$$l = 0$$

and the other legislator clearly accepts it.

Part (ii): Fix the budgeting rule as two-item. If the second-period proposer is Legislator 2, it is optimal for him to offer

$$(l_1, l_2) = \left(\frac{1}{n}L, \frac{m+1}{n}L\right)$$

by Assumption 2, and Legislator 1 accepts it by Assumption 1. If the second-period proposer is Legislator 1, it is optimal for him to offer

$$(l_1, l_2) = \left(\frac{m+1}{n}L, \frac{1}{n}L\right)$$

by Assumption 2, and Legislator 2 accepts it by Assumption 1. Given the second-period equilibrium, in the first period, Legislator 1 offers

$$(l_1, l_2) = \left(\frac{1}{n}L, \frac{m+1}{n}L\right)$$

and Legislator 2 accepts it. Similarly, Legislator 2 offers

$$(l_1, l_2) = \left(\frac{m+1}{n}L, \frac{1}{n}L\right)$$

and Legislator 1 accepts it. ∎

A.4 Proof of Corollary 1

The proof of the corollary follows from Proposition 2 and the social planner's solution in Section 4. ∎

A.5 Proof of Corollary 2

The proof of the corollary follows from Proposition 3 and the social planner's solution in Section 4. ∎

A.6 Proof of Corollary 3

The proof of the corollary follows from Proposition 2 and the social planner's solution in Section 4. ∎

A.7 Proof of Corollary 4

The proof of the corollary follows from Proposition 3 and the social planner's solution in Section 4. ∎

A.8 Proof of Proposition 4

Fix $\Gamma = (m, n, L)$. Take $\underline{p}$ as defined in Section 5.1 and $p \in [0, \underline{p}]$.

Part (i): Assume that we have President 1. As the president will allocate the whole labor for g_1 under one-item budgeting, in the second period, for any proposer, it optimal for to offer

$$l = \frac{m+1}{n}L$$

or

$$(l_1, l_2) = \left(\frac{m+1}{n}L, 0\right)$$

by Assumption 2, and the other legislator clearly accepts these offers. Given the second-period equilibria, it is optimal for any first-period proposer to make one of the same offers, and the other legislator clearly accepts it.

Part (ii): Assume that we have President 2. If the second-period proposer is Legislator 2, it is optimal for him to offer

$$l = \frac{m+1}{n}L$$

by Assumption 2, and Legislator 1 clearly accepts it. If the second-period proposer is Legislator 1, it is optimal for him to offer

$$(l_1, l_2) = \left(\frac{m+1}{n}L, 0\right),$$

and Legislator 2 clearly accepts it. Given the second-period equilibria, in the first period, it is optimal for Legislator 1 to offer

$$l = \frac{m+1}{n}L,$$

and for Legislator 2 to offer

$$(l_1, l_2) = \left(\frac{m+1}{n}L, 0\right)$$

by Assumption 2. Both legislators' proposals are accepted. ■

A.9 Proof of Proposition 5

Fix $\Gamma = (m, n, L)$. Take $\bar{p}$ as defined in Section 5.1 and $p \in [\bar{p}, 1]$.

Assume that we have President 1. In the second period, if the proposer is Legislator 2, under one-item budgeting, by Assumption 2, it is optimal for him to offer

$$l = 0.$$

However, under two-item budgeting, by Assumption 2, his optimal offer is

$$(l_1, l_2) = \left(\frac{1}{n}L, \frac{m+1}{n}L\right),$$

which is better than $l = 0$ by Assumption 1. Thus he offers $(l_1, l_2) = (\frac{1}{n}L, \frac{m+1}{n}L)$ and Legislator 1 accepts it by Assumption 1.

In the second period, if the proposer is Legislator 1, under one-item budgeting, by Assumption 2, it is optimal for him to offer

$$l = 0.$$

However, under two-item budgeting, by Assumption 2, his optimal offer is

$$(l_1, l_2) = \left(\frac{m+1}{n}L, \frac{m+1}{n}L\right),$$

which is better than $l = 0$ by Assumption 1. Thus he offers $(l_1, l_2) = (\frac{m+1}{n}L, \frac{1}{n}L)$ and Legislator 2 accepts it by Assumption 1.

Given the second-period equilibrium, in the first-period, Legislator 1 offers

$$(l_1, l_2) = \left(\frac{1}{n}L, \frac{m+1}{n}L\right)$$

and Legislator 2 offers

$$(l_1, l_2) = \left(\frac{m+1}{n}L, \frac{1}{n}L\right).$$

Both legislators' offers are accepted.

Following a similar procedure, we can show that the same results hold if we have President 2. ■

A.10 Proof of Proposition 6

Fix $\Gamma = (m, n, L)$. Take $\underline{p}$ as defined in Section 5.1 and $p \in [0, \underline{p}]$.

Assume that we have President 2 and the first-period proposer is Legislator 1. Assume also that we have two-item budgeting. In this case, equilibrium budget is $(l_1, l_2) = (\frac{m+1}{n}L, 0)$ as given in Proposition 2. Thus whatever the state is the whole labor $\frac{m+1}{n}L$ is allocated for g_1.

Now assume that we have flexible two-item budgeting. Denote a typical flexible two-item budget by (l_1, l_2, k) where $k \in \{0, \frac{1}{n}L, \dots, L\}$ denotes the maximum amount of labor that the president can transfer between two public goods. For feasibility, we also need to have $(\frac{l_1+l_2}{2}, l_1, l_2) \in P$.

In the second period, Legislator 2's optimal offer is

$$(l_1, l_2, k) \in \left\{ \left(\frac{m+1}{n}L, 0, \frac{m+1}{n}L \right), \left(0, \frac{m+1}{n}L, \frac{m+1}{n}L \right) \right\}$$

by Assumption 2. Legislator 1 accepts this offer. Given this second-period equilibrium, in the first period, Legislator 1's optimal offer is also $(l_1, l_2, k) \in \{(\frac{m+1}{n}L, 0, \frac{m+1}{n}L), (0, \frac{m+1}{n}L, \frac{m+1}{n}L)\}$ and Legislator 2 accepts this offer. Thus, if the state is N, the whole labor $\frac{m+1}{n}L$ is allocated for g_1. However, if the state is P, the whole labor $\frac{m+1}{n}L$ is allocated for g_2.

Clearly, flexible two-item budgeting increases Legislator 2's utility but decreases Legislator 1's.

For all other situations, it is easy to show that two-item budgeting and flexible two-item budgeting lead to the same government policies. So, legislators obtain the same utility under the two budgeting rules. ■

A.11 Proof of proposition 7

Fix $\Gamma = (m, n, L)$. Take $\bar{p}$ as defined in Section 5.1 and $p \in [\bar{p}, 1]$.

Assume that we have President 2 and the first-period proposer is Legislator 1. Assume also that we have two-item budgeting. In this case, equilibrium budget is $(l_1, l_2) = (\frac{1}{n}L, \frac{m+1}{n}L)$ as given in Proposition 3. Thus whatever the state is $\frac{1}{n}L$ labor is allocated for g_1 and $\frac{m+1}{n}L$ labor is allocated for g_2. This leads to a waste of $\frac{m+1}{n}L$ labor if the state is N.

Now assume that we have flexible two-item budgeting. Denote a typical flexible two-item budget by (l_1, l_2, k) where $k \in \{0, \frac{1}{n}L, \dots, L\}$ denotes the maximum amount of labor that the president can transfer between two public goods. For feasibility, we also need to have $(\frac{l_1+l_2}{2}, l_1, l_2) \in P$.

In the second period, if the proposer is Legislator 2, his optimal offer is

$$(l_1, l_2, k) = \left(\frac{m+2}{n}L, 0, \frac{m+1}{n}L \right)$$

by Assumption 2. Legislator 1 accepts this offer by Assumption 1. Given this second-period equilibrium, in the first period, Legislator 1's optimal offer is also $(l_1, l_2, k) = (\frac{m+2}{n}L, 0, \frac{m+1}{n}L)$ and Legislator 2 accepts this offer. Thus, if the state is N, the whole labor $\frac{m+2}{n}L$ is allocated for g_1. If the state is P, $\frac{1}{n}L$ labor is allocated for g_1 and $\frac{m+1}{n}L$ labor is allocated for g_2.

Clearly, flexible two-item budgeting increases both legislators' utility by eliminating waste when the state is N.

For all other situations, it is easy to show that two-item budgeting and flexible two-item budgeting lead to the same government policies. So, legislators obtain the same utility under the two budgeting rules. ■

A.12 Proof of Proposition 8

Fix $\Gamma = (m, n, L)$. Take $\bar{p}$ as defined in Section 5.1 and $p \in [\bar{p}, 1]$.

Assume that we have two-item budgeting. In this case, equilibrium budget is $(l_1, l_2) = (\frac{1}{n}L, \frac{m+1}{n}L)$ if the first-period proposer is Legislator 1, and $(l_1, l_2) = (\frac{m+1}{n}L, \frac{1}{n}L)$ if the first-period proposer is Legislator 2. These budgets also give the equilibrium policies whatever the state is. Thus when the state is N, some government resources are wasted due to provision of g_2.

Now assume that we have flexible two-item budgeting with legislature-approved transfers. In the second period, if the proposer is Legislator 2, his optimal offer is $(l_1, l_2) = (\frac{1}{n}L, \frac{m+1}{n}L)$ by Assumption 2. This offer is accepted by Legislator 1 by Assumption 1. Notice that existence of legislature-approved transfers does not change the optimal budget of Legislator 2. Because, due to high polarization he cannot allocate less labor for g_1 and it is not optimal for him to allocate more labor to g_2. If the proposer is Legislator 1, his optimal offer is $(l_1, l_2) = (\frac{m+1}{n}L, \frac{1}{n}L)$ by Assumption 2. This offer is accepted by Legislator 2 by Assumption 1. Similarly, existence of legislature-approved transfers does not change the optimal budget of Legislator 1.

Given the second-period equilibrium, in the first period Legislator 1 offers $(l_1, l_2) = (\frac{1}{n}L, \frac{m+1}{n}L)$ and Legislator 2 offers $(l_1, l_2) = (\frac{m+1}{n}L, \frac{1}{n}L)$ by Assumption 2. Both legislators' proposals are accepted by Assumption 1. When the state is N, the president asks legislature to transfer all government resources to g_1, and the legislators accept it.

Thus, legislature-approved transfers increases both legislators' utility by eliminating waste when the state is N.

For all other situations, it is easy to show that two-item budgeting and two-item budgeting with legislature-approved transfers lead to the same government policies. So, legislators obtain the same utility under the two budgeting rules. ■

A.13 Proof of Proposition 9

Fix $\Gamma = (m, n, L)$. Take $\underline{p}$ and $\bar{p}$ as defined in Section 5.1.

Part (i): Assume that $p \in [0, \underline{p}]$. Whoever the second-period proposer is, his optimal offer is $(\frac{m+1}{n}L, l_2) \in P$ by Assumption 2. Notice that although allocating any positive labor for g_2 is not desirable by any legislator, since the president has line-item veto right, he will reject any positive labor allocated for g_2 in the budget and no g_2 will be provided at an equilibrium. Thus the second-period proposer can allocate any amount of labor for g_2 in the budget and the other legislator accepts his offer.

Given the second-period equilibria, the first-period proposer's optimal offer is also $(\frac{m+1}{n}L, l_2) \in P$ by Assumption 2. The responder accepts this offer. As we mentioned, president rejects any positive labor allocated to g_2. So, the implemented government policy is given as $(\frac{m+1}{n}L, 0)$.

Part (ii): In the second period, if the proposer Legislator i and President i' are from different groups, an optimal offer for the proposer is $(l_i, l_{i'}) = (l_i, 0) \in P$. Because, the president will reject the provision of the public good that is valuable for the proposer if the budget is accepted.

Similarly, if the responder Legislator i and President i' are form different groups, responder will accept a budget $(l_i, l_{i'})$ if and only if $(l_i, l_{i'}) = (l_i, 0) \in P$. Because, the president will reject the provision of the public good that is valuable for the responder if the budget is accepted.

Given the second-period equilibrium, in the first period, if the proposer Legislator i and President i' are from different groups, the proposer offers a budget $(l_i, l_{i'}) = (l_i, 0) \in P$, the other legislator accepts the budget and the president rejects l_i if it is positive. Similarly, if the responder Legislator i and President i' are from different groups, the proposer offers a budget $(l_i, l_{i'}) = (l_i, 0) \in P$, the other legislator accepts the budget and the president rejects l_i if it is positive. Thus at the equilibrium no public good is provided. ■

A.14 Proof of Proposition 10

Fix $\Gamma = (m, n, L)$. Take $\underline{p}$ and $\bar{p}$ as defined in Section 5.1.

Part (i): Take $p \in [0, \underline{p}]$. Let l denote a one-item budget that gives a utility to the first-period proposer better than the status quo. By Assumption 1, we know that there exists such a budget. Assume that the first-period proposer offers l and the responder accepts. Then the responder's equilibrium utility is

$$1 - \frac{1}{2}l + (1 - p)h(l).$$

However, if the responder rejects the first-period offer and proposes l in the second period, the other legislator accepts his offer and he gets a utility equal to

$$1 - \frac{1}{2}l + h(l).$$

Clearly, it is better for the first-period responder to reject the offer.

In the second period, the proposer's optimal offer is $l = \frac{m+1}{n}L$ by Assumption 2 and the responder accepts this offer.

Part (ii): Take $p \in [\bar{p}, 1]$. In the second period, the responder rejects any offer $l > 0$. Given the second-period equilibrium, the first-period responder also rejects any offer $l > 0$. Thus at the equilibrium no public good is provided. ■

A.15 Proof of Proposition 11

Fix $\Gamma = (m, n, L)$. Take $\underline{p}$ as defined in Section 5.1 and $p \in [0, \underline{p}]$.

Part (i): In the second period, it is optimal for Legislator 2 to offer $l = \frac{m+1}{n}L$ by Assumption 2, and Legislator 1 accepts it. In the first period, whatever one-item budget Legislator 1 offers, Legislator 2 rejects by the same reasoning in the proof of Part (i) of Proposition 10. Besides, since we have a low probability of polarization, in a two-item budget it is never optimal for Legislator 2 to allocate a positive amount of labor for g_2. In addition, no two-item budget with $l_2 = 0$ can be better than the one-item budget $l = \frac{m+1}{n}L$ for Legislator 2 when he also selects the government policy. Thus Legislator 2 rejects all first-period proposals.

Part (ii): In the second period, Legislator 1's optimal offer is either $l = \frac{m+1}{n}L$ or $(l_1, l_2) = (\frac{m+1}{n}L, 0)$, and Legislator 2 accepts the offer. Given the second period equilibria, in the first-period, Legislator 2 offers $(l_1, l_2) = (\frac{m+1}{n}L, 0)$ and Legislator 1 accepts the offer. ■

APPENDIX B: EFFECT OF POLARIZATION ON WELFARE

Assume that we have two-item budgeting. Under a low probability of polarization, p', Legislator 2's equlibrium utility is

$$1 - \frac{m+1}{2n}L + (1-p')h\left(\frac{m+1}{n}L\right).$$

Under a high probability of polarization, p, if Legislator 1 is the first-period proposer, Legislator 2's equilibrium utility is

$$1 - \frac{m+2}{2n}L + (1-p)h\left(\frac{1}{n}L\right) + ph\left(\frac{m+1}{n}L\right).$$

Legislator 2 can have a higher utility under a high probability of polarization if p and p' are large enough.

Under a high probability of polarization, p, if Legislator 2 is the first-period proposer, his equilibrium utility is

$$1 - \frac{m+2}{2n}L + (1-p)h\left(\frac{m+1}{n}L\right) + ph\left(\frac{1}{n}L\right).$$

Legislator 2 can have a higher utility under a high probability of polarization if p and p' are large enough, and $h(\frac{1}{n}L)$ is close enough to $h(\frac{m+1}{n}L)$.