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Making Rules Credible: Divided Government and Political Budget Cycles*

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Abstract

Political budget cycles (PBCs) result from the credibility problems that office-motivated incumbents face under asymmetric information, due to their temptation to manipulate fiscal policy to increase their electoral chances. We analyze the role of rules that limit debt, crucial for aggregate PBCs to take place. Since the budget process under separation of powers typically requires that the legislature authorize new debt, divided government can make these fiscal rules credible. Commitment is undermined either by unified government or by imperfect compliance with the budget law. When divided government affects efficiency, voters must trade off electoral distortions and government competence.

Keywords: political budget cycles, discretion, unified government, rules, credibility, separation of powers, divided government

1 Introduction

In the rational choice approach to electoral cycles, asymmetric information allows the incumbent to exploit its discretionary power over economic policy for electoral purposes. In the case of monetary policy, Lohmann (1998a) points out that even when the incumbent cannot affect in equilibrium the

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results of elections, the incumbent may be tempted towards a stimulative stance if it cannot credibly commit to optimal policy.[1] This electoral bias carries over to fiscal policy: Shi and Svensson (2006) and Alt and Lassen (2006a) show how the inability of the executive incumbent to credibly commit not to use debt for electoral purposes causes aggregate political budget cycles (PBCs).

The solution to the credibility problems caused by time consistency has often been cast in terms of the "rules versus discretion" debate (Kydland and Prescott 1977). von Hagen (2006) characterizes ex ante fiscal rules as numerical constraints on certain budgetary aggregates, like numerical debt ceilings. For the case of US states, von Hagen (2006) summarizes the empirical evidence on the effectiveness of ex ante rules on debt and deficits as limited, because they can be circumvented. Besides requiring rules to be clear-cut and comprehensive, Strauch and von Hagen (2001) stress that enforcement of rules should rely on independent agents and the restraints should be hard to ammend. This is the issue we focus on, because in a political environment a budget rule does not suffice to solve the credibility problems of fiscal policy. Rather, it is necessary to introduce an institutional arrangement that limits the discretion to change rules. Paraphrasing Montesquieu, a power to check power is needed to turn the budget rule into a credible commitment.

Since in constitutional democracies the budget process in fact requires the participation of the legislature, we analyze fiscal policy under separation

[1]Persson and Tabellini (2000, pp. 420-5) characterize models such as Lohmann (1998a) as moral hazard models of electoral cycles, in contrast to the adverse selection models developed by Rogoff and Sibert (1988), Rogoff (1990), and Persson and Tabellini (1990) where electoral cycles are a signal of the competence of the incumbent. If the incumbent does not have private information about its competence, but asymmetric information on the choice of policy instruments remains, the moral hazard problem discussed in the text comes to the forefront.

of powers. We specifically consider the role of a budget rule that prohibits the executive from issuing new debt, unless authorized by the legislature. Once the assumption of a single fiscal authority is dropped, the possibility of PBCs will depend on the leeway that the legislature allows the executive in pursuing electoral destabilization (Streb 2005, Saporiti and Streb 2008).

Separation of powers can moderate PBCs only when the executive and legislative branches are not aligned. We draw on the insight of Alesina and Rosenthal (1995), in the context of partisan political parties, about the moderating influence of an opposition legislature. Instead of the Alesina and Rosenthal (1995) formalization of policy outcomes as a weighted average of the preferences of both branches, we rely on the Romer and Rosenthal (1978, 1979) model to formalize divided government as the presence of a veto player.[2] Our contribution is to show that the moderating influence of an opposition legislature carries over to an opportunistic framework with office-motivated parties, where divided government can be used to solve the credibility problem behind electoral cycles in fiscal policy. Through the metric of veto players (Tsebelis 2002), this insight applies not only to divided government in presidential systems, but more generally to coalition governments in presidential and parliamentary systems.

Divided government not only moderates the executive, it can also reduce government efficiency, so voters must choose between fiscal stabilization and government competence. To use Umeno and Bugarin's (2008) terms, voters face a trade-off between the "control" and "selection" motives: voters can control the moral hazard problem that leads to PBCs, at the cost of introducing an adverse selection effect under divided government, namely, forcing the most competent party to share power with less competent ones.[3]

[2]This can be traced back to Montesquieu's *Spirit of the Laws*, book 11.

[3]Ferreira and Bugarin (2006) develop a model where state transfers to municipalities

While our focus is on the credibility of rules, Lohmann (1998b) and Keefer and Stasavage (2003) make a related point on the credibility of delegation. They show that an independent central bank, the Rogoff (1985) solution to the time consistency problem of monetary policy, is not credible unless there are political veto players that can block the executive incumbent.

In Section 2 we describe the setup to study the role of divided government in PBCs. In Section 3 we analyze the equilibria. In Section 4 we discuss the empirical implications of this framework, which allows to formalize a conjecture put forward by Schuknecht (1996), namely, that stronger PBCs in developing countries are due to weaker checks and balances. In Section 5 we conclude.

2 Setup

We first sketch the relationship between divided government and aggregate PBCs when there is asymmetric information on fiscal policy. As in Rogoff and Sibert (1988), we assume that the competence of the executive just before elections matters for performance after elections, so retrospective voting is rational. To abstract from the signaling dimension in Rogoff and Sibert (1988), we assume that the executive does not know its competence, which implies that the government operates under uncertainty about the effect of its policy actions. This is the Lohmann (1998a) timing, which allows to focus on the credibility problems of economic policy in electoral periods, when the executive is tempted to increase expenditure and reduce taxes to increase its electoral chances.

may help to control the moral hazard problem (the electoral distortion in fiscal policy) at the cost of introducing an adverse selection problem (incompetent candidates affiliated with the state governor's party win the elections).

The Romer and Rosenthal (1978) and (1979) agenda setter model is used to model the interaction between the executive and the legislative branches in the fiscal process. Persson, Roland and Tabellini (1997) apply the agenda setter model to analyze how separation of powers allows to control the rents of politicians, while Saporiti and Streb (2008) apply this framework to PBCs, using it to depict how the process of drafting, revising, approving, implementing and controlling the budget in constitutional democracies requires the participation of the legislature.[4]

We assume that the legislature must authorize new debt. The authorization of new debt is a standard prerogative of the legislature in many countries. Following Shi and Svensson (2006) and Alt and Lassen (2006a,b), we additionally assume that debt financing is distortionary, so fiscal policies are reversed after elections.

Under discretion, the ex-ante optimal fiscal policy is not credible ex-post, so the legislature may play a credibility role. The role of the legislature in preventing electoral destabilization turns out to be crucial because of its veto power to reject new indebtedness. The basic intuition is that when the legislature is aligned with the executive, it will not curb aggregate cycles in spending, taxes and debt because it shares the same electoral objectives. On the other hand, if the legislature is not aligned with the executive, it will not be interested in increasing the chances of success of the executive, so it will veto these electoral changes in the budget. For this veto power to be effective in avoiding PBCs, the legislature needs the oversight and enforcement capacity to insure that the executive complies with the approved budget law.

[4] In Saporiti and Streb (2008), the legislature acts benevolently as a representative of the interests of the people, so it is never aligned with the executive. In contrast, here the issue of unified or divided government is endogenous and depends on voters.

Voters have to decide without observing the choice of fiscal policy instruments, but after observing fiscal policy outcomes. We assume voters know the game and voter expectations depend on the known distribution of exogenous competence shocks and on the inferred endogenous policy actions by the incumbent government.

2.1 Citizens

Consider an infinite-horizon society. Let t denote time, where odd positive integers are electoral periods and even positive integers are non-electoral periods.

The society is composed by a large but finite number of identical individuals, labeled $i = 1, 2, \ldots, n$. There is a representative individual that cares about the competence of the incumbent in providing public goods. Following Alt and Lassen (2006a), we could alternatively assume there is heterogeneity among voters, in which case these preferences would represent instead the median voter. Under this alternative interpretation, our assumption implies that the median voter is indifferent between the incumbent and the opposition in terms of ideology, so in equilibrium its vote is determined by the expected competence of each.[5]

In every period t, individual i plays roles both as a consumer and as a citizen. The representative consumer derives utility from a public good g_t and a private good c_t. The representative consumer's per-period payoff is given by a quasi-linear utility function,

$$u(c_t, g_t) = c_t + \alpha \ln(g_t), \tag{1}$$

[5] If the median voter were more inclined towards one of the parties, this could be represented by an additional term that pulled preferences towards right or left, following the ideas in Alt and Lassen (2006a).

where $0 < \alpha < 1$. The intertemporal utility function U is given by

$$U = \sum_{t=0}^{\infty} \beta^t u(c_t, g_t), \quad 0 < \beta < 1. \tag{2}$$

Output y_t is exogenous, with $y_t = y$. By the consumer's budget constraint, consumption c_t equals disposable income, namely, y net of the tax burden p_t:

$$c_t = y - p_t. \tag{3}$$

2.2 Government

Unlike Rogoff (1990) and the subsequent literature on PBCs, we strictly distinguish between budgetary items and the production of public goods.[6] Each period t, the government is subject to the budget constraint

$$\gamma_t = \pi_t + d_t - (1 + r)d_{t-1}, \tag{4}$$

where γ_t denotes budget expenditures on public goods, π_t are tax revenues or receipts, d_t is public debt and r is the interest rate on debt, that is constant.[7]

As to the economic impact of the budget items, public resources γ_t are transformed into the public good g_t according to the competence θ_t of the government:

$$g_t = \theta_t \gamma_t. \tag{5}$$

[6] In Rogoff (1990), the total production of public goods is determined by tax revenues and government competence. Though total public expenditure equals tax revenues, at times it is confused with the production of public goods (in this regard, see Saporiti and Streb 2008 on how the Tufte proposal of determining the budget one year ahead does not destroy information about government competence, unlike what Rogoff states). Moreover, unlike voters, an econometrician does not observe the production of public goods, but budget expenditures instead.

[7] Since domestic consumers cannot save, a positive public debt implies that the government incurs in external debt.

Similarly, the competence of the government affects how the tax burden p_t turns into government tax receipts π_t, reflecting, among other things, the use of more or less distortionary taxes:

$$p_t = \frac{\pi_t}{\theta_t}. \tag{6}$$

By (5), to provide a given level of public goods, expenditure must be higher with less competent governments. By (6), to generate a given level of tax receipts, the tax burden must be higher with less competent governments.

The representative individual (alternatively, the median voter, as mentioned above) cares about the competence of the incumbent in providing public goods. Since the incumbent does not know its competence when it takes budget decisions, from its viewpoint the electoral outcome is uncertain.[8]

Our technological assumptions lead tax revenues and expenditures to fluctuate with the competence of the government. Since voters are inclined to reelect more competent incumbents, this creates an electoral incentive for governments to lower taxes and to increase expenditure in electoral years using debt finance. However, since the assumption that utility is linear in consumption can lead in electoral years to corner solutions where there is either no distortion in taxes, or taxes are reduced to zero, we introduce a restriction by which debt has to be used in specified proportions to reduce taxes and increase expenditures. This restriction assures there is an interior solution.[9] We discuss this restriction in detail later when we consider the

[8]Given our timing, to have uncertain electoral outcomes it is not necessary to introduce probabilistic voting through a looks shock as in Rogoff (1990), or uncertainty about relative preferences for candidates as in Shi and Svensson (2006).

[9]In Shi and Svensson (2006) and Alt and Lassen (2006a, b) electoral cycles in the budget balance are exclusively through expenditure cycles, not tax and expenditure cycles. We

inference problem of the voter.

We assume that the competence of the government depends on the competence of the party that controls the executive branch E. For each party i, competence is partially lasting, following a first-order moving average process as in Rogoff and Sibert (1988) and others (a superscript i for each party is omitted here):

$$\theta_t = \bar{\theta} + \varepsilon_{t-1} + \varepsilon_t. \tag{7}$$

Each competence shock ε is uniformly distributed over the interval $\left[-\frac{1}{2\xi}, \frac{1}{2\xi}\right]$, with expected value $\mathbf{E}(\varepsilon) = 0$ and density function $\xi > 0$. A higher value of ε corresponds to a more competent politician. The probability distribution of competence θ_t conditional on ε_{t-1}, $\mathbf{F}(\theta_t|\varepsilon_{t-1})$, is also uniform, with support $\left[\bar{\theta} + \varepsilon_{t-1} - \frac{1}{2\xi}, \bar{\theta} + \varepsilon_{t-1} + \frac{1}{2\xi}\right]$, and $\mathbf{E}(\theta_t|\varepsilon_{t-1}) = \bar{\theta} + \varepsilon_{t-1}$.Henceforth, $\bar{\theta} > 1/\xi$, so $\theta_t > 0$ and (5) and (6) are well-defined.

Following Shi and Svensson (2006), the quasilinear preferences in (1), jointly with an assumption about the value of the discount factor β and the interest rates, drastically simplify the optimal policy problem. Whereas Shi and Svensson (2006) assume the interest rate is increasing in the level of debt, we assume that the rate r at which the government can borrow is constant, but this borrowing rate is larger than the rate r' at which it can lend, and $r > r' > 0$. Furthermore, we assume the following condition is satisfied, which will assure that neither debt nor holding financial assets will be optimal in equilibrium:[10]

prefer a more open view, given the evidence on tax cuts before elections since Tufte (1978) and Frey and Schneider (1978); Streb, Lema and Torrens (2009) confirm this.

[10]Below, we will show that this implies that in expected value there is a loss of utility if debt is used to finance present consumption, or if asset accumulation is used to finance future consumption.

$$\frac{1}{(1+r)}\frac{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)} < \beta < \frac{1}{(1+r')}\frac{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}. \tag{8}$$

2.3 Separation of powers

The agenda setter model of Romer and Rosenthal (1978, 1979) allows to reduce the budget process to the interaction of the two branches of government, the executive E and the legislature L. Both must reach an agreement for there to be a change in the status quo. We assume the executive is the agenda setter: E makes a budget allocation proposal, which must be accepted by L to become law; no amendment rights exist, so L faces a take-it-or-leave-it proposal where the reversion outcome (the status quo) in case of rejection is specified below. This is the case where E has most power. This perspective is applied more often to European, Asian and Latin American democracies, where the executive can unilaterally issue decrees, than to the United States (McNollgast 2007, p. 1680). We later review the case where L can amend E's proposal, so L has the agenda setting power.

What matters for PBCs is not a nominal veto player, but rather an effective veto player. Therefore, below we distinguish between two polar cases, perfect compliance with the budget law and null compliance with the budget law, to reflect the feature that the legislature does not have the same capability in all democracies to monitor and control the budget.[11]

The terms in office in the executive and legislative branches last two periods. Every other period, the electorate removes or confirms the executive and legislative leaders in an explicit electoral contest (we are abstracting from midterm legislative elections). If the incumbent is confirmed, it controls

[11]Saporiti and Streb (2008) distinguish a continuum of degrees of compliance with the budget law. The cases of imperfect compliance would fall in between our polar cases.

this branch for another term. Otherwise, the opposition takes office.

We assume there are two parties, A and B. Each party has a leader, that changes before each election.[12] A party leader's payoffs are as follows. Besides caring about the utility from the consumption of private and public goods, when a party wins executive elections, its leader becomes the E incumbent and receives an exogenous rent $\chi^E > 0$ at the beginning of each term in office. The leader of the party that wins legislative elections and controls L receives a rent $\chi^L \geq 0$, where $\chi^L < \chi^E$. These rents reflect the strength of the electoral goal, to use Lohmann's (1998a) words, and will be the source of conflict between political parties and the electorate.

Through the idea of veto players, the agenda setter model can be used to reflect not only presidential systems, but also the working of parliamentary systems (Tsebelis 2002). While in a presidential system E is the leader of the executive and L is the leader of the legislature, in a parliamentary system E can be taken to represent the leader of the majority coalition party and L the leader of the minority coalition party. If E and L are controlled by the same party, there is no veto player: in a presidential system, this is referred to as unified government, when the executive has an aligned legislature; in a parliamentary system, as single-party rule where one party has a majority of seats in the legislature. There are veto players in a presidential system when there is divided government, and the legislature is controlled by an opposition party whose electoral motives are strictly opposed to those of the executive; in a parliamentary system, something similar happens when the party that leads government is forced to form a coalition to reach a majority of seats in parliament; we will refer to this case as divided government too.

[12]This assumption rules out end-period problems, since parties will always be interested in winning the upcoming election. This is consistent with Aldrich (1995) and the literature on how parties solve collective action problems.

What does not translate so easily from a presidential system to a parliamentary system is the voting decision. In a presidential system, each voter has two separate votes and can decide whether to support the same party in the executive and legislative branches. In a parliamentary system, an individual voter cannot literally split its vote among two political parties, since there is no separate vote for the executive. However, the representative voter has a preference for whether it wants a single-party government or a coalition government. If we allow for fictitious vote splitting, so the voter can distribute its vote in a given proportion between parties A and B, this can artificially recreate what the electorate at large can do. With our representative voter who can split votes, we are skipping over the need to coordinate votes among the electorate at large, and the specific process by which certain vote totals lead either to a single-party or to a coalition government. Our specific purpose at hand is to see the consequences for PBCs of whether one party or more run the government.

2.4 Budget process

The budget proposals are in terms of budget revenue and debt, because the budget restriction determines budget expenditure (only two of these three variables can be chosen freely). The timing of the budget process in period t is as follows:

1. E proposes $\tilde{\pi}_t^E$, $\tilde{d}_t^E$ to L.

2. Since L has no amendment rights, L chooses whether to accept the proposal or not. If the proposal is not accepted, the budget is given by status quo $\bar{\pi}_t$, $\bar{d}_t$. This will determine the approved budget $\tilde{\pi}_t$, $\tilde{d}_t$.

3. E implements π_t, d_t, which equals the approved budget under perfect compliance.

4. ε_t is realized and g_t and p_t are determined according to (5) and (6);

5. Voters observe g_t and p_t, but not ε_t nor (γ_t, π_t, d_t), forming a belief $\hat{\theta}_t$ about the incumbent's competency.

6. Without loss of generality, we assume party A controls E. If t is an odd positive integer, i.e., an electoral period, voters decide whether to reelect party A in E, and whether to vote incumbent party A or opposition party B for L.

7. Individuals observe ε_t and (γ_t, π_t, d_t) and period t ends.

If the executive's budget proposal is rejected, the status quo for taxation is given by an arbitrary reversion point $\overline{\pi}_t$. The reversion point can be exogenous or endogenous. McNollgast (2007) describe how the main alternatives in the US Federal Government budget are either a zero budget rule or reverting to the past budget. A zero budget rule leads to no expenditure unless Congress approves new appropriations, where the exogenous reversion point $\overline{\pi} = 0$. Reverting to the past budget implies an endogenous status quo, where $\overline{\pi}_t = \pi_{t-1}$. This is typical of entitlements like Social Security, but not of most discretionary spending.[13] Though expenditure must be authorized by the legislature, since the executive cannot spend more than tax

[13] Shepsle and Bonchek (1997) criticize zero budget rules, compared to reverting to the past budget, on the grounds that they give the agenda setter huge power. However, in the hands of the legislative branch the zero budget rule might not be such a powerful tool: Keith (1999) discusses a specific proposal advanced by Senator McCain in 1997 for an "automatic continuing resolution" to fund spending at 100% of the prior year's level, to avoid federal government shutdowns as those of 1994/95 due to funding gaps; President Clinton vetoed it, in principle because the onus of government shutdowns fell mostly on Congress.

receipts plus new debt, and it has no incentive to spend less, no additional restriction on this front is required.

As to the status quo for debt, in the case of the United States the amount of money the federal government is allowed to borrow is subject by the Constitution to a statutory limit that can be raised by Congress (Heniff 2004). This budget rule is typical of budget processes. Hence, we assume that there is an endogenous debt ceiling:

$$\overline{d}_t \leq d_{t-1}. \tag{9}$$

This endogenous debt ceiling merely reflects the restriction that, unless authorized by L, the outstanding amount of debt cannot be increased.

Incumbents do not observe the value of ε_t before making budget decisions in period t, as in Lohmann (1998a). The interpretation of this timing is that policy is decided under uncertainty, so the choice of the policy instrument is not equivalent to the choice of an outcome, but rather to the choice of a lottery of outcomes.

Voters know the incentives political parties face and the objectives they try to achieve. Though the representative (median) voter knows the structure of the budget process, it does not observe either the executive party's most recent competence shock, ε_t, or the budget decisions (γ_t, π_t, d_t) before voting. The only information it receives is the amount of public good g_t that is provided, and of tax payments p_t it makes. Thus, incumbents have a temporary information advantage over the actual budget allocation implemented. All past competence shocks are common knowledge.

2.5 Shared government

If the only role of the legislative veto player were to prevent electoral manipulations of fiscal policy, we show below that voters would always lean towards divided government. What happens instead when shared government implies a trade-off between competence and stabilization in electoral periods? To answer this, the agenda setter model is combined with a stylized model of government performance when parties share power.

Our hypothesis on shared government is that the competence of the government θ_t is a weighted average of the competence of the executive and legislative branches, θ_t^E and θ_t^L, with weights ρ and $(1-\rho)$ and $\rho \in (1/2, 1]$, so the executive branch has a higher weight in government performance:

$$\theta_t = \rho\theta_t^E + (1-\rho)\theta_t^L. \tag{10}$$

The competence of each branch is in turn related to the parties that are in office, so voters will want to have the most competent party in the executive office. In even (non-electoral) periods, we suppose that the competence of the executive branch equals the competence of the party $i \in \{A, B\}$ that leads E, and the competence of the legislative branch equals the competence of the party $j \in \{A, B\}$ that leads L.

$$\text{For } t \text{ even,} \begin{cases} \theta_t^E = \theta_t^i \ , \\ \theta_t^L = \theta_t^j \ . \end{cases} \tag{11}$$

In odd (electoral) periods, while the competence of the executive branch equals the competence of the party $i \in \{A, B\}$ that leads E, the competence of the legislative branch either equals the competence of the party that leads L, when $i = j$ (unified government), or zero, when $i \neq j$ (divided government):

$$\text{For } t \text{ odd}, \begin{cases} \theta_t^E = \theta_t^i \ , \\ \theta_t^L = \theta_t^j \text{ if } i = j, \, \theta_t^L = 0 \text{ otherwise.} \end{cases} \tag{12}$$

That is to say, we assume by (10-12) that divided government affects efficiency, particularly so during electoral periods. There is a political rationale for assumption (12), because even political parties that regularly form coalitions find it particularly hard to work together in government when the members of the coalition start campaigning and competing for votes. Hence, assumption (12) reflects the feature that it is difficult for different political parties to cooperate close to elections, when the opposition party in a presidential system, or the minor coalition members in a presidential or parliamentary system, drag their feet or adopt a blocking behavior.

Specification (12) is also used for tractability, since the inference problem in electoral years is drastically simplified when fiscal outcomes under divided government only reflect the competence of the party that leads the executive. This inference problem has been considered to be a relevant empirical issue to explain why economic voting is less important in some countries. For example, Powell and Whitten (1993) link this to instances where responsibility is less clear, most of which reflects divided government, e.g., a bicameral opposition, minority governments, or coalition governments. However, following our argument in the previous paragraph, an alternative interpretation for why economic voting is less important in those instances might be that voters discount that worse performance close to elections does not reflect the low competence of the party that leads the government, but rather the breakdown of cooperation among parties in power when campaign time starts.

3 Equilibrium

Our solution concept is perfect Bayesian equilibrium. As a benchmark, we first describe the equilibrium without elections, as well as the standard setup of concentration of powers where the incumbent has full discretion. We then turn to separation of powers, where there can either be unified government (the same party controls E and L) or divided government (an opposition party controls L and can check the party in charge of E). The role of the legislature is to act as a potential veto player. Afterwards, we incorporate the effect of power-sharing on performance, when divided government comes at the expense of government competence.

3.1 Benevolent ruler

A candidate is randomly selected in period $t = 0$, and remains in office forever. By quasilinear preferences, the marginal utility of consumption is equal to one. If, in expected value, the marginal utility of the public good is equal to the marginal utility of consumption, any extra resources the government may have will be optimally used to reduce taxes.

Suppose the government resorts to an extra dollar of debt in period t to reduce taxes. From expressions (1), (2), (3), (4), and (6), it follows that expected utility increases $\mathbf{E}_t\left(\frac{1}{\theta_t}\right)$ in period t. If the extra dollar of debt is repaid next period, utility falls by $(1+r)\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)$ in period $t+1$. Since the future is discounted at the rate β, it will never be optimal to borrow an extra dollar and repay it in the next period, because by (8):

$$\beta(1+r)\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right) > \mathbf{E}_t\left(\frac{1}{\theta_t}\right).$$

Here $\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)$ equals unconditional expectation, since there is no information on current shock when decision is taken.[14] Following an analogous argument, condition (8) also rules out the possibility that the government may become a net lender. This leads to a corner solution with no debt nor financial assets.

Since our assumptions about β, r and r' in (8) assure that $d_t = 0$ (i.e., $\gamma_t = \pi_t$) for $t = 0, 1, ...$, the intertemporal problem can be broken down into a sequence of simpler optimization problems:

$$\max_{\{\gamma_t, \pi_t\}} \mathbf{E}_t[c_t + \alpha \ln(g_t)]$$
$$s.t. \text{ (3), (4), (5) and (6).}$$

The solution, using the properties of the uniform distribution, and then integrating, is:

Proposition 1 *Benevolent ruler. Suppose there are no elections. The ruler will choose optimal expenditure and tax collection each period:*

$$\gamma_t^* = \pi_t^* = \frac{\alpha}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)} = \frac{\alpha}{\xi \ln\left(\frac{\bar{\theta}+\varepsilon_{t-1}+\frac{1}{2\xi}}{\bar{\theta}+\varepsilon_{t-1}-\frac{1}{2\xi}}\right)}, \ t = 0, 1, \ldots \tag{13}$$

Since the budget is decided ex-ante, it cannot be conditioned on the current competence shock ε_t. However, fiscal policy γ_t^* and π_t^* does depend on expected competence, since higher competence lowers the relative cost of public versus private goods. Differentiation of (13) shows public expenditure is increasing in the past competence shock ε_{t-1}:

[14]This condition also rules out that repaying the debt farther out in the future is optimal, because $(1 + r) > 1$, so the compounding effect makes the condition more binding from $t + 2$ on.

$$\frac{\partial \gamma_t^*}{\partial \varepsilon_{t-1}} = \alpha \frac{\mathbf{E}_t\left(\frac{1}{\theta_t^2}\right)}{\left[\mathbf{E}_t\left(\frac{1}{\theta_t}\right)\right]^2} > 0.$$

The expected provision of the public good is increasing in the past competence shock for two reasons, higher expected competence and a larger budget for the public good:

$$\frac{\partial \mathbf{E}_t\left(g_t\right)}{\partial \varepsilon_{t-1}} = \frac{\partial \mathbf{E}_t(\theta_t \gamma_t^*)}{\partial \varepsilon_{t-1}} = \gamma_t^* + \mathbf{E}_t\left(\theta_t\right) \frac{\partial \gamma_t^*}{\partial \varepsilon_{t-1}} > 0.$$

Though taxes are increasing in the past competence shock, expected consumption of the private good is constant, since the increase in legislated taxes is exactly compensated by larger efficiency in tax collection:

$$\mathbf{E}_t\left(c_t\right) = \mathbf{E}_t\left(y - p_t\right) = y - \mathbf{E}_t\left(\frac{\pi_t^*}{\theta_t}\right) = y - \pi_t^* \mathbf{E}_t\left(\frac{1}{\theta_t}\right) = y - \alpha.$$

As to the ex-post outcomes, a more competent incumbent generates a greater provision of the public good with the allocated budget expenditure. It also imposes a lower burden on tax payers to collect the required tax revenues, so disposable income increases and there is a consumption boom.

3.2 Concentration of powers

Consider next the model with regular elections every two periods. There is only one policy-maker, the executive. The players are the incumbent party A, the opposition party B, the representative (median) voter V, and Nature. From the viewpoint of the representative (median) voter V, the two parties only differ in competence. Because the competence shocks are transitory, each election can be treated separately, so the infinite-horizon model can be broken down into a series of separate problems. Using backwards induction, the solution can be found in a sequence of steps.

The incumbent's decision in a non-electoral period

In period $t+1$, a non-electoral period, the incumbent (either A or B) has no incentive to manipulate the voters' perception of its competence, since the outcome of future elections will depend on the expected competence in $t+3$, which is uncorrelated with competence in $t+1$. Since the optimal strategies of all incumbents in the post-electoral period are the same, the distinction between the original and the potential incumbents is omitted to simplify the notation. Hence:

$$\gamma_{t+1}^{u} = \gamma_{t+1}^{*} = \frac{\alpha}{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)}, \tag{14}$$

$$\pi_{t+1}^{u} = \gamma_{t+1}^{*} + (1+r)d_t, \tag{15}$$

where the superscript u refers to an unchecked executive. In a non-electoral period, the expenditure is the same as in a setup without elections, but there may be more taxes if the incumbent has to pay off the debt incurred in the last election period.

The inference problem of voters

At election time t, voters observe g_t and p_t, but not d_t, γ_t and π_t. Their problem is to estimate the competence shock ε_t.

Let the actual budget choices γ_t and π_t be determined by scale factors a_t, b_t that multiply π_t^* and γ_t^*, the budget that is not affected by opportunistic concerns, that is:

$$\gamma_t = a_t \gamma_t^*, \quad \pi_t = \frac{\pi_t^*}{b_t}. \tag{16}$$

Moreover, from (5) and (6) we have that:

$$\theta_t a_t = \frac{g_t}{\gamma_t^*}, \quad \theta_t b_t = \frac{\pi_t^*}{p_t}. \tag{17}$$

Since voters observe g_t and p_t and they can compute π_t^* and γ_t^*, they can employ these expressions to form their estimate of ε_t. Though voters know the proportion between the two distortions is $\frac{a_t}{b_t} = \frac{g_t p_t}{\gamma_t^* \pi_t^*}$, they cannot determine a_t and b_t individually. To put it another way, voters face a problem of inference under perfect multicollinearity: they know the exact linear relation between a_t and b_t but not the individual values. They can deduce that the government may be selecting the optimal budget when $\frac{a_t}{b_t} = 1$ (case 1), while this is absolutely impossible if $\frac{a_t}{b_t} \neq 1$ (case 2).

We hereafter impose the restriction that debt must be split between more expenditure and less taxes in the same proportion. As mentioned in Section 2, we make this assumption in order to avoid having corner solutions. Formally, we assume that $\omega_t = a_t = b_t$ (case 1). Voters also know that $\pi_t^* = \gamma_t^*$ when there is no previous debt. This implies that, beyond identity (4), debt must also satisfy:

$$d_t = \gamma_t - \pi_t = \left(\omega_t - \frac{1}{\omega_t}\right) \pi_t^*. \tag{18}$$

Note that restriction (18) forces the incumbent to use debt in a way that preserves the characteristics of the original distribution of competence shocks. That is to say, the ratio of expenditures to taxes is required to replicate the distribution of outcomes without electoral manipulation, with the expected value of the distribution shifted to the right by $\omega_t \geq 1$ (the government is tempted to mimic positive competence shocks, not negative ones).[15]

Given this, let's call $\widehat{\omega}_t$ voters's expectations of ω_t. Voters's estimate of the incumbent's competence is given by the ratio of both fiscal outcomes (either one could also be used to make the inference, see 17):

$$\hat{\theta}_t = \frac{\sqrt{g_t/p_t}}{\widehat{\omega}_t}. \tag{19}$$

Using expression (19), voters can estimate the incumbent's current competence shock (ε_{t-1} is already known in period t):

$$\hat{\varepsilon}_t = \hat{\theta}_t - \bar{\theta} - \varepsilon_{t-1} = \frac{\sqrt{g_t/p_t}}{\hat{\omega}_t} - \bar{\theta} - \varepsilon_{t-1}. \tag{20}$$

The citizen's vote

Voters compare the expected utility next period with either the incumbent or the challenger. Voters can estimate the competence shock of the incumbent, but nothing can be concluded about the opposition from the observed policy actions of the government. In regard to the opposition, voters only know the distribution of ε_t and hence that $\mathbf{E}_t[\varepsilon_t] = 0$. Hence, expected utility from a vote for the opposition is not conditional on the current competence shock:

$$\mathbf{E}_t\left[c_{t+1} + \alpha \ln(g_{t+1})\right] = \mathbf{E}_t\left[y - \frac{\pi^u_{t+1}}{\theta_{t+1}} + \alpha \ln(\theta_{t+1}\gamma^u_{t+1})\right]. \tag{21}$$

On the other hand, expected utility from a vote for the incumbent can be conditioned on the current competence shock, which can be estimated

[15] Since utility is linear in consumption and the incumbent's utility is linear in the probability of reelection, the model has an extreme behavior: either there is no distortion of taxes in electoral years (when political rents are low), or no taxes are levied at all (when political rents are high). Our restricion (18) allows an interior solution to emerge. In contrast, Shi and Svensson (2006) achieve an interior solution by assuming that the interest rate increases with debt.

from policy outcomes:

$$\mathbf{E}_t\left[c_{t+1}+\alpha\ln(g_{t+1})\mid\hat{\varepsilon}_t\right]=\mathbf{E}_t\left[y-\frac{\pi^u_{t+1}}{\theta_{t+1}}+\alpha\ln(\theta_{t+1}\gamma^u_{t+1})\mid\hat{\varepsilon}_t\right]. \qquad (22)$$

In order to determine voters' decisions, we must compare these two expressions. We first go through two preliminary steps in the Appendix. First, in Lemma 1 we prove that when the conditional expected value of a function of two independent stochastic variables is increasing and concave, it is greater or equal to its unconditional expected value if and only if the conditioning variable (estimated using a vector of information variables) is greater or equal to its expected value. Second, $c_{t+1}+\alpha\ln(g_{t+1})$ is a function of the two independent stochastic variables ε_t and ε_{t+1}, and Lemma 2 establishes that $\mathbf{E}_t\left[c_{t+1}+\alpha\ln(g_{t+1})\mid\varepsilon_t\right]$ is increasing and concave. Given that, we have that

Corollary 1 $\mathbf{E}_t\left[c_{t+1}+\alpha\ln(g_{t+1})\mid\hat{\varepsilon}_t\right]\geq\mathbf{E}_t\left[c_{t+1}+\alpha\ln(g_{t+1})\right]$ *if and only if* $\hat{\varepsilon}_t\geq 0$.

Corollary 2 *Voters vote for the incumbent if and only if* $\hat{\varepsilon}_t\geq 0$.

Proof: For the exact enunciation and proof of the two lemmas, please see the Appendix. The proof of Corollary 1 follows from Lemma 2 and the application of Lemma 1, where the vector of information variables to estimate $\hat{\varepsilon}_t$ is integrated by g_t, p_t, ε_{t-1}, and $\hat{\omega}_t$. Given that voters maximize expected utility, Corollary 2 is immediate from Corollary 1. Note that in case of indifference (a zero probability event), we assume that voters reelect the incumbent.■

We employ Corollary 2 to compute the probability that the incumbent wins the election. Let's call this probability $\mu_t=\Pr(\hat{\varepsilon}_t\geq 0)$. First, replace

$\hat{\varepsilon}_t$ by $\frac{\sqrt{g_t/p_t}}{\widehat{\omega}_t} - \bar{\theta} - \varepsilon_{t-1}$. Considering that the actual value of ε_t equals $\frac{\sqrt{g_t/p_t}}{\omega_t} - \bar{\theta} - \varepsilon_{t-1}$, adding these terms to each side and simplifying, we get $\mu_t = \Pr\left[\varepsilon_t \geq \frac{\sqrt{g_t/p_t}}{\omega_t}\left(1 - \frac{\omega_t}{\widehat{\omega}_t}\right)\right]$. Finally, given that ε_t follows a uniform distribution with density ξ, and that $\theta_t = \frac{\sqrt{g_t/p_t}}{\omega_t}$, we obtain:

$$\mu_t = \frac{1}{2} + \xi\theta_t\left(\frac{\omega_t}{\widehat{\omega}_t} - 1\right). \tag{23}$$

Notice that if voters are surprised ($\omega_t > \widehat{\omega}_t$), the incumbent increases its probability of winning above the value $\frac{1}{2}$:

$$\frac{\partial\mu_t}{\partial\omega_t} = \xi\theta_t\frac{1}{\widehat{\omega}_t} > 0.$$

The incumbent's decision in an electoral period

Taking into account μ_t, the endogenous probability that the incumbent is reelected, the incumbent's objective function is:

$$\max_{\{\gamma_t,\pi_t,d_t\}} \mathbf{E}_t\left\{c_t + \alpha\ln(g_t) + \beta\left[c_{t+1} + \alpha\ln(g_{t+1})\right] + \beta\mu_t\,\chi^E\right\}$$

$$s.t.(3)\text{-}(6),\ (18)\text{ and }(23).$$

Incorporating these restrictions, the government's problem in the electoral period can be reframed in terms of the choice of ω_t, which will determine all fiscal variables:

$$\max_{\{\omega_t \geq 1\}} \left\{ \mathbf{E}_t y - \frac{\pi_t^*}{\omega_t}\frac{1}{\theta_t} + \alpha \ln(\theta_t \pi_t^* \omega_t) + \beta \left[y - \frac{\gamma_{t+1}^* + (1+r)\pi_t^* \left(\omega_t - \frac{1}{\omega_t}\right)}{\theta_{t+1}} \right] + \right.$$
$$\left. + \beta \left[\alpha \ln(\theta_{t+1}\gamma_{t+1}^*) + \left(\frac{1}{2} + \xi\theta_t \left(\frac{\omega_t}{\hat{\omega}_t} - 1 \right) \right) \chi^E \right] \right\}$$

The first order condition is given by:

$$\frac{d\mathbf{E}_t\left[\cdot\right]}{d\omega_t} = \mathbf{E}_t \left[\frac{\pi_t^*}{\theta_t}\frac{1}{\omega_t^2} + \frac{\alpha}{\omega_t} - \frac{\beta(1+r)\pi_t^*}{\theta_{t+1}} \left(1 + \frac{1}{\omega_t^2}\right) + \beta\xi\frac{\theta_t}{\hat{\omega}_t}\chi^E \right] \leq 0,$$
$$\text{with strict equality if } \omega_t > 1$$

which can be simplified using the definition of π_t^*:

$$\frac{d\mathbf{E}_t\left[\cdot\right]}{d\omega_t} = \alpha\left(\frac{1}{\omega_t} + \frac{1}{\omega_t^2}\right) - \alpha\beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)}\left(1 + \frac{1}{\omega_t^2}\right) + \beta\xi\frac{\bar{\theta} + \varepsilon_{t-1}}{\hat{\omega}_t}\chi^E \leq 0,$$
$$\text{with strict equality if } \omega_t > 1. \tag{24}$$

Note that $\frac{d_t^2\mathbf{E}[.]}{d\omega_t^2} = -\alpha\left(\frac{1}{\omega_t^2} + \frac{2}{\omega_t^3}\right) + 2\alpha\beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)}\frac{1}{\omega_t^3}$, which is strictly negative for $\omega_t \geq 1$ if the following condition holds:

$$\beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)} \leq \frac{3}{2}. \tag{25}$$

Assuming (25), the first order condition (24) becomes sufficient for an optimum.

If we call ω_t^u the equilibrium value of ω_t, we obtain:

Proposition 2 *Concentration of powers. Suppose there are elections in odd periods and the incumbent faces no checks and balances. Let conditions (8)* *and (25) hold, i.e.,* $1 < \beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)} \leq \frac{3}{2}$, *and let*

$$\bar{\chi}_t = \frac{2\alpha\left[\beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)} - 1\right]}{\beta\xi(\bar{\theta} + \varepsilon_{t-1})}$$

In a non-electoral period $t+1$*, the incumbent chooses optimal expenditure and tax collection, namely,*

$$\gamma_{t+1}^u = \gamma_{t+1}^* = \frac{\alpha}{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)},$$

$$\pi_{t+1}^u = \gamma_{t+1}^u + (1+r)d_t.$$

In an electoral period t*:*

1. *If* $\chi^E \leq \bar{\chi}_t$*, the incumbent does not generate PBCs (*$\omega_t^u = 1$*), so* $\gamma_t^u = \gamma_t^*$ *and* $\pi_t^u = \pi_t^*$*.*

2. *If* $\chi^E > \bar{\chi}_t$*, the incumbent generates PBCs (*$\omega_t^u > 1$*), hence* $\gamma_t^u = \omega_t^u \gamma_t^*$ *and* $\pi_t^u = \frac{\pi_t^*}{\omega_t^u}$*.*

Proof: In a perfect Bayesian equilibrium, expectations are determined by equilibrium strategies (i.e., expectations are rational), so $\hat{\omega}_t$ must be equal to ω_t^u and

$$\frac{d\mathbf{E}_t[\cdot]}{d\omega_t} = \alpha\left(\frac{1}{\omega_t^u} + \frac{1}{(\omega_t^u)^2}\right) - \alpha\beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)}\left(1 + \frac{1}{(\omega_t^u)^2}\right) + \beta\xi\frac{\bar{\theta} + \varepsilon_{t-1}}{\omega_t^u}\chi^E \leq 0$$

$$\text{with strict equality if } \omega_t^u > 1. \tag{26}$$

If $\chi^E < \bar{\chi}_t$, expression (26) is negative at $\omega_t^u = 1$, so incumbents will not want to go further.[16] If $\chi^E = \bar{\chi}_t$, expression (26) is zero at $\omega_t^u = 1$. For for $\chi^E > \bar{\chi}_t$, it becomes positive at that point, which implies that the incumbent prefers $\omega_t^u > 1$ in equilibrium. In an opportunistic framework the overriding concern of politicians is to be reelected, so the natural scenario is $\chi^E > \bar{\chi}_t$ where the executive is indeed willing to distort fiscal outcomes to be reelected.■

Time consistency and budget rules

Suppose that an unconstrained executive E must formulate optimal plans in non-electoral period $t-1$. Viewed at $t-1$, when the incumbent sets policy in advance, the probabilities of reelection μ_t are exogenous and equal to 1/2 in expected value. Therefore, the incumbent's best policy is to plan to pick γ_t^* and π_t^* that are socially optimal every period to maximize welfare. The problem with this optimal plan, of course, is that it is not time-consistent: when an electoral period arrives, the incumbent has an incentive to increase expenditure and reduce taxes. This credibility problem underlies Proposition 2 under an unchecked executive.

What happens if the status quo is set according to rule (9)? Well, if the rule were binding, this would effectively curb the credibility problem: in an electoral period the executive would prefer to use debt to increase expenditures and reduce taxes in order to look more competent, but the status quo rules out more public indebtedness. However, it does not make sense to assume that the executive is constrained to follow any rule unless it has to share the power to change rules with another body. Otherwise, if the executive is also vested with legislative power, it can do and undo any rule it likes, being effectively unconstrained.

The natural environment where the executive shares rule-making power

[16] Given assumption (8) that rules out asset accumulation, $\omega_t^u < 1$ will not be optimal either.

is when there is separation of powers, and an agreement has to be reached with the legislative veto player on changes in the budget.

3.3 Separation of powers

We know turn to fiscal policy under separation of powers when the role of the legislature is to act as a veto player. We distinguish between divided and unified government. For both presidential and parliamentary systems, we describe divided government in terms of E being in the hands of one party and L in the hands of the other. We first consider the case of perfect compliance with the budget law and then the case of imperfect compliance. In what follows, we assume that $1 < \beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)} \leq \frac{3}{2}$ and $\chi^E > \bar{\chi}_t$, so that the executive has an incentive to distort fiscal outcomes due to electoral reasons.

As regards voters at election in t, as before they will want the party with the highest expected competence in the executive. At the same time, we conjecture they will want to have divided government: in terms of government competence it is indifferent for voters whether a single party controls both the executive and the legislature or if two parties share control, but in terms of the distortion of fiscal variables, divided government is strictly preferred if an opposition legislature can block the executive's attempts to distort the budget in period $t+2$ to look more competent. On the other hand, with an aligned legislature or a single party government, nobody will veto proposals by E. This implies, by Proposition 2, that there will be an electoral cycle in fiscal policy in $t+2$.

Does what actually happens in the next term under divided government, in periods $t+1$ and $t+2$, conform to these conjectures? Without loss of generality, let us assume that A controls the executive and B the legislature.

In electoral period $t + 2$, the executive would like to increase its electoral chances by using debt to select π^u_{t+2} and γ^u_{t+2}. However, party B can veto any attempt of A to employ debt to increase expenditures and reduce taxes, since the status quo debt restriction given by (10), i.e., $\overline{d}_{t+2} \leq d_{t+1}$, introduces a binding constraint on the executive. Party B has the motivation and the power to veto any attempt of party A to use debt: if this authorization of new debt were unexpected by voters, this would increase the electoral chances of party A at the expense of B; if expected, it would reduce the welfare of party B because of the electoral distortion of fiscal variables. Therefore, party A is forced to set expenditures equal to taxes.

On the other hand, the legislature does not have an incentive to veto the optimal level of taxes and expenditures, because this would not affect the voters' perception of party A's competence. What voters use in their inference problem is the no new debt restriction, which implies that $\gamma_{t+2} = \pi_{t+2}$, so $\omega_{t+2} = 1$. Hence, the ratio g_{t+2}/p_{t+2} can be used to infer competence, whatever the level of taxation. Given this, the legislature has no incentive to block optimal taxation in election periods either, whatever the level of the status quo $\bar{\pi}_{t+2}$. Finally, given that it cannot affect its perceived competence, the best party A can do is to select the optimal level of taxes and expenditures.

As to non-electoral period $t + 1$, the executive, controlled by party A, chooses an optimal expenditure and repays past debt, if any, because whatever it does then does not affect its electoral chances in the next electoral period, only current welfare. The legislature, controlled by party B, does not want to veto this proposal, because if does not affect future reelection prospects of either party, and it leads to optimal outcome in non-electoral period. This confirms the voters's conjectures as assumed at the outset.

The degree of compliance with the authorized budget describes the effective limits L imposes on the executive office. Under null compliance with the balanced budget rule (the extreme case of imperfect compliance), L is not capable of effectively monitoring fiscal policy. The environment then reverts to an unchecked executive.

Putting together the arguments of these last paragraphs, and extending the logic to all future time periods, we can state the following:

Proposition 3 *Separation of powers. Suppose there are elections in odd periods, and the legislature must authorize new debt. Assume that* $1 < \beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)} \leq \frac{3}{2}$ *and* $\chi^E > \bar{\chi}_t$.

In a non-electoral period the executive, with the agreement of the legislature, will set taxes and expenditures at the optimal level.

In an electoral period:

1. *Under perfect compliance with the budget law, divided government will set taxes and expenditures at the optimal level, while unified government will generate PBCs. Voters strictly prefer divided government.*

2. *Under null compliance with the budget law, the executive will generate PBCs. Voters will be indifferent between divided and unified government.*

The results in Proposition 3 assume that E is the agenda setter. What happens when the legislature has amendment powers? The results are unchanged. Since L can prevent new indebtedness, an unaligned legislature would not be willing to authorize the use of debt for electoral purposes, so $\overline{d}_t = d_{t-1}$. At the same time, L would be willing to authorize the optimal level of expenditure $\gamma_t^* = \pi_t^*$, because a lower level of expenditures and taxes does not reduce E's reelection chances, given that voters can use the g_t/p_t ratio to infer competence.

3.4 Shared government

We now introduce the feature of shared government competence into the model, in order to have a more balanced view of the costs and benefits of divided government. As discussed in Section 2, competence depends on which party is in charge of each government branch ($\theta_t = \rho\theta_t^E + (1-\rho)\theta_t^L$) and on whether it is an electoral or a non-electoral period.[17] Table 1 summarizes the possible cases:

<*Please insert Table 1*>

In a non-electoral period $t+1$, the same arguments used in Propositions 2 and 3 apply. First, the party in charge of the executive does not want to generate a budget cycle. Furthermore, no matter what parties are in charge of each government branch, expenditures will be at the optimal level and taxes will be equal to this optimal level plus the repayment of previous debt, if any. Adapting the previous derivations, optimal expenditure is:

$$\gamma_{t+1}^* = \frac{\alpha}{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)} = \frac{\alpha}{\mathbf{E}_t\left(\frac{1}{\rho\theta_{t+1}^E + (1-\rho)\theta_{t+1}^L}\right)}.$$

The difference with the previous model is that competence is a weighted average of the competence of the executive and the legislative branches, so the optimal level of taxes and expenditures may depend on both parties' competence, not just on the competence of the party in charge of the executive.

[17] Formally the model of the previous section is a special case when $\rho = 1$.

Regarding electoral periods, the argument behind Proposition 3 also applies; that is, the opposition in the legislature will not approve new debt to generate a cycle and increase the electoral chances of the other party, nor will it object the optimal level of taxes and expenditures. Therefore, divided government eliminates budget cycles. However, now there is a cost of having divided government, due to the efficiency losses generated by power-sharing, plus the breakdown of cooperation between the executive and the legislature in electoral periods. This is the fundamental trade-off that the representative voter faces.

Let's consider the voter's inference problem in electoral periods. The voter observes g_t, p_t, ε_{t-1}^{E}, and ε_{t-1}^{L}, forming expectations about $\hat{\varepsilon}_t^A$ and $\hat{\varepsilon}_t^B$ as follows. If the government is unified, so both branches are dominated by the same party, then expectations about government competence are formed as in equation (20), with an expected distortion $\hat{\omega}_t = \omega_t^u$. If the government is divided, expected government competence is a proportion ρ of the competence of the party in charge of the executive, as detailed in Table 1, and the voter also knows that the legislature is going to stop any attempt of the executive to generate a cycle, so $\hat{\omega}_t = 1$. Table 2 summarizes the possible cases.

<Please insert Table 2>

The voter's decision is a dynamic programming problem. Let $V(i, j)$ be the value for the voter in the electoral period t given that currently (that is, before elections) party i leads E, and party j, L. Since the voter's problem has a recursive structure, we have the following Bellman equation, where $\hat{\varepsilon}_t^i$ is estimated using information set $\Im_t = \left(g_t, p_t, \varepsilon_{t-1}^E, \varepsilon_{t-1}^L, \hat{\omega}_t\right)$ and $i', j' \in \{A, B\}$ are the control variables:

$$V\left(i,j\mid\hat{\varepsilon}_t\right)=\max_{i',\,j'\in\{A,B\}}\left\{\beta_t\mathbf{E}_t\left[c_{t+1}(i,j,i\prime,j\prime)+\alpha\ln g_{t+1}(i,j,i\prime,j\prime)\mid\hat{\varepsilon}_t^i\right]\right.$$
$$\left.+\beta_t^2\mathbf{E}_t\left[c_{t+2}(i\prime,j\prime)+\alpha\ln g_{t+2}(i\prime,j\prime)+V\left(i',j'\right)\right]\right\},$$

where:

$$c_{t+1}(i,j,i\prime,j\prime)=y-\frac{\frac{\alpha}{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta_{t+1}^{i'}+(1-\rho)\theta_{t+1}^{j'}}\right)}+(1+r)\left(\hat{\omega}_t\left(i,j\right)-\frac{1}{\hat{\omega}_t(i,j)}\right)\frac{\alpha}{\mathbf{E}_t\left(\frac{1}{\theta_t^i}\right)}}{\rho\theta_{t+1}^{i'}+(1-\rho)\theta_{t+1}^{j'}},$$

$$\ln g_{t+1}(i,j,i\prime,j\prime)=\ln\left(\frac{\rho\theta_{t+1}^{i'}+(1-\rho)\theta_{t+1}^{j'}}{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta_{t+1}^{i'}+(1-\rho)\theta_{t+1}^{j'}}\right)}\right)+\ln\alpha,$$

$$c_{t+2}(i\prime,j\prime)=y-\frac{\alpha}{\hat{\omega}_{t+2}\left(i',j'\right)\theta_{t+2}^{i'}\mathbf{E}_{t+2}\left(\frac{1}{\theta_{t+2}^{i'}}\right)},$$

$$\ln g_{t+2}(i\prime,j\prime)=\ln\left(\frac{\hat{\omega}_{t+2}\left(i',j'\right)\theta_{t+2}^{i'}\alpha}{\mathbf{E}_{t+2}\left(\frac{1}{\theta_{t+2}^{i'}}\right)}\right)+\varphi\left(i',j'\right)\alpha\ln\rho^2,$$

$$\hat{\omega}_t\left(i,j\right)=\begin{cases}1 & \text{if } i\neq j\\ \omega_t^u & \text{otherwise}\end{cases},\quad \varphi\left(i',j'\right)=\begin{cases}1 & \text{if } i'\neq j'\\ 0 & \text{otherwise}\end{cases}.$$

Let $\Phi\left(i,j,\hat{\varepsilon}_t^i\right)$ denote the policy function that solves the voter's decision problem. We make the following conjecture, where i is the party currently in charge of E:

$$\Phi\left(i,j,\hat{\varepsilon}_t^i\right)=\begin{cases} ii & \text{if } i=j \text{ and } \hat{\varepsilon}_t^i \geq \varepsilon_H, \\ ij & \text{if } i=j \text{ and } 0\leq \hat{\varepsilon}_t^i < \varepsilon_H, \\ ji & \text{if } i=j \text{ and } -\varepsilon_L < \hat{\varepsilon}_t^i < 0, \\ jj & \text{if } i=j \text{ and } \hat{\varepsilon}_t^i \leq -\varepsilon_L, \\ ii & \text{if } i\neq j \text{ and } \hat{\varepsilon}_t^i \geq \varepsilon_H', \\ ij & \text{if } i\neq j \text{ and } 0\leq \hat{\varepsilon}_t^i < \varepsilon_H', \\ ji & \text{if } i\neq j \text{ and } -\varepsilon_L' < \hat{\varepsilon}_t^i < 0, \\ jj & \text{if } i\neq j \text{ and } \hat{\varepsilon}_t^i \leq -\varepsilon_L', \end{cases} \tag{27}$$

where $\varepsilon_H', \varepsilon_H$, as well as $\varepsilon_L', \varepsilon_L$, differ. The higher and lower limits are not necessarily symmetrical, despite the fact that the efficiency cost of divided government in $t+1$ is $(1-\rho)\hat{\varepsilon}_t^i$ for both positive and negative shocks $\hat{\varepsilon}_t^i$, because government competence affects utility in a complicated way. We verify this conjecture in three steps.

The vote for the executive

As in Corollary 2, the representative voter prefers to reelect the party in charge of the executive $i \in \{A, B\}$ if and only if $\hat{\varepsilon}_t^i \geq 0$, since the voter never receives information about the current shock of the opposition party, whether it is completely out of office or leads the legislature. Intuitively, if the voter were to appoint to the executive a party with less expected competence, the voter would obtain more just switching the role of the parties.

Vote splitting?

What remains to be determined is whether the representative voter favors unified or divided government. Specifically, if the representative (median) voter chooses divided government in period t, this will affect the Bellman equation as follows:

- First, there will be an efficiency loss in period $t+1$ because expected government competence will be lower with divided government;
- Second, there will be an efficiency loss in period $t+2$ because of the breakdown of cooperation in electoral years with divided government, and divided government prevents cycles in an electoral year (Proposition 3 under perfect compliance with the budget law);
- Third, the choice of divided government now implies that no debt has to be repaid in $t+3$.

Without loss of generality, let's assume that party A has the control of the executive in period t. We know that the representative voter favors in the executive the party with the largest expected competence. That is, if $\hat{\varepsilon}_t^A \geq 0$, then voters pick $i' = A$, and in the Bellman equation we must only consider the controls $j' = A, B$ (if $\hat{\varepsilon}_t^A < 0$, the representative voter favors party B instead and similar arguments apply).

As to the first welfare effect, $\mathbf{E}_t\left[c_{t+1}(A,j,A,A) + \alpha \ln g_{t+1}(A,j,A,A) \mid \hat{\varepsilon}_t^A\right]$ $-\ \mathbf{E}_t\left[c_{t+1}(A,j,A,B) + \alpha \ln g_{t+1}(A,j,A,B) \mid \hat{\varepsilon}_t^A\right]$, for $\hat{\varepsilon}_t^A = 0$ the difference is second order and has to do with the effects on variance. With unified government, shock $\hat{\varepsilon}_t^A$ is known, whereas with divided government $\rho\hat{\varepsilon}_t^A + (1-\rho)\varepsilon_t^B$ has the same expected value of zero but greater variance; on the other hand, in the next period variance is lower with divided government, because the distribution of $\rho\varepsilon_{t+1}^A + (1-\rho)\varepsilon_{t+1}^B$ has the same expected value but less dispersion than ε_{t+1}^A. These two risk effects have opposite signs. However, as $\hat{\varepsilon}_t^A$ increases, there is a competence effect that clearly favors unified government: by Lemma 3 in the

Appendix, for $\rho < 1$, $\mathbf{E}_t \left[c_{t+1}(A,j,A,A) + \alpha \ln g_{t+1}(A,j,A,A) \mid \hat{\varepsilon}_t^A \right] - \mathbf{E}_t \left[c_{t+1}(A,j,A,B) + \alpha \ln g_{t+1}(A,j,A,B) \mid \hat{\varepsilon}_t^A \right]$ is increasing in $\hat{\varepsilon}_t^A$.

As to the second welfare effect, expectations about period $t+2$ are not conditional on the current competence shock, so

$$\mathbf{E}_t \left[c_{t+2}(A,A) + \alpha \ln g_{t+2}(A,A) \right] - \mathbf{E}_t \left[c_{t+2}(A,B) + \alpha \ln g_{t+2}(A,B) \right] =$$
$$= \mathbf{E}_t \left[\frac{\alpha \left(1 - \frac{1}{\omega_{t+2}^u} \right)}{\theta_{t+2}^{i'} \mathbf{E}_{t+2} \left(\frac{1}{\theta_{t+2}^{i'}} \right)} + \alpha \ln \left(\frac{\omega_{t+2}^u}{\rho^2} \right) \right],$$

which is positive because $\omega_{t+2}^u > 1$ and $\rho \leq 1$. Intuitively, in period $t+2$ there will be an efficiency loss with divided government due to the break down in cooperation between the executive and legislative branches. Furthermore, there will be no cycle under divided government. Both effects tends to reduce utility in period $t+2$ compared to a situation with unified government (recall that no cycle implies more taxes and less public goods in period $t+2$).

As to the third welfare effect, $\mathbf{E}_t \left[V(A,A) \right] - \mathbf{E}_t \left[V(A,B) \right] < 0$. Simply put, the voter prefers to begin with divided government because there is no debt to repay in the future. Formally, the result follows from a direct inspection of the Bellman equation.

While the second and third welfare effects are fixed costs and benefits, by Lemma 3 the first welfare effect is increasing in $\hat{\varepsilon}_t^A$. Hence, if for some $\hat{\varepsilon}_t^A \geq 0$ the representative voter prefers unified government AA to divided government AB, then for $\hat{\varepsilon}_t^{A\prime} > \hat{\varepsilon}_t^A$ the voter will also prefer AA to divided government AB; and if for $\hat{\varepsilon}_t^A \geq 0$ the representative voter prefers AB to AA, then for $0 \leq \left(\hat{\varepsilon}_t^A \right)' < \hat{\varepsilon}_t^A$ the voter will also prefer AB to AA. This shows that the policy function must be a cutting point strategy as conjectured in (27).

As to the influence of the inherited situation, the only difference of starting with either (A, A) or (A, B) is the burden of the debt in period $t+1$. Since voting unified or divided government affects competence in period $t+1$, the expected burden of the debt depends on the voting decision. Specifically, if $\mathbf{E}_t\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}} \mid \hat{\varepsilon}^A_t\right) > \mathbf{E}_t\left(\frac{1}{\theta^A_{t+1}} \mid \hat{\varepsilon}^A_t\right)$, the expected burden of the debt is lower if the representative voter votes unified government (A, A) rather than divided government (A, B). This implies that, if for some $\hat{\varepsilon}^A_t \geq 0$ the representative voter prefers unified government (A, A) when the starting point is divided government with party A in the executive position, then for the same expected competence $\hat{\varepsilon}^A_t$ the voter also prefers (A, A) to (A, B) when the starting point is unified government of party A. On the other hand, if $\mathbf{E}_t\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}} \mid \hat{\varepsilon}^A_t\right) < \mathbf{E}_t\left(\frac{1}{\theta^A_{t+1}} \mid \hat{\varepsilon}^A_t\right)$, the expected burden of the debt is higher if the representative voter votes unified government (A, A) rather than divided government (A, B), and hence debt tends to discourage voting unified government. The intuition behind these results is that divided government imposes a loss in expected competence, but also reduces competence variance. These two effects have opposite effect in the expected burden of the debt. When the loss in expected competence prevails, divided government increases the expected burden of the debt, making unified government more attractive when there is debt. On the other hand, when the variance effect is dominant, divided government reduces the expected burden of the debt, making unified government less attractive when there is debt.

Influence of parameter ρ on choice

The standard assumption is that opportunism is high, so $\chi^E > \bar{\chi}_t$ and politicians are willing to engineer a cycle. By Proposition 3, for $\rho = 1$ and $\chi^E > \bar{\chi}_t$, the representative voter strictly prefers divided government, since there is no efficiency cost and electoral cycles are avoided. Since the efficiency cost of divided government increases as ρ falls, given the magnitude of electoral cycles there will be a $\rho < 1$ for which there are values $\varepsilon_H, \varepsilon_L$ such that if $\hat{\varepsilon}_t^A > \varepsilon_H$ or $\hat{\varepsilon}_t^A < -\varepsilon_L$, then the representative voter prefers AA to AB when the starting point is a unified government with party A in the executive position (a similar argument applies when the starting point is divided government). Moreover, as ρ keeps falling, the efficiency costs of divided government will eventually outweigh its moderating effects, so the representative voter always prefers unified government.[18]

This leads us to our final proposition:

Proposition 4 *Separation of powers and shared government competence. Suppose there are elections in odd periods, and the legislature must authorize new debt. Furthermore, government competence is a weighted average of the competence of the parties that share government. Assume that* $1 < \beta(1+r)\frac{\mathbf{E}_t\left(\frac{1}{\theta_{t+1}}\right)}{\mathbf{E}_t\left(\frac{1}{\theta_t}\right)} \leq \frac{3}{2}$ *and* $\chi^E > \bar{\chi}_t$.

In a non-electoral period the executive, with the agreement of the legislature, will set taxes and expenditures at the optimal level.

In an electoral period:

1. *Under perfect compliance with the budget law, divided government will set taxes and expenditures at the optimal level, while unified government will generate PBCs. Voters are more likely to pick unified government either when the current government is very competent (and hence reelected) or very incompetent (and hence replaced by the opposition).*

[18]If, unlike our assumption, $\chi^E \leq \bar{\chi}_t$, the representative voter would strictly prefer unified government for any $\rho < 1$ because there would be no cycles to avoid, and divided government would come at the expense of government efficiency.

2. *Under null compliance with the budget law, the executive will generate PBCs. Voters favor unified government.*

4 Empirical implications

Alesina, Roubini, and Cohen (1997, chaps. 4 and 6) link the lack of recent evidence on opportunistic cycles for the United States to the fact that after 1980 many federal transfer programs became mandatory by acts of Congress, so they cannot be easily manipulated for short run purposes by the President. According to the logic of our model, these developments may be due in turn to the fact that in the postwar period US voters have favored divided government (cf. Alesina and Rosenthal 1995), because Propositions 3 and 4 imply that divided government can prevent PBCs.

The moderating influence of divided government in Propositions 3 and 4 assumes there is perfect compliance with the budget law, but not all legislatures actually have the capability to assure such compliance. If not, by Propositions 3 and 4 the budget rule is not credible. The US Congress has an uncommon capability of monitoring and enforcing the budget. Nordhaus (1989) traces the roots of this back to the Nixon administration, whose lies prompted the US Congress to establish in 1974 the Congressional Budget Office to have an independent control of the budget.

One can derive a sharp empirical implication from these two propositions, namely, that aggregate PBCs should be larger either in countries with low legislative checks and balances, or with low observance of the rule of law. Streb, Lema and Torrens (2009) empirically study this implication, constructing a proxy for effective checks and balances that combines the presence of a legislative veto player (using the Henisz political constraints index) with the degree of compliance with the law (using the ICRG law and order index). With a panel of democracies over the 1960-2001 period, they find that legislative checks and balances indeed moderate cycles in countries with high observance of the rule of law. These results confirm the Schuknecht (1996) conjecture that stronger PBCs in developing countries are due to weaker checks and balances.

Another implication of Propositions 3 and 4 is that the choice of unified or divided government is endogenous. Proposition 3 has a counterfactual implication, that voters will always choose divided government. Instead, Proposition 4 implies that divided government is more likely when the differences in expected competence between both parties are not too large. On the other hand, if a legislature does not have the capability to assure compliance with the budget law, then divided government is useless to moderate the executive and only the efficiency costs are left. Hence, we should expect more divided government in countries where the legislature has a greater possibility of enforcing the budget law, because here is where divided government actually puts a break on PBCs.

5 Conclusions

The inability of the executive incumbent to credibly commit not to use debt for electoral purposes has been pointed out as being at the heart of aggregate PBCs (Shi and Svensson 2006, Alt and Lassen 2006a,b). Since this credibility problem is generated by the discretionary power of the executive, this paper models the role of legislative veto players as a possible solution to PBCs.

When there is separation of powers, appropriate checks and balances may work as a commitment device that eliminates electoral cycles in fiscal policy, making all players better off (including the executive incumbent).

However, the actual checks and balances under separation of powers are endogenous, since they depend on whether voters pick unified or divided government. This endogenous choice will depend on the degree of compliance with the budget law, and on the specific trade-off voters face of having lower government competence when power is shared to avoid PBCs.

More generally, in relation to the debate on rules versus discretion our discussion of PBCs shows that a way to solve the credibility problem, making the budget rule a credible commitment, is to introduce an institutional arrangement that limits the discretion to change rules. That is, separation of powers and compliance with the budget law provide an institutional technology that gives voters the opportunity to turn the budget law into a credible commitment if they pick divided government. Voters may find this commitment device useful or not depending on its benefits (eliminating PBCs) and costs (lower competence).

6 Appendix

Lemma 1 *Let* $Z = h(X, Y)$ *be a function of two independent stochastic variables* X *and* Y*, with marginal densities* $f_x(x)$ *and* $f_y(y)$*. Let* $g(x) = \mathbf{E}[Z \mid x]$ *be the expected value of* Z *conditional on* x*. Suppose that* $g(x)$ *is an increasing and concave function of* x*. Consider a known vector of information variables* W *that allows to estimate* X *and call* $\hat{x}(w)$ *the estimated value of* X *when* W *adopts the value* w*. Then*

$$\mathbf{E}[Z \mid \hat{x}(w)] \geq \mathbf{E}[Z] \text{ if and only if } \hat{x}(w) \geq \mathbf{E}[X].$$

Proof: First, since X and Y are independent stochastic variables, $g(x) = \mathbf{E}[Z \mid x] = \int h(x, y)\ f_y(y)\ dy$. Since $g(x)$ is concave, by Jensen's inequality it follows that $g[\mathbf{E}(X)] \geq \mathbf{E}[g(x)]$. Employing the definition of g, the left hand side of the inequality is $\mathbf{E}\left[Z \mid E\left[X\right]\right]$, while the right hand side is $\mathbf{E}_X\left[\mathbf{E}\left[Z \mid X\right]\right]$. Therefore, $\mathbf{E}\left[Z \mid \mathbf{E}\left[X\right]\right] \geq \mathbf{E}_X\left[\mathbf{E}\left[Z \mid X\right]\right]$. By the law of iterated expectations, $\mathbf{E}\left[Z\right] = \mathbf{E}_X[\mathbf{E}\left[Z \mid X\right]]$. Hence,

$$\mathbf{E}\left[Z \mid \mathbf{E}\left[X\right]\right] \geq \mathbf{E}\left[Z\right]. \tag{28}$$

Now, consider the vector of information variables W, whose realization w is known. From inspection of (28), if $g(x) = \mathbf{E}\left[Z \mid x\right]$ is an increasing function of x, then $\mathbf{E}\left[Z \mid \hat{x}(w)\right] \geq \mathbf{E}\left[Z \mid \mathbf{E}\left[X\right]\right]$ if and only if $\hat{x}(w) \geq \mathbf{E}\left[X\right]$.■

Lemma 2 $\mathbf{E}_t[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t]$ *is an increasing and concave function of* ε_t.

Proof: We begin using expressions (3), (5), and (6) to replace c_{t+1} and g_{t+1} (line 1). Next we replace γ^u_{t+1} and π^u_{t+1} for their respective values (line 2). Finally, in line 3 we apply the conditional expected value operator.

$$\begin{aligned}
&\mathbf{E}_t\left[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t\right] = \\
&= \mathbf{E}_t\left[y - \frac{\pi^u_{t+1}}{\theta_{t+1}} + \alpha \ln(\theta_{t+1}\gamma^u_{t+1}) \mid \varepsilon_t\right] \\
&= \mathbf{E}_t\left[y - \frac{\frac{\alpha}{E_{t+1}\left(\frac{1}{\theta_{t+1}}\right)} + (1+r)d_t}{\theta_{t+1}} + \alpha \ln\left(\frac{\theta_{t+1}\alpha}{E_{t+1}\left(\frac{1}{\theta_{t+1}}\right)}\right) \mid \varepsilon_t\right] \\
&= y - \alpha - (1+r)d_t\mathbf{E}_t\left(\frac{1}{\theta_{t+1}} \mid \varepsilon_t\right) + \alpha\mathbf{E}_t\left[\ln\left(\frac{\theta_{t+1}\alpha}{E_{t+1}[\frac{1}{\theta_{t+1}}]}\right) \mid \varepsilon_t\right]
\end{aligned}$$

Note that $\mathbf{E}_t\left(\frac{1}{\theta_{t+1}} \mid \varepsilon_t\right) = \mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)$ is used to simplify the expression for expected utility.

Expected utility is increasing in ε_t, a fact that can be confirmed by derivation:

$$\frac{\partial \mathbf{E}_t \left[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t\right]}{\partial \varepsilon_t} =$$
$$= \frac{\partial \mathbf{E}_t \left(c_{t+1} \mid \varepsilon_t\right)}{\partial \varepsilon_t} + \alpha \mathbf{E}_t \left[\frac{1}{g_{t+1}} \frac{\partial g_{t+1}}{\partial \varepsilon_t} \mid \varepsilon_t\right]$$
$$= (1+r) d_t \mathbf{E}_t \left(\frac{1}{\theta_{t+1}^2} \mid \varepsilon_t\right) + \alpha \left[\mathbf{E}_t \left(\frac{1}{\theta_{t+1}} \mid \varepsilon_t\right) + \frac{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)}\right] > 0$$

Expected utility in $t+1$ is increasing in ε_t because of three effects, represented by each term: a lower expected burden of outstanding debt, a higher expected competence in the provision of the public good, and a higher expenditure on the public good. Though future expenditure on the public good increases, expected consumption of the private good remains constant at $y - \alpha$ (see Proposition 1).

As for the second derivative of $\mathbf{E}_t[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t]$, the second derivative of the private consumption good is negative:

$$\frac{\partial^2 \mathbf{E}_t \left(c_{t+1} \mid \varepsilon_t\right)}{\partial \varepsilon_t^2} = -2(1+r) d_t \mathbf{E}_t \left(\frac{1}{\theta_{t+1}^3} \mid \varepsilon_t\right) = \frac{(-2)\,(1+r) d_t (\bar{\theta} + \varepsilon_t)}{\left[(\bar{\theta} + \varepsilon_t)^2 - (\frac{1}{2\xi})^2\right]^2} < 0.$$

Since debt may be zero, for expected utility to be concave in ε_t, it is necessary for the second derivative of the public good to be negative:

$$\frac{\partial^2 E_t[\ln(g_{t+1}) \mid \varepsilon_t]}{\partial \varepsilon_t^2} = -\mathbf{E}_t\left(\frac{1}{\theta_{t+1}^2} \mid \varepsilon_t\right) + \frac{(-2)\,\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^3}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right) + \mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right)}{\left[\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)\right]^2}$$

$$= \frac{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right)\left\{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right) - \left[\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)\right]^2\right\} - 2\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^3}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)}{\left[\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)\right]^2}.$$

Note that we use the identity $\mathbf{E}_t\left(\frac{1}{\theta_{t+1}^2} \mid \varepsilon_t\right) = \mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right)$. Since $\left\{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right) - \left[\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right)\right]^2\right\}$ is second order in relation to the following term, this derivative is always negative.

It is specially easy to see that this expression is negative when ξ is large. Recall that $\varepsilon_{t+1} \sim U\left[-\frac{1}{2\xi}, \frac{1}{2\xi}\right]$, which implies $\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}}\right) = \xi \ln\left(\frac{\bar{\theta}+\varepsilon_t+\frac{1}{2\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right)$, $\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^2}\right) = \frac{1}{(\bar{\theta}+\varepsilon_t)^2-(\frac{1}{2\xi})^2}$, and $\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^3} \mid \varepsilon_t\right) = \frac{\bar{\theta}+\varepsilon_t}{\left[(\bar{\theta}+\varepsilon_t)^2-(\frac{1}{2\xi})^2\right]^2}$. Simplifying, $\frac{\partial^2 E_t[\ln(g_{t+1})|\varepsilon_t]}{\partial \varepsilon_t^2} < 0$ requires

$$\left(\frac{1}{(\bar{\theta}+\varepsilon_t)^2-(\frac{1}{2\xi})^2} - \left[\xi \ln\left(\frac{\bar{\theta}+\varepsilon_t+\frac{1}{2\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right)\right]^2\right) < 2\frac{\bar{\theta}+\varepsilon_t}{(\bar{\theta}+\varepsilon_t)^2-(\frac{1}{2\xi})^2}\xi \ln\left(\frac{\bar{\theta}+\varepsilon_t+\frac{1}{2\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right) \tag{29}$$

For ξ large, $\ln\left(\frac{\bar{\theta}+\varepsilon_t+\frac{1}{2\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right) \simeq \left(\frac{\bar{\theta}+\varepsilon_t+\frac{1}{2\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right) - 1 = \left(\frac{\frac{1}{\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right)$. Hence,

$$\begin{aligned}
&\left(\frac{1}{(\bar{\theta}+\varepsilon_t)^2-(\frac{1}{2\xi})^2} - \left[\xi \ln\left(\frac{\bar{\theta}+\varepsilon_t+\frac{1}{2\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right)\right]^2\right) \simeq \\
&\simeq \left(\frac{1}{(\bar{\theta}+\varepsilon_t)^2-(\frac{1}{2\xi})^2} - \left[\xi\left(\frac{\frac{1}{\xi}}{\bar{\theta}+\varepsilon_t-\frac{1}{2\xi}}\right)\right]^2\right) \\
&= \frac{1}{(\bar{\theta}+\varepsilon_t+\frac{1}{2\xi})(\bar{\theta}+\varepsilon_t-\frac{1}{2\xi})} - \frac{1}{(\bar{\theta}+\varepsilon_t-\frac{1}{2\xi})(\bar{\theta}+\varepsilon_t-\frac{1}{2\xi})} \\
&= \frac{(\bar{\theta}+\varepsilon_t-\frac{1}{2\xi})-(\bar{\theta}+\varepsilon_t+\frac{1}{2\xi})}{(\bar{\theta}+\varepsilon_t+\frac{1}{2\xi})(\bar{\theta}+\varepsilon_t-\frac{1}{2\xi})^2} \\
&= \frac{-\frac{1}{\xi}}{(\bar{\theta}+\varepsilon_t+\frac{1}{2\xi})(\bar{\theta}+\varepsilon_t-\frac{1}{2\xi})^2} < 0
\end{aligned}$$

Since the right-hand side of (29) is positive, the derivative is clearly negative for ξ large.■

Lemma 3 *Suppose that party A controls the executive in period t, then the difference $D(A,B) = \mathbf{E}_t\left[c_{t+1}(A,j,A,A) + \alpha \ln g_{t+1}(A,j,A,A) \mid \hat{\varepsilon}_t^A\right] - \mathbf{E}_t\left[c_{t+1}(A,j,A,B) + \alpha \ln g_{t+1}(A,j,A,B) \mid \hat{\varepsilon}_t^A\right]$ is increasing in $\hat{\varepsilon}_t^A$.*

Proof: Applying standard properties of the operator $\mathbf{E}$ and introducing the corresponding definitions of c_{t+1} and g_{t+1} we obtain:

$$
\begin{aligned}
&D\left(A,B\right) = \\
&= \frac{(1+r)\left[\hat{\omega}_t\left(A,j\right) - \frac{1}{\hat{\omega}_t(A,j)}\right]}{\mathbf{E}_t\left(\frac{1}{\theta_t^A}\right)} \mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B} - \frac{1}{\theta_{t+1}^A} \mid \hat{\varepsilon}_t^A\right] + \\
&+ \alpha \mathbf{E}_t\left[\ln\left(\frac{\theta_{t+1}^A}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B}\right) \mid \hat{\varepsilon}_t^A\right] + \\
&+ \alpha \mathbf{E}_t\left[\ln\left(\frac{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^A}\right)}\right) \mid \hat{\varepsilon}_t^A\right].
\end{aligned}
$$

Note that $\hat{\omega}_t\left(A,j\right) \geq 1$ because either there is an electoral cycle and $\hat{\omega}_t\left(A,j\right) > 1$ or there is no cycle and $\hat{\omega}_t\left(A,j\right) = 1$.

We now show the difference $D\left(A,B\right)$ is increasing in $\hat{\varepsilon}_t^A$:

$$
\begin{aligned}
&\frac{\partial D\left(A,B\right)}{\partial \hat{\varepsilon}_t^A} = \\
&= \frac{(1+r)\left[\hat{\omega}_t\left(A,j\right) - \frac{1}{\hat{\omega}_t(A,j)}\right]}{\mathbf{E}_t\left(\frac{1}{\theta_t^A}\right)} \frac{\partial \mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B} - \frac{1}{\theta_{t+1}^A} \mid \hat{\varepsilon}_t^A\right]}{\partial \hat{\varepsilon}_t^A} + \\
&+ \alpha \frac{\partial \mathbf{E}_t\left[\ln\left(\frac{\theta_{t+1}^A}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B}\right) \mid \hat{\varepsilon}_t^A\right]}{\partial \hat{\varepsilon}_t^A} + \\
&+ \alpha \frac{\partial \mathbf{E}_t\left[\ln\left(\frac{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\theta_{t+1}^A}\right)}\right) \mid \hat{\varepsilon}_t^A\right]}{\partial \hat{\varepsilon}_t^A}.
\end{aligned}
$$

As to the first derivative:

$$\frac{\partial \mathbf{E}_t\left[\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}} - \frac{1}{\theta^A_{t+1}} \mid \hat{\varepsilon}^A_t\right]}{\partial \hat{\varepsilon}^A_t} =$$

$$= \mathbf{E}_t\left[\frac{-\rho}{\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)^2} + \frac{1}{\left(\theta^A_{t+1}\right)^2} \mid \hat{\varepsilon}^A_t\right]$$

$$= \mathbf{E}_t\left[\frac{-\rho\left(\theta^A_{t+1}\right)^2 + \left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)^2}{\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)^2\left(\theta^A_{t+1}\right)^2} \mid \hat{\varepsilon}^A_t\right]$$

$$= (1-\rho)\mathbf{E}_t\left[\frac{\left(\theta^B_{t+1}\right)^2 - \rho\left(\theta^A_{t+1}-\theta^B_{t+1}\right)^2}{\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)^2\left(\theta^A_{t+1}\right)^2} \mid \hat{\varepsilon}^A_t\right]$$

For $\rho = 1$, this is zero, and for $\rho = 0$, this is positive.When $\rho < 1$, we can expect this to be positive because the second term of the numerator is second order with respect to the first term: at $\hat{\varepsilon}^A_t = 0$, the second term is close to zero; when $\hat{\varepsilon}^A_t = 1/(2\xi)$, the first term will be approximately $\bar{\theta}^2$, while the second term will be approximately $\rho\left(1/(2\xi)\right)^2$. Therefore:

$$\frac{\partial \mathbf{E}_t\left[\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}} - \frac{1}{\theta^A_{t+1}} \mid \hat{\varepsilon}^A_t\right]}{\partial \hat{\varepsilon}^A_t} \begin{array}{l} = 0 \text{ if } \rho = 1, \\ > 0 \text{ if } \rho < 1. \end{array} \tag{30}$$

As to the second derivative:

$$\frac{\partial \mathbf{E}_t\left[\ln\left(\frac{\theta^A_{t+1}}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right) \mid \hat{\varepsilon}^A_t\right]}{\partial \hat{\varepsilon}^A_t} =$$

$$= \mathbf{E}_t\left[\frac{1}{\theta^A_{t+1}} - \frac{\rho}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}} \mid \hat{\varepsilon}^A_t\right]$$

$$= \mathbf{E}_t\left[\frac{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}-\rho\theta^A_{t+1}}{\theta^A_{t+1}\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)} \mid \hat{\varepsilon}^A_t\right]$$

$$= \mathbf{E}_t\left[\frac{(1-\rho)\theta^B_{t+1}}{\theta^A_{t+1}\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)} \mid \hat{\varepsilon}^A_t\right] \begin{array}{l} = 0 \text{ if } \rho = 1, \\ > 0 \text{ if } \rho < 1. \end{array} \tag{31}$$

Finally, as to the third derivative:

$$\frac{\partial \mathbf{E}_t\left[\ln\left(\frac{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right)}\right)\mid \hat{\varepsilon}^A_t\right]}{\partial \hat{\varepsilon}^A_t} =$$

$$= \mathbf{E}_t\left[\frac{\mathbf{E}_{t+1}\left(\frac{-\rho}{\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)^2}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)} - \frac{\mathbf{E}_{t+1}\left(\frac{-1}{\left(\theta^A_{t+1}\right)^2}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right)} \mid \hat{\varepsilon}^A_t\right]$$

$$= \mathbf{E}_t\left\{\frac{\mathbf{E}_{t+1}\left(\frac{1}{\left(\theta^A_{t+1}\right)^2}\right)\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right) - \mathbf{E}_{t+1}\left(\frac{\rho}{\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)^2}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right)} \mid \hat{\varepsilon}^A_t\right\}$$

$$= \mathbf{E}_t\left\{\frac{(1-\rho)\mathbf{E}_{t+1}\left(\frac{1}{\left(\theta^A_{t+1}\right)^2}\right)\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right)} + \right.$$

$$\left. -\rho\frac{\left[\mathbf{E}_{t+1}\left(\frac{1}{\left(\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}\right)^2}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right) - \mathbf{E}_{t+1}\left(\frac{1}{\left(\theta^A_{t+1}\right)^2}\right)\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)\right]}{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right)} \mid \hat{\varepsilon}^A_t\right\},$$

where the first term in the numerator is positive, and the second term of the numerator is second order (since it is the difference of two products of similar magnitude). Hence,

$$\frac{\partial \mathbf{E}_t\left[\ln\left(\frac{\mathbf{E}_{t+1}\left(\frac{1}{\rho\theta^A_{t+1}+(1-\rho)\theta^B_{t+1}}\right)}{\mathbf{E}_{t+1}\left(\frac{1}{\theta^A_{t+1}}\right)}\right)\mid \hat{\varepsilon}^A_t\right]}{\partial \hat{\varepsilon}^A_t} \begin{array}{l} = 0 \text{ if } \rho = 1, \\ > 0 \text{ if } \rho < 1. \end{array} \tag{32}$$

Summing up, (30)-(32) imply that the second part of Lemma 3 is satisfied.■

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Table 1. Competence with shared government

Executive	Legislature	Electoral period t	Non-electoral period $t+1$
A	A	θ_t^A	θ_{t+1}^A
A	B	$\rho\theta_t^A$	$\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B$
B	A	$\rho\theta_t^B$	$\rho\theta_{t+1}^B + (1-\rho)\theta_{t+1}^A$
B	B	θ_t^B	θ_{t+1}^B

Table 2. Voters' expectations in electoral periods

Executive	Legislature	$\hat{\varepsilon}_t^A$	$\hat{\varepsilon}_t^B$	$\hat{\omega}_t$
A	A	$\frac{\sqrt{g_t/p_t}}{\hat{\omega}_t} - \bar{\theta} - \varepsilon_{t-1}^A$	0	ω_t^u
A	B	$\frac{\sqrt{g_t/p_t}}{\rho} - \bar{\theta} - \varepsilon_{t-1}^A$	0	1
B	A	0	$\frac{\sqrt{g_t/p_t}}{\rho} - \bar{\theta} - \varepsilon_{t-1}^B$	1
B	B	0	$\frac{\sqrt{g_t/p_t}}{\hat{\omega}_t} - \bar{\theta} - \varepsilon_{t-1}^B$	ω_t^u