Costs of taxation and the size of government

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Abstract

Existing theory on the form of government suggests that a parliamentary system promotes a larger size of government than does a presidential system. This paper extends the existing theory by allowing for distortionary taxation. A main result is that if taxation is sufficiently distortionary, the parliamentary system may promote a smaller size of government than the presidential system. The proposed mechanism appears consistent with several empirical patterns in the data that cannot be explained by other theories.

Keywords: Political economy. Constitution. Tax costs. Comparative politics.

JEL: H3, H4, H5, P51.

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1 Introduction

It is now well established in the literature that constitutional provisions, such as the form of government and the electoral system, are associated with fiscal policy outcomes.[1] Theories that can explain this observed variation are, however, in scarce supply, particularly with regard to the form of government. One exception is the theory by Persson et al. (1997, 2000), which suggests that presidential systems should be associated with a lower level of public goods provision, a lower level of economic diversion of public funds by politicians, a lower level redistribution, and hence a smaller size of government than the parliamentary system.[2] Missing in this theory, however, is an account of the fact that taxation may be distortionary.[3]

The present paper extends the framework in Persson et al. (2000) by allowing for tax distortions. A main new insight is that the parliamentary form of government promotes a stronger incentive to internalize the distortions arising from taxation. If the marginal distortion is sufficiently high, the monotonic relationship in the existing theory between regime type and the size of government may even break down. Hence, with a high marginal tax distortion, the size of government and the total economic loss from the distortions can be lower in a parliamentary system than in a presidential form of government, while the opposite is more likely if taxation is less distortionary.

In the parliamentary system the mechanism causing a stronger internalization of the distortions of taxation is essentially the same as the one that causes the parliamentary regime to produce a higher, and closer to the social optimum, provision of public goods as delineated in the theory by Persson et al. (2000). Since the parliamentary form of government represents a majority of the voting population, its voters do not only have a strong incentive to internalize the social benefits from public goods provision, but they are also incentivized to take into account the social costs of taxation. Consequentially, additional tax distortion, above an endogenously determined threshold level, will effectively constrain the size of government in a parliamentary system. The threshold level is determined in the intra-governmental bargaining game. Intuitively, if the government is dominated by one strong member, all residual government revenue will be

[1] Economic analysis of the fiscal effects of constitutions dates back to the late 1950s and early 1960s (see, e.g., Buchanan and Tullock 1962; Brennan and Buchanan 1980). Buchanan and Congleton (1979) studies the role of the tax scheme (i.e., proportional versus progressive taxation) as a disciplinary device on government behavior. Moral hazard and the disciplinary effects of elections has also been studied extensively (e.g., Barro 1973; Ferejohn 1986), but without special attention to the role of different institutions. Persson and Tabellini (2000, 2003, 2004, 2008) provide overviews of the theoretical and empirical literatures. For a critical review of Persson and Tabellini (2003), the reader may consult Acemoglu (2005).

[2] Political inefficiency and diversion have been studied extensively in the literature on political agency. Persson and Tabellini (2000) and Besley (2006) provide overviews of several classes of political agency models.

[3] Distortions from taxation generally include deadweight losses due to price distortions, tax avoidance, tax evasion, compliance costs, and collection costs. Recent empirical evidence suggests that the costs of taxation are much higher than indicated by earlier estimates. For example, Feldstein (1999) finds that the marginal deadweight loss of changes in the income tax rates may be more than 10 times as large as found by Harberger (1964): the relative deadweight loss caused by increasing existing tax rates may exceed \$2 per \$1 of revenue. Other researchers find that also other types of taxation seem to be afflicted with significant social costs. See, e.g, Fisman and Wei (2004) on the relationship between tax rates and tax evasion, Slemrod (2007) for an overview of the literature on tax evasion, and Auerbach (2005) on the deadweight losses of corporate taxes.

directed towards this member's constituents, and taxation will hence be perceived as less costly to these recipients. The incentive for the government to internalize the tax distortions is then relatively weak. If, on the other hand, political power is evenly distributed among two or more members of government, redistributionary benefits must be shared among all the government's voters, implying that the tax distortions will be perceived as more costly to each recipient.

Due to its separation of powers, the presidential form of government promotes a weaker incentive than the parliamentary system for the legislators to take account of the distortionary costs of taxation. In particular, the separation of powers characterizing this system implies that decisions taken by one governmental body effectively constrain the decisions taken by other branches at a later stage of the political game. For example, a budget request submitted by the President of the United States cannot be executed until the associated budget resolution is approved by the House and the Senate, and then the associated appropriation bills are enacted. Hence, although it is the U.S. Congress which specifies both tax and expenditure decisions, the President has the option of signing the legislation or vetoing it. Voters tend not to fault their own representatives for the level of taxation, of which the governmental bodies are collectively responsible for, but they do credit their own representatives for spending that comes back to their districts. So while the same body makes the taxing and spending decisions, voters tend to perceive that these choices are made separately.

In the model, the voters of the legislative body that decides on the size of government in the presidential system (the "tax committee") cannot know for sure whether their legislators will belong to the winning faction that actually gets to benefit from the proceeds of large government. Thus these voter's main concern is keeping taxes as low as possible, just high enough to finance the preferred level of public goods, given an incentive-compatibility constraint on the legislators. Compared with the parliamentary system, the presidential system thus promotes a strong incentive to keep economic diversion of the legislators low, but a relatively weaker incentive to internalize the economic distortions of taxation.[4]

The insight that more encompassing interests can lead to more economically efficient policy outcomes, ceteris paribus, is not new. According to Olson (1993): "the more encompassing an interest—the larger share of the national income it [ref: the majority in government] receives taking all resources together—the less social losses from its redistribution to itself" (p. 571).[5] As a strong majority coalition will have more encompassing interests than a divided government, it would also be expected to have a stronger incentive to internalize the social benefits and costs of public policy.

The hypothesis that fiscal policy is more sensitive to the distortionary costs of taxation under a parliamentary form of government appears broadly consistent with the observed patterns of the growth and variation in the size of government across countries. First, it appears consistent

[4] Crain et al. (1985) discusses the separation of powers, the structure of committees, and the size of government in U.S. state legislatures.

[5] See McGuire and Olson (1996) for a formalized version of this theory. The efficiency consequences of encompassing interests (in the context of autocracy) is analyzed in, e.g., Overland et al. (2005).

with the observed pattern of a much stronger growth in the size of government among countries with a parliamentary rather than a presidential form of government, as documented in Persson and Tabellini (2003), among other studies.[6] In particular, under the assumption that an overall reduction in the distortionary costs of taxation has taken place over time—an observation for which there are several indications in the empirical literature[7]—the pattern of stronger government growth in the parliamentary system is consistent with the main insights of the proposed theoretical framework. Second, there is also a clear pattern in the data of a much stronger variability in the size of government across parliamentary regime types. Given that the distribution (not the level) of tax costs is not systematically correlated with the form of government across countries, the proposed theory is also consistent with this empirical regularity.

The hypothesis that the size of government in parliamentary systems is more responsive to tax distortions is established more rigorously by using a panel of OECD countries in the period from 2000 to 2008. The main result from this empirical exercise is that the indicator of tax distortion (which is a measure of the tax wedge on labor income) exerts a negative effect on the size of government when the form of government is parliamentary, but has either no (zero) effect or a positive effect under a presidential form of government. Due to several potential endogeneity issues, this result should not be assigned a causal interpretation. However, the correlations fit well with the main hypothesis of the paper, suggesting that the proposed mechanism may be relevant.

The remainder of the paper is organized as follows. The theoretical framework is presented in Section 2, while the equilibrium concept is introduced in Section 3. Section 4 constitutes the core of the paper, and discusses the relationship between diversionary and distortionary costs of taxation, and the size of government across the two regime types. Section 5 presents panel data evidence which is suggestive that the size of government is more responsive to distortions of taxation in parliamentary than in presidential systems. Finally, Section 6 sums up and concludes, by pointing out several avenues for future research.

2 The model: voters, politicians, and institutions

Consider a society consisting of three distinct groups of citizens, denoted by $i = 1, 2, 3$. Each group consists of a continuum of voters with unit mass. Time t is measured discretely, and the time horizon is infinite.

[6] See Figure 4, Section 5.2, for a plot of this relationship. The overall growth in the size of government over time has been studied extensively in the literature (see Garrett and Rhine 2006, for a broad overview), and the arguments are typically divided into demand side and supply side arguments (as in, e.g., Kau and Rubin 1981). The mechanisms related to the size of government proposed in this literature are being briefly reviewed in Section 5.3.

[7] A brief overview of different indicators of the efficiency of the tax system is provided in Section 5.2, Foonote 25.

The preferences of a member of group i in an arbitrary starting period j are given by

$$u_j^i = \sum_{t=j}^{\infty} \delta^{(t-j)} U^i \left(\mathbf{q}_t\right), \tag{1}$$

where $\delta < 1$ is a discount factor, $\mathbf{q}_t$ is a vector of policies at t (to be defined below), and U^i is the utility function per period. Period utility, $U^i\left(\mathbf{q}_t\right)$, is quasi-linear, such that

$$U^i\left(\mathbf{q}_t\right) = c_t^i + H\left(g_t\right) = y_t\left(1-\tau_t\right) + r_t^i + H\left(g_t\right), \tag{2}$$

where y_t is private income, τ_t is the tax rate, r_t^i is a transfer payment to group i, and g_t is the supply of Samuelsonian public goods. In the remainder of the discussion, and without loss of generality, y_t will be normalized to unity to simplify the analytical derivations and expressions. Public goods are valuable to citizens, and the preferences for public goods, $H\left(g_t\right)$, are assumed to satisfy the Inada conditions.

The public policy vector $\mathbf{q}$ in period t is defined by

$$\mathbf{q}_t = \left[\tau_t, g_t, \left\{r_t^i\right\}, \left\{s_t^l\right\}\right], \tag{3}$$

where g_t, r_t^i, and τ_t are all constrained to be nonnegative, and s_t^l denotes the diversion benefiting legislator l. As in Persson et al. (1997, 2000), diversion may refer to the financing of political parties, outright diversion, or as an allocation of resources benefiting the legislators but not the citizens. Imposing a balanced budget restriction, the government budget constraint in period t is given by

$$3\left[\tau_t - c\left(\alpha, \tau_t\right)\right] = \sum_i r_t^i + \sum_l s_t^l + g_t \equiv r_t + s_t + g_t. \tag{4}$$

In contrast to Persson et al. (2000), the budget constraint reflects that there may be real costs, $c\left(\tau_t\right)$, associated with levying taxes. In the baseline model it will be assumed that the tax cost function is linear in the tax rate, such that $c\left(\alpha, \tau_t\right) = \alpha\tau_t$, $\alpha \in [0,1)$.[8,9] The product of the parameter α and the equilibrium level of taxation 3τ is then the economy-wide efficiency loss from tax distortions; hence α also has the interpretation as the average cost of taxation

[8] Later, in Section 4.4, the analysis is extended to employing a convex tax cost function.

[9] The most commonly used application of distortionary tax costs is labor supply costs. Assuming that labor supply is elastic, a proportional income tax distorts the relative prices of consumption and leisure. Hence, an increase in the proportional—or, equivalently, the marginal—tax rate creates a real efficiency loss by reducing labor supply, and hence real income (given that labor demand is also elastic). However, levying taxes may generate a myriad of efficiency losses in different markets. Since the present analysis focuses on the effects of economic distortions from taxation in general, rather than in one particular market, it seems reasonable to model the distortions on a reduced form. In a recent contribution on inefficient redistribution policies, Drazen and Limão (2008) model the tax collection costs in a similar way. Battaglini and Coate (2007) use a dynamic model of legislative bargaining to analyze the effects of distortionary taxation on public policy, but do not perform comparative politics with regard to the rules for legislation. Their result that a high level of distortions (i.e., weak state capacity) will generate efficient legislative decisions (in the long run) is consistent with the intuition of the present analysis. However, as will be demonstrated below, the efficiency of the political outcome may critically depend on the rules for legislative bargaining.

in the economy. The baseline tax cost function is similar to the one applied by Becker and Mulligan (2003), and implies larger efficiency losses the higher the overall level of taxation is in the economy. As a higher level of taxation implies a proportional increase in the economic losses from taxation, the government revenues from any given tax rate τ is equal to $3\tau_t(1-\alpha)$.

Each region i coincides with a voting district and is represented by exactly one legislator $l = 1, 2, 3$. Separate elections under plurality rules take place in each voting district. In period j, the incumbent legislator l has preferences over outcomes, given by

$$v_t^l = \sum_{t=j}^{\infty} \delta^{(t-j)} V^l(\mathbf{q}_t) D_t^l, \tag{5}$$

where

$$V^l(\mathbf{q}_t) = s_t^l \tag{6}$$

is the utility in each period. D_t^l is a dummy variable which equals one if legislator l holds office in period t, and is zero otherwise.

At the end of each time period, each region holds an election and the candidate with the largest number of votes wins. The incumbent runs against a single opponent, who is drawn at random from a large set of identical candidates. An incumbent who is not reelected can never return to political office.

Throughout the analysis it will be assumed that the actions of the voters and politicians are contingent on payoff-relevant information in period t only, implying that voters cannot commit to intertemporal reelection rules across periods. Hence the equilibrium is stationary, and time subscripts are dropped when there is no risk of confusion.

2.1 The presidential-congressional regime type

The important feature in the model which distinguishes the presidential-congressional regime type from the parliamentary for of government is that decisions on different policy dimensions in the presidential regime are made sequentially by different governmental bodies, rather than simultaneously by one single government coalition, as in the parliamentary regime. Thus, in the presidential system, later proposals are bound by decisions made at an earlier stage. Albeit highly stylized, this feature is recognizable in real-world politics, such as in the U.S. presidential-congressional system, where decisions made by one governmental body effectively do bind later decisions. In the model, the decisionmaking process is assumed to consist of two stages, one stage for setting taxes and the other stage for the allocation of spending.[10]

The sequence of events that defines the legislative game in the presidential regime is as follows:

[10] The mechanisms and intuition of the model are robust to an even finer separation of the decision over the size and allocation of the budget, as long as the two are separated. For a discussion of this issue, as well as other related issues, such as amendment rights, collusion, and having a national, rather than regional, ballots, the reader is referred to Persson et al. (2000).

(1) Nature randomly selects two agenda setters among the incumbent legislators, one for taxes and one for the allocation of public spending, a_τ and a_g, respectively.

(2) Voters set their reservation utilities for their voting rule, b^i.

(3) Agenda setter a_τ proposes a tax rate.

(4) The legislators vote. If at least two legislators are in favor of the proposal, the policy is implemented. Otherwise, a default tax rate $\tau = \sigma < 1$ is enacted.

(5) Agenda setter a_g proposes $\left[g, \left\{s^i\right\}, \left\{r^i\right\}\right]$ subject to the budget constraint $r + s + g \leq 3\tau\left(1 - \alpha\right)$.

(6) The legislators vote. If at least two legislators are in favor, the policy is implemented. Otherwise, a default policy, with $g = 0$, $r^i = 0$, and $s^i = \tau\left(1 - \alpha\right)$, is put in place.

(7) Elections are held.

In the model voting is retrospective. Note that the sequence of decisions also matters outside of equilibrium, as earlier decisions impose constraints at subsequent stages. Also note that at stage 5, legislator a_g attempts to form the coalition that is best for her. If a_g is indifferent between the other legislators, it is assumed that they have the same probability of being included in the winning coalition.

2.2 The parliamentary regime

The key feature distinguishing the parliamentary from the presidential regime is that in the parliamentary regime agenda-setting powers are concentrated in the hands of a government coalition that decides on each element in the policy vector simultaneously. Each coalition partner has a veto right, the veto can be thought of as a vote of no confidence for the government. If the veto is exercised, a government crisis follows. In the case of a government crisis, a new agenda setter is picked at random from the legislature and the decisionmaking process reverts to a simple legislature characterized by one, single agenda setter (see the Appendix, Section 8.1.1, for the equilibrium in the simple legislature).[11]

The parliamentary game is characterized by the following stages:

(1) Nature randomly selects two coalition partners (ministers) among the incumbent legislators; one becomes the agenda setter for public finance decisions, a, and the other her junior partner, m.

(2) Voters set reservation utilities for their voting rule, $\{b^i\}$.

(3) Agenda setter a proposes $\left[\tau_a, \{r^i\}, g, \{s^l\}\right] : r_a + g_a + s_a \leq 3\tau_a\left(1 - \alpha\right)$.

(4) The junior coalition partner can veto the joint proposal from stage 3. If approved, the proposal is implemented and the game goes on to stage 9. If not, the government falls and the game goes on to stage 5.

(5) Nature randomly selects a new agenda setter a' among the three legislators.

[11] The model captures the basic costs of triggering a government crisis in parliamentary systems without a constructive vote of confidence—namely the prospective loss of valuable proposal powers associated with ministerial portfolios. Huber (1996) and Persson et al. (2000) use the same approximation.

(6) Voters reformulate their reelection strategies, conditional on the status of their representative after the government crisis.

(7) The agenda setter a' proposes an entire allocation $\mathbf{q}_{a'}$.

(8) The legislators vote on this proposal. If approved by at least two legislators, $\mathbf{q}_{a'}$ is implemented. If not, the legislative bargaining ends and a default outcome with $\tau = \frac{s^l}{1-\alpha} = \sigma$ and $g = r^i = 0$ is implemented.

(9) Elections are held.

As noted above, the parliamentary game implies that decisions on the different elements in the policy vector are made simultaneously. However, note that sequential proposals within government would not add any effective separation of powers; as long as a veto at the last proposal stage triggers a government crisis, sequential intra-governmental voting would produce identical results.[12]

3 Equilibrium

In all regime types, an equilibrium is a vector of policies $\mathbf{q}_t(\mathbf{b}_t)$ and a vector of reservation utilities $\mathbf{b}_t$, such that, in any period t, when all players take as given the equilibrium outcomes of periods $t+k$, $k \geq 1$:

(I) for any given b_t^i, there exists at least one legislator apart from the agenda setter who weakly prefers $\mathbf{q}_t(\mathbf{b}_t)$ to the default outcome;

(II) for any given $\mathbf{b}_t$, the agenda-setting legislator(s) prefer(s) $\mathbf{q}_t^L(\mathbf{b}_t)$ to any other policy satisfying part I;

(III) the reservation utilities b_t^i are optimal for the voters in each district i, when one takes into account that policies in the current period are set according to $\mathbf{q}_t(\mathbf{b}_t)$ and takes as given the reservation utilities in other regions b_t^{-i} and the identity of the agenda setter(s);

(IV) whenever the game is characterized by more than one node, the optimality conditions for policy proposals and for voting by the legislators must hold at each node of the game, for any given voting rules and decisions at earlier nodes in the same period, and when one takes into account equilibrium behavior at subsequent nodes of the same period.

Additionally, political equilibria differ according to the specific constitutional features. The regime specific equilibrium definitions are described in detail the Appendix (Definitions A2 and A3, in Sections 8.1.2 and 8.1.3, respectively).

4 Costs of taxation and comparative politics

Distortions from taxation create deadweight losses, and hence constitute real costs.. From the voters's viewpoint, however, taxation in representative democracy is potentially associated with costs even if taxation is nondistortionary. The reason is that the legislators, once in office, are

[12] Persson et al. (1997) provide a formal proof of this proposition.

endowed with powers to divert resources. Agenda-setting legislators optimize their respective objective functions by trading off the benefits from diversion against their reelection probability and the associated expected future payoffs. The resulting equilibrium level of diversion constitutes a *diversionary tax cost* from the voters' point of view.

The incentive to divert resources is constrained by the political institutions, and in particular by the constitutional features that guide the formation of government and the processes of legislative bargaining. Intuitively, a coalition of legislators who gets to decide the entire size and allocation of the government budget is likely to propose a larger budget and, implicitly, a higher level of diversion (given its expectation of the reelection probability, and future equilibrium- and out-of-equilibrium payoffs), while a legislator who gets to decide only on the size of the budget, but not on its allocation, is likely to minimize other legislator's opportunity for diversion. In either case, however, the opportunity to divert will ultimately be limited by state capacity, which in turn will be effectively constrained by the level of tax distortion.[13] Hence, the diversionary and distortionary costs of taxation are likely to interact to affect equilibrium policy.

In the remainder of this section, the comparative politics of the size of government in the presidential and the parliamentary regime types, respectively, will be analyzed more formally, with particular attention to the level of economic distortions of taxation. For expositional reasons, the full political equilibrium propositions and proofs are delegated to the Appendix (Propositions A2 and A3 in Sections 8.1.2 and 8.1.3, respectively). The exposition included in the main text thus focuses on the key mechanisms and intuition regarding the association between the form of government, the level of distortionary taxation is, and the equilibrium size of government.

The discussion is further structured by, first, discussing the comparative politics in the case where the level of tax distortion is 'low' (i.e., below a well-defined threshold), and, second, by discussing the case where the distortionary taxation is "high" (i.e., above the same threshold).

4.1 Low levels of distortion ($\alpha \leq 2/3$)

Any relevant equilibria of the model imply positive tax rates $\left(\tau^C, \tau^P > 0\right)$, positive levels of diversion $\left(s^C, s^P > 0\right)$, and positive levels of public goods provision $\left(g^C, g^P > 0\right)$, where the notation C and P refers to the presidential-congressional (C) and the parliamentary equilibria (P), respectively. The equilibrium level of pure redistribution may, however, be either strictly positive or equal to zero $\left(r^C, r^P \geq 0\right)$, depending on whether the nonnegativity constraint on redistribution is binding. For example, if the government is sufficiently poor (e.g., due to weak state capacity), or if preferences are strongly skewed towards public goods, it may not be in the self-interest of the agenda-setters' constituents to demand redistribution toward themselves, as the marginal benefit from public goods will be higher than the marginal benefit from private consumption.

The equilibria in which the nonnegativity constraint on redistribution is binding will be

[13] State capacity here refers to the ability of the government to raise revenue from taxation, given any level of potential output in the economy.

analyzed below, but first consider the case where the political equilibria are characterized by positive levels of redistribution: r^C, $r^P > 0$.

Proposition 1 *(i) When $\alpha \leq 1/3$ and the nonnegativity constraint on r is not binding, the equilibrium tax rates in both regimes will be insensitive to changes in α; (ii) If $1/3 < \alpha \leq 2/3$, the equilibrium tax rate can be decreasing in α in the parliamentary regime, dependent on the intra-governmental Nash bargaining outcome; (iii) In the region where the equilibrium tax rate is insensitive to changes in α (i.e., $\alpha \leq 1/3$), α will affect the size of government exclusively via its impact on state capacity, and not via the (equilibrium) tax rate.*

Proposition 1 has the following intuition (for the full formal proof, consult Propositions A2 and A3 in the Appendix). In the parliamentary regime, the coalition government decides simultaneously on the size of the budget and on its allocation. Consequently, the voters are residual claimants on government revenue, and are hence incentivized to maximize the level of taxation as long as the marginal cost of redistribution is lower than the marginal net benefit (via increased private consumption). The exact threshold for when the tax distortion get so high that redistribution is no longer beneficial depends, from the viewpoint coalition government's voters, on the outcome of the intra-governmental Nash game over redistribution.

There are two extreme, possible outcomes of the intra-governmental Nash game over redistribution: one in which the stronger part receives all the redistribution, and another in which the amount of redistribution is shared equally between the two groups of voters. Any equilibrium outcome implying a positive level of redistribution must lie in the interval between these two extremes.

Redistribution, within the current framework, may be seen as a subsidy on private consumption, the size of which depends on the fraction of the (voting) population that holds the residual claim on government revenue. If the Nash outcome means that one group receives all of the redistribution (if any), this works as a subsidy on private consumption paid by the other two constituencies. Redistribution would thus provide a net gain for the benefiting voter group, up to the point where $\alpha = 2/3$. Beyond this threshold, an equilibrium with a positive level of redistribution would never be consistent with the voters' reservation utilities, as the level of distortion would preempt the potential redistributionary gains from the implicit subsidy. However, if the Nash outcome involves that the two coalition partners share the budget for redistribution exactly equally, this would imply a lower level of "subsidy", as perceived by the voters in each group (because now only one constituency subsidizes the private consumption of the two other constituencies). Hence, in the latter case, a positive level of redistribution would only be consistent with the reservation utilities of the government coalition's voters as long as $\alpha < 1/3$; beyond the threshold $\alpha = 1/3$, one monetary unit paid in taxes by the government's voters would generate a less than one monetary unit of redistribution to each of the groups. Thus, when $1/3 \leq \alpha \leq 2/3$, there exist multiple equilibria, which outcomes depend on the intra-governmental Nash game for redistribution and on the shape of $H(.)$.[14]

[14] The 2/3-threshold (and to a lesser extent the 1/3-threshold, since this only requires an equal power division

Hence, in the parliamentary regime, if $\alpha < 1/3$, the tax rate will be pushed up to its maximum, i.e., $\tau^P = 1$, and the tax distortion, α, will only have first-order effects for the size of government (by effectively constraining state capacity). If $1/3 \leq \alpha \leq 2/3$, there are multiple equilibria, depending on the intra-governmental Nash game for redistribution and on the shape of $H(.)$, and α will exert either only a first-order effect, via a reduction in state capacity, on the size of government if the equilibrium involves $\tau^P = 1$ and positive redistribution, or both the first-order effect and an additional second-order effect, via reduced levels of redistribution and public goods provision.

The presidential regime contrasts with the parliamentary one in that powers are separated and policy decisions are taken sequentially. In the model, the level of taxation is decided prior to the level and direction of public expenditures. Hence, when deciding on the tax rate, the tax minister, a_τ, (and her junior partner) cannot know with certainty that she will be the direct beneficiary of any residual government revenue. Thus she discounts the expected future equilibrium payoff by the probability that she will be part of the winning coalition at the expenditure stage of the game. In the specific parameterization of the model, all legislators $i \neq a_g$ are in the winning coalition during the expenditure stage of the game (stages 5 and 6 of the presidential game) with a probability of 1/2. Thus, the junior partner at stage 5, m, demands diversion s^m to satisfy $s^m/2 + \delta W \geq v^d$, where $v^d = \frac{1}{2}(1-\alpha)$ and represents the expected payoff in a disequilibrium history with maximized taxes and diversion. Here, $(1-\alpha)$ is the allocation of diversion to the junior partner at the expenditure stage of the game in a disequilibrium history, and 1/2 is the probability that a_τ will be in the winning coalition.[15] W is the equilibrium continuation value, which is an implicit function of the equilibrium tax rate. In equilibrium, incentives must be compatible such that $s^m = \tau(1-\alpha) - \delta W \geq 1 - \alpha - 2\delta W$. The implied tax rate thus satisfies $\tau^C \geq 1 - \frac{1}{1-\alpha}\delta W$. Incentive compatibility requires that the tax rate, τ^C, is set high enough so that the expected utility from complying with the equilibrium weakly exceeds the expected utility from deviating and receiving the out-of-equilibrium payoff.

Turning to the reservation utilities of the voters, a_τ's voters require that the equilibrium tax rate cannot not exceed the incentive-compatible level, since these voters are not residual claimants at the expenditure stage. Consequently, the equilibrium tax rate in the presidential regime type will be (weakly) lower than unity. When the parameterization of the economy implies that the equilibrium entails positive levels of redistribution ($r^c > 0$), the relative importance of distortions on the in- and out-of-equilibrium expected payoffs exactly cancels out (i.e., α decreases the expected payoffs from complying or deviating from the equilibrium path in the exact same

in government) will in general depend on the parametrization of the model, and in a "real world context" it would depend on the exact composition of the government coalition. Intuitively, if the stronger coalition partner would represent more than one-third of the constituencies, this would pull in the direction of a lower threshold, as the government would have incentives to internalize more of the costs of taxation. Similarly, the opposite would be more likely if the stronger coalition partner would represent a fraction smaller than one-third of the constituency.

[15] Note that the total size of government in a disequilibrium history with maximized taxes and diversion will be $3(1-\alpha)$(i.e., the tax rate, 1, times the taxable size of the economy, $(1-\alpha)$, times the three constituencies), and that incentive-compatibility implies that the agenda-setting legislator at the expenditure stage will demand $2(1-\alpha)$.

proportions), such that $\tau^C = 1 - \frac{\delta}{\left(1+\frac{2}{3}\delta\right)}$. The equilibrium tax rate is thus a decreasing function of the discount factor δ (because more patient legislators settle with lower levels of diversion), but independent of the distortions of taxation. The distortionary tax cost α will hence only affect the size of government via its first order effect on state capacity.[16]

Corollary 1 *When $\alpha \leq 2/3$ and the nonnegativity constraint on r is not binding, positive shifts in α will have a stronger negative impact on the size of government if the form of government is parliamentary, as opposed to presidential.*

The above discussion implies that when $\alpha < 1/3$, tax rates in both regime types will be independent of α (in the parameter space with positive levels of redistribution). If $1/3 \leq \alpha \leq 2/3$ there may exist equilibria in the parliamentary regime where the tax rate would be negatively related to α, dependent on the outcome of the intra-governmental Nash game for redistribution. Consequently, because the size of government is larger in the parliamentary regime than in the presidential regime whenever $\alpha \leq 2/3$, the effects of changes in the distortions of taxation on the size of government will be stronger in the parliamentary regime. If the outcome of the Nash game would be that the redistribution is shared equally among the voters of the government coalition, the tax distortions will be internalized with even lower levels of tax costs than $\alpha = 2/3$, which would strengthen the negative effect of α on the size of government in this regime type.

As discussed above, the effects of α are expected to be stronger in the parliamentary system, mainly because the size of government is larger in this regime type without any distortions of taxation, implying that the first-order effect of tax costs on the size of government is larger than in the presidential regime. Additionally, dependent on the Nash outcome on redistribution, the voters in the parliamentary regime might internalize the social costs from tax distortions, which constitutes a second order effect that comes in addition to the first-order effect. However, if the nonnegativity constraint on redistribution in the presidential regime is binding (because citizens have strong preferences for public goods, relative to private consumption), *or* if the combined costs of taxation in the presidential regime are sufficiently high, such that $\frac{1-\delta/3}{2\delta(1-\alpha)} > 1$,[17] the comparative results on the effect of tax distortions on the size of government are indefinite and generally depend on the shape of $H(.)$.

The intuition for this result is that when citizens care strongly enough for public goods, the voters of the tax minister, a_τ, know that the voters of the spending minister, a^g, will prioritize public goods provision over redistribution toward themselves. Hence, those voting for the tax minister have an incentive to raise taxes *above* the level associated with the incentive-compatibility constraint, until the marginal benefit of raising taxes, in terms of an increase in the provision of public goods (which they know will be implemented at the expenditure stage of the game because those voting for the spending minister care equally much about public goods) equals the marginal cost. However, because raising taxes not only increases the distortions of

[16] Note that in the more general case of convex tax costs, as demonstrated in Section 4.4., τ^C will also be a decreasing function of the tax distortions parameter.

[17] An intuition for this expression is provided below, following Proposition 2. The full derivation is provided in the proof of Proposition A2 in the Appendix.

taxation, but also increases the diversionary costs by potentially allowing the legislators to break off from the equilibrium path, the tradeoff between public goods and private consumption will be different than in the parliamentary regime. Generally, the effect of α on the size of government may be both weaker or stronger than in the parliamentary regime. The effect may be weaker because higher tax costs due to higher incentive compatible levels of diversion imply a low equilibrium level of public goods provision. On the other hand, the effect may be stronger due to the combined first-order effects of both sources of tax costs: the diversionary and the distortionary.

In sum, in all equilibria which sustain a positive level of redistribution, the effect of α is expected to be stronger in the parliamentary regime. However, when considering also equilibria in which the nonnegativity constraint on r is binding, the comparative statics of the effect of α on the size of government is inconclusive when $\alpha \leq 2/3$.

4.2 High levels of distortion ($\alpha > 2/3$)

As the level of distortion rises above $\alpha = 2/3$, the incentive to take the distortions into account when determining the tax rate is further strengthened in the parliamentary regime, but less so in the presidential regime.

Proposition 2 *In the equilibrium of the parliamentary regime, if $\alpha > 2/3$, the distortionary costs of taxation are fully internalized and no redistribution will take place. If $\tau^P < 1$, the implied provision of public goods, $H_g^{-1}\left(\frac{1}{3(1-\alpha)}\right)$, equals the social optimum.*

In the parliamentary regime, the allocation of residual government revenues between the constituencies of the coalition government is determined in a multiple equilibria Nash game. When $\alpha > 2/3$, an outcome involving redistribution cannot be sustained as an equilibrium outcome. To see this, consider the subgame that follows a government crisis.[18] If $\alpha > 2/3$, it follows (see Proposition A3 in the Appendix) that the reservation utilities for any voter i is given by $H(g') - g' - \frac{3(1-\alpha)(1-\delta)}{1-\delta/3}$, which involves no redistribution and a level of public goods provision equal to $g^P = \min\left[H_g^{-1}\left(\frac{1}{3(1-\alpha)}\right), \frac{2\delta(1-\alpha)}{1-\delta/3}\right]$. In this expression, $\frac{2\delta(1-\alpha)}{1-\delta/3}$ is a corner solution for the provision of public goods in the case where the optimal provision of public goods is financially unattainable. Any policy proposal in the parliamentary regime involving redistribution to the constituencies of one or both of the government partners when the distortions exceed the threshold $\alpha > 2/3$, would be vetoed by the coalition member(s) whose voters benefit the least from the redistribution.

Given that the equilibrium tax rate is less than one, the equilibrium level of public goods provision, $H_g^{-1}\left(\frac{1}{3(1-\alpha)}\right)$, equals the social optimum. Here, $\frac{1}{3(1-\alpha)}$ is the social cost of providing one unit of public goods, which is increasing in the level of distortions, α. When $\alpha > 2/3$, this cost coincides with the costs of a marginal increase in the provision of public goods as perceived

[18] Although the mechanics and intuition are slightly different, the equilibrium policy vector of the parliamentary regime and a simple legislature (with just one single agenda setter) is identical when $\alpha > 2/3$ (see the Appendix for details).

by each member of the government coalition. Thus, the parliamentary equilibrium implies that tax distortions, when sufficiently high, are fully internalized.

In the presidential regime, on the other hand, the distortions from taxation are only partially internalized. In particular, the marginal cost of public goods provision, as perceived by the voters of the tax minister, a_τ, is given by $\frac{1-\delta/3}{2\delta(1-\alpha)}$, which is found by substituting the incentive-compatibility condition into the government budget constraint, solving for the tax rate, and differentiating with respect to the level of public goods provision.[19] This expression reflects the fact that the voters of a_τ also take into account the diversionary costs of taxation (which depend on δ), but only partially internalize the tax distortion as $\frac{1-\delta/3}{2\delta(1-\alpha)} > \frac{1}{3(1-\alpha)}$. Yet because the incentive-compatibility condition constitutes a lower bound for the level of taxation, the optimal level of public goods provision as perceived by those voting for legislator a_τ , $H_g^{-1}\left(\frac{1-\delta/3}{2\delta(1-\alpha)}\right)$, may not be feasible in equilibrium. Consider the problem of legislator a_τ and her voters: if citizens have relatively weak preferences for public goods (such that $r^C > 0$ in equilibrium), the voters of a_τ prefer a low tax rate but will be forced to implement the minimum tax rate implied by the incentive-compatibility condition. The implied tax rate will, as argued above in the discussion following Proposition 1 (and as derived in the Appendix under Proposition A2), be completely independent of the level of tax distortions. Moreover, given the incentive-compatible tax rate, it is up to legislator a_g and her voters to determine the level of public goods provision by trading off the benefits from public goods provision against benefits from redistribution towards her own constituents—since, at this stage of the game, the tax rate has already been determined, a_g and her voters have no incentive to take into account the tax distortion. The separation of powers in the presidential regime thus leads to an incomplete internalization of the distortionary costs of taxation, and the tax distortions have only first-order effects for the size of government.

Note however that, whenever the marginal tax costs, as perceived by the voters of legislator a_τ, exceed the threshold $\frac{1-\delta/3}{2\delta(1-\alpha)} > 1$, *and* citizens have sufficiently strong preferences for public goods (such that $r^C = 0$), the distortionary costs of taxation are partially internalized also in the presidential regime. Yet, as will be shown below, the internalization of the tax distortions is still weaker than in the parliamentary regime, implying that the equilibrium size of government can be higher in the presidential than in the parliamentary system.

4.3 Comparative analysis of the size of government

The above discussion implies that the incentive to internalize the distortionary costs of taxation critically depends on the form of government. Two clear cases emerge. First, when the level of tax distortions is "low" ($\alpha \leq 2/3$) and the nonnegativity constraint on r is not binding, the equilibrium tax rates in both regime types are (for different reasons) insensitive to the level of distortions. However, because the equilibrium level of taxation is higher in the parliamentary regime, the overall effect of the tax distortions on the size of government, via state capacity,

[19] The full derivation is provided in the proof of Proposition A2 in the Appendix.

is stronger in the parliamentary regime. If the nonnegativity constraint on r is binding, the comparative effects of the tax distortions are shown to be indecisive.

Second, if tax distortions are "high" ($\alpha > 2/3$), the distortions are fully internalized in the determination of the equilibrium tax rate in the parliamentary regime. In the presidential regime, the tax distortions are only internalized in the special case when there is no redistribution in equilibrium. Hence, economic distortions have stronger effects for the equilibrium tax rate in the parliamentary regime, and the distortions are even fully internalized when the level of distortion is sufficiently high ($\alpha > 2/3$).

As a consequence of the differences in incentives between the two regimes to internalize the distortionary costs of taxation in policymaking, the main insight from Persson et al. (2000)—that the size of government is smaller with a presidential than with a parliamentary form of government—is no longer generally valid. The conditions for this result to break down are summarized in the following proposition.

Proposition 3 *When $\alpha > 2/3$, $\delta > 3/7$, and the nonnegativity constraint on r is not binding, the size of government in the equilibrium of the parliamentary regime is smaller than the size of government in the presidential regime.*

Proof. Consider the equilibrium tax rates in the two regime types (as discussed above, and precisely defined in Propositions A2 and A3 in the Appendix). When $\alpha > 2/3$ and the nonnegativity constraint on r in the equilibrium of the presidential regime is not binding, the difference between the size of government in the presidential and the parliamentary regime is given by

$$3\tau^C - 3\tau^P = 3\left[1 - \frac{\delta}{1+2\delta/3} - \frac{1-\delta}{1-\delta/3} - \frac{1}{3\left(1-\alpha\right)} H_g^{-1}\left(\frac{1}{3\left(1-\alpha\right)}\right)\right],$$

where $3\tau^C$ and $3\tau^P$ are the total amount of tax revenues from the three constituencies in the two regimes. If the preference structure is such that the equilibrium provision of public goods is sufficiently low, $H_g^{-1}\left(\frac{1}{3(1-\alpha)}\right) \longrightarrow 0$, then $\delta \in (3/7, 1)$ is a necessary and sufficient condition for $\left(\tau^C - \tau^P\right)$ to be positive. ■

Note that if, more realistically, $H_g^{-1}\left(\frac{1}{3(1-\alpha)}\right) > 0$, $\delta \in (3/7, 1)$ is a necessary, but not a sufficient, condition for $\left(\tau^C - \tau^P\right)$ to be positive. In this latter case, an even more restrictive condition on δ, depending on the shape of $H\left(g\right)$, is required to get $\tau^C > \tau^P$.

In other words, when there are high inefficiencies from taxation, legislators are patient, and citizens attach a sufficiently low value to the consumption of public goods relative to private goods, the size of government will be larger in the presidential regime than in the parliamentary regime.

The intuition behind this result is that the *perceived* relative price of redistributionary policies is lower in the presidential regime than in the parliamentary regime: when a_g decides on g^C and r^C, the only cost of redistribution is the opportunity cost of public goods consumption. The coalition government of the parliamentary regime, however, decides on the entire policy vector

simultaneously, and thus provides its voters with stronger incentives to internalize the distortions of taxation. In particular, when $\alpha > 2/3$, the marginal costs of redistribution, as perceived by the government's voters, are higher than the marginal benefits, providing the voters with strong incentives to abstain from levying taxes for the pure purpose of redistribution.

Intuitively, even if the economic conditions are such that the equilibrium levels of redistribution and public goods provision will be higher in the presidential regime (i.e., with a high level of tax distortion, relatively weak preferences for public relative to private goods, and relatively patient legislators), it is still the case that the level of diversion, due to the underlying threat of a government crisis, will be higher in the parliamentary regime. It is hence not trivial that the equilibrium tax rate should be higher in the presidential regime than in the parliamentary regime. To see why this is still the case, recall that when a_τ sets the tax rate, she takes into account that the probability of her becoming a member of the winning coalition at the public expenditures stage of the game is less than one. Since the legislators discount their expected future payoffs with the probability of being in the winning coalition, taxes must be set higher in the presidential regime than in the parliamentary regime for incentive compatibility to hold, so that the legislators are willing to go along with the equilibrium.

4.4 Extension: convex tax costs

The theoretical analysis above assumed that the tax cost function, $c(\alpha, \tau)$, was linear in the tax rate, and, more specifically, that $c(\alpha, \tau) = \alpha\tau$. In reality, tax distortions may be nonlinear, and are often assumed to be convex in the tax rate (or, alternatively, in the overall level of taxation). Allowing for convexity makes the analytical derivations less tractable; however, the main insights and results do not change. In the following extension, we substitute the baseline specification of the tax costs with a convex function, such that now $c(\alpha, \tau) = \alpha\tau^2$. Apart from this modification, the model, the equilibrium definition, and the procedure to solve for the respective equilibria, are all the same as before.

First, consider the equilibrium of the parliamentary regime. The voters of the parliamentary government demand taxes be raised up to the point where the marginal redistributional benefit from taxation equates the marginal cost via the tax bill. When the distortionary costs of taxation were linear, the marginal tax costs could not be reduced by lowering the tax rate, which resulted in a discrete jump in the tax rate from one to the minimum incentive compatible tax rate when the marginal tax cost, α, exceeded the tax cost threshold. If tax costs are convex, however, the marginal costs from tax distortions, $c' \equiv \frac{dc(\alpha,\tau)}{d\tau} = 2\alpha\tau$, will be an increasing function of the equilibrium tax rates. Without loss of generality and to facilitate comparison with the linear case, assume for now that $\alpha \in [0, 1)$ as in the case of linear distortions.[20] In contrast to the case with linear tax costs, the equilibrium tax rate will now move continuously, rather than jump discontinuously, towards the minimum incentive compatible rate as the marginal distortions of taxation increase.

[20] This assumption can easily be relaxed without qualitatively affecting the results.

The revenue-maximizing tax rate associated with the quadratic tax cost function is $\tau = \min\left[1, \frac{1}{2\alpha}\right]$, which, by the same techniques as before, implies an incentive compatible level of diversion $s^P = \min\left[\frac{3(1-\delta)}{2(1-\delta/3)}, \frac{3(1-\delta)}{4\alpha(1-\delta/3)}\right]$.[21] The equilibrium level of diversion s^P is, as in the linear case, decreasing in both α and δ. The value of s^P constitutes a lower bound for the size of government in the parliamentary system. Define the minimum equilibrium tax rate, $\underline{\tau^P}$, as the one that exactly finances s^P; $\underline{\tau^P}$ is then implicitly defined by $3\underline{\tau^P}\left(1-\alpha\underline{\tau^P}\right) = \min\left[\frac{3(1-\delta)}{2(1-\delta/3)}, \frac{3(1-\delta)}{4\alpha(1-\delta/3)}\right]$. Consequently, $\underline{\tau^P}$ solves

$$\underline{\tau^P}\left(1-\alpha\underline{\tau^P}\right) = \min\left[\frac{1-\delta}{2\left(1-\delta/3\right)}, \frac{1-\delta}{4\alpha\left(1-\delta/3\right)}\right]. \tag{7}$$

As with linear distortions, the voters of a strong coalition partner will demand redistribution to cease if the marginal distortionary tax cost exceeds a threshold level such that $c' > c'^*$, where $c'^* \in [1/3,\ 2/3]$ depends on the intra-governmental bargaining outcome, as before. Note that c'^* is associated with a specific tax rate $\tau^* \equiv \frac{c'^*}{2\alpha}$. Thus, there exist two bounds, an upper and a lower, for the tax rate threshold τ^*, where the upper bound is defined as $\overline{\tau} \equiv \frac{1}{3\alpha}$, and the lower bound is defined as $\underline{\tau} \equiv \frac{1}{6\alpha}$. Hence, as before there exist multiple equilibria depending on the outcome of the Nash bargaining game over redistribution. If the threshold is not binding, meaning $\tau^* < \underline{\tau^P}$, and at the same time $H_g^{-1}(\bullet) \longrightarrow 0$, then $\tau^P \longrightarrow \underline{\tau^P}$. If the threshold is binding, such that $\tau^* > \underline{\tau^P}$, then $\tau^P = \tau^*$, implying that $\tau^P \geq \underline{\tau^P}$.

Turning to the presidential equilibrium, and using the same procedure to solve for the equilibrium policy vector, the equilibrium tax rate is the one that solves

$$\tau^C\left(1-\alpha\tau^C\right) = \min\left[\frac{1-\delta/3}{2\left(1+2\delta/3\right)}, \frac{1-\delta/3}{4\alpha\left(1+2\delta/3\right)}\right]. \tag{8}$$

The equilibrium tax differential between the two regime types, under the assumption that $H_g^{-1}(\bullet) \longrightarrow 0$, is now given by

$$\begin{aligned} \tau^C - \underline{\tau^P} \quad = \quad & \frac{1}{(1-\alpha\tau^C)}\left\{\min\left[\frac{1-\delta/3}{2\left(1+2\delta/3\right)}, \frac{1-\delta/3}{4\alpha\left(1+2\delta/3\right)}\right]\right\} \\ & -\frac{1}{(1-\alpha\underline{\tau^P})}\left\{\min\left[\frac{1-\delta}{2\left(1-\delta/3\right)}, \frac{1-\delta}{4\alpha\left(1-\delta/3\right)}\right]\right\}, \end{aligned}$$

where τ^C solves (8) and $\underline{\tau^P}$ solves (7). Due to the complex nature of the nonlinearities in (7) and (8), the conditions for the size of government to be larger in the presidential than in the parliamentary regime cannot be evaluated analytically. A graphical evaluation is, however, available, as shown in figures 1–3.[22] In figures 1–3, the solid, thin curve represents the presidential tax rate, τ^C, and the solid, thick curve is the minimum size of the parliamentary tax rate, $\underline{\tau^P}$.

[21] Note that the tax rate can never exceed one; hence the upper bound on s^P is implicitly defined by $\frac{1}{2\alpha} = 1 \Longleftrightarrow \alpha = 0.5$.

[22] The figures are produced using the mathematical software in Scientific WorkPlace, version 5.50, MacKichan Software, Inc.

Note that only the lower set of solid curves can constitute an equilibrium: The higher curves, involving a higher level of taxation for any given vector (α, δ) in both regimes types can never be consistent with the reservation utilities of the respective voters, since the voters would always demand the lowest possible tax rate that is consistent with the incentive-compatibility constraints of their respective legislators (and also with the preferred provision of public goods and level of redistribution). Furthermore, the upper dashed line in the figures is the 2/3 threshold, $\overline{\tau}$, and lower dashed line is the 1/3 threshold, $\underline{\tau}$. Thus, τ^* is somewhere in the interval between the $\overline{\tau}$- and the $\underline{\tau}$ curves, and the exact location follows from the intra-governmental Nash bargaining in the parliamentary regime.

In figures 1, 2, and 3, δ is (arbitrarily) set to 0.1, 0.6, and 0.8, respectively, to illustrate three qualitatively different sets of equilibria. It can be verified from the figures that the more myopic politicians are (i.e., the lower is δ), the higher are the equilibrium tax rates. Moreover, the curves confirm that in the range where the tax costs represent a constraint on the revenue-maximizing tax rate (i.e., when $\alpha > 0.5$), the equilibrium tax rates are falling in the tax cost parameter α throughout. To the left of this point (i.e., when $\alpha \leq 0.5$), however, the revenue maximizing tax rate is equal to one *independent* of the value of α. Hence, in this interval, the equilibrium tax rates must be increasing in the level of distortion for the government revenues to be high enough to satisfy the incentive-compatibility constraint. The curves of τ^C and $\underline{\tau^P}$ are thus characterized by a peak at the point where, in an out-of-equilibrium history, government revenues are just maximized by setting the tax rate equal to one (i.e., moving to the right of this point, revenue-maximization implies a tax rate strictly lower than one due to the convexity of the tax distortions).

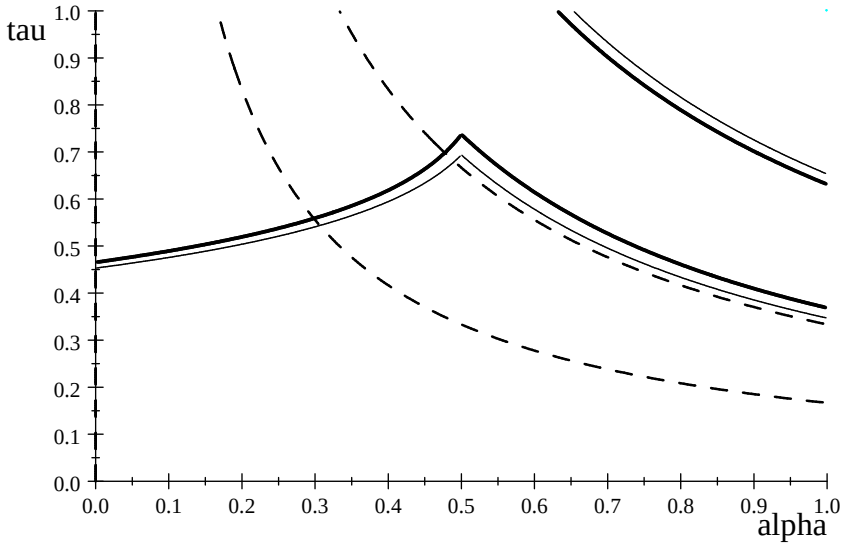

Figure 1. Equilibrium tax rates for δ=0.1. The thick, solid line is the $\underline{\tau^P}$-curve, the thin, solid line is the τ^C-curve, and the upper and lower dashed lines are the 2/3 and the 1/3 thresholds, respectively.

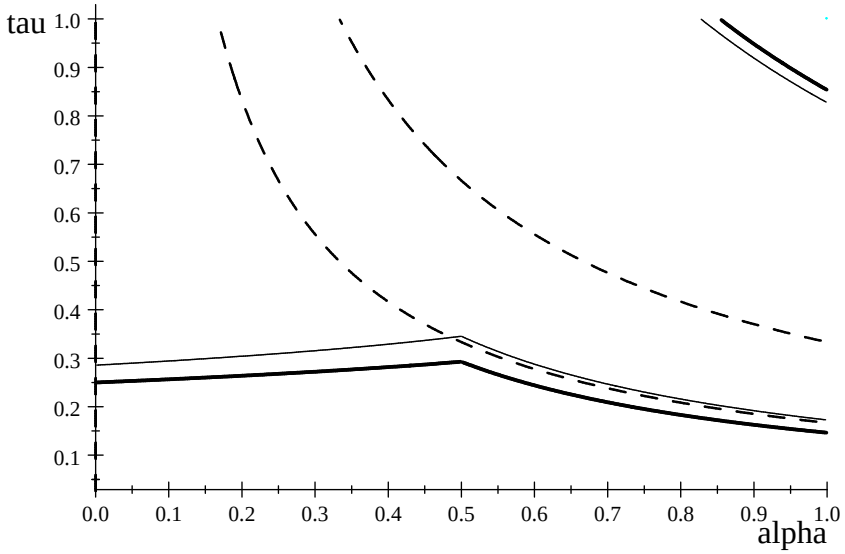

Figure 2. Equilibrium tax rates for δ=0.6. The thick, solid line is the $\underline{\tau^P}$-curve, the thin, solid line is the τ^C-curve, and the upper and lower dashed lines are the 2/3 and the 1/3 thresholds, respectively.

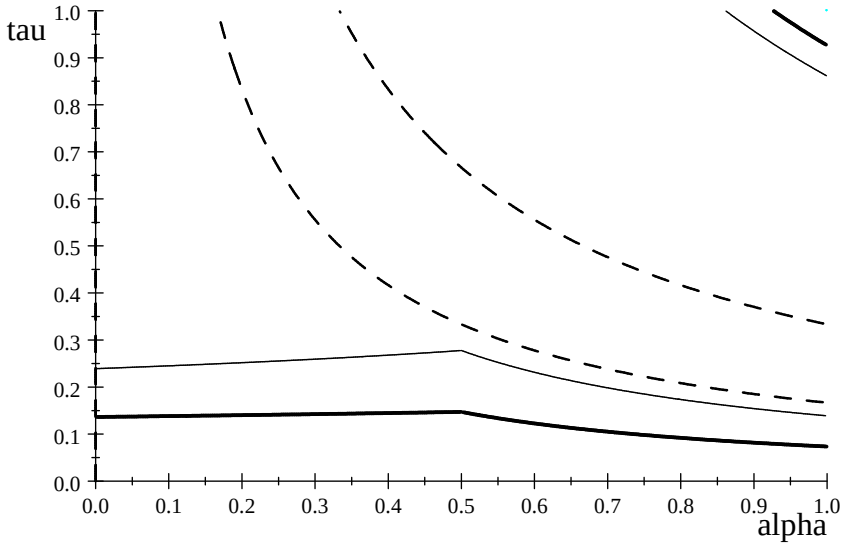

Figure 3. Equilibrium tax rates for δ=0.8. The thick, solid line is the $\underline{\tau^P}$-curve, the thin, solid line is the τ^C-curve, and the upper and lower dashed lines are the 2/3 and the 1/3 thresholds, respectively.

Figures 1–3 demonstrate (at least) three qualitatively different sets of equilibria, dependent on the value of the parameter δ:

1. $\tau^C < \underline{\tau^P} < \underline{\tau}$ when the value of α is lower than the intersection between the $\underline{\tau^P}$-curve and the $\underline{\tau}$ curve; otherwise $\underline{\tau} < \tau^C < \underline{\tau^P}$.

2. $\underline{\tau^P} < \tau^C < \underline{\tau}$ when the value of α is lower than the intersection between the $\underline{\tau^C}$-curve and the $\underline{\tau}$ curve, otherwise $\underline{\tau^P} < \underline{\tau} < \tau^C$.

3. $\underline{\tau^P} < \tau^C < \underline{\tau}\ \forall\ \alpha$.

In the first set of equilibria, as seen in Figure 1, the equilibria in the parliamentary regime where $\tau^* < \underline{\tau^P}$ imply that the equilibrium tax rate is set just so that it finances the incentive compatible level of diversion and the socially optimal level of public goods. The size of government is then unambiguously larger with a parliamentary rather than with a presidential form of government (in the figure, $\tau^C < \underline{\tau^P}$). The equilibria where $\tau^* > \underline{\tau^P}$ entail positive levels of redistribution, hence the distance between the equilibrium size of government in the two regimes, $\left(\tau^P - \tau^C\right)$, is even larger.

In the second set of equilibria, as illustrated in Figure 2, it can (but need not), be the case that the equilibrium size of government is smaller in the parliamentary regime, i.e., that $\tau^P < \tau^C$ (since, in the figure, $\underline{\tau^P} < \underline{\tau}$).[23] In particular, this can be an equilibrium outcome for higher values of α (i.e., $\alpha \gtrsim 0.5$), but not for lower (meaning to the left of the intersection between the thick, solid line and the dashed $\underline{\tau}$-curve). Note that in the region where $\underline{\tau^P} < \underline{\tau}$, the parliamentary equilibrium can—depending on the whether the nonnegativity condition on redistribution is binding (which, in turn, depends on the preferences for public goods)—involve both a positive level of public goods provision and a positive level of redistribution, even when $\tau^P < \tau^C$.

Finally, in the third set of equilibria, as illustrated in Figure 3, the minimum size of government in the parliamentary regime is smaller than in the presidential equilibrium. However, because $\underline{\tau} > \tau^C$, the equilibrium level of redistribution and/or public goods provision will be so high in the parliamentary regime that, in equilibrium, $\tau^P > \tau^C$.

In sum, the main result from employing a convex tax cost function confirms the main result from the baseline analysis with linear tax costs—in either case, and in contrary to the case without distortions (i.e., with $c(\tau) = 0$), there exist equilibria in which either of the regime types produces a smaller (or larger) size of government. However, while in the case of linear distortions the parliamentary regime was more likely to produce a smaller size of government only when the marginal costs of taxation were high and when politicians were not myopic, with convex costs the parliamentary regime can be smaller only with intermediate levels of political myopia (in particular, if $0.41 \lesssim \delta \lesssim 0.63$): If there is a higher degree of myopia, the size of government is relatively larger in the parliamentary system because politicians demand higher levels of diversion, compared to the presidential system, in order to stay on the equilibrium path; if there is a lower degree of myopia, on the other hand, the equilibrium tax rates and levels of distortion are so low that the parliamentary equilibrium entails relatively much higher levels of redistribution (and/or public goods provision if the nonnegativity constraint on redistribution is binding). With intermediate levels of myopia, however, as illustrated in Figure 2, the equi-

[23] The specific condition for this is $\tau^* < \tau^C$.

librium minimum incentive-compatible tax rate in the parliamentary regime will be lower than the equilibrium tax rate in the presidential regime, but high enough for redistribution to be shut down if the government is characterized by relatively equally powerful coalition partners (i.e., if τ^* is relatively close to $\frac{1}{6\alpha}$).

5 Some evidence and discussion

5.1 OECD panel data evidence

One of the theory's main predictions is that the size of government should be more responsive to the distortionary effects of taxation if the form of government is parliamentary as opposed to presidential. Consequently, indicators of tax distortion are expected to exert a negative impact on the size of government in parliamentary regimes, but less so in presidential regimes.

Several proxies are suggested in the literature as indicators for the level of distortions from taxation. Many of these are available only for a small cross-section countries (mostly subsamples of OECD countries).[24] One available proxy for tax efficiency for which there is sufficient variation over time, however, is the marginal tax wedges on wage earnings in the OECD, i.e., the difference between labor costs to the employer and the net take-home pay of the employee, including any cash benefits from government welfare programs.[25] This variable is available for a panel of 30 OECD countries during the period from 2000 to 2008.

The government can be expected to pay attention to behavioral responses in the economy associated with changes in the tax wedge, and to respond accordingly. As an increase in the marginal tax wedge for a given average tax rate will be associated with a higher level of economic distortions from taxation, an optimal response would, ceteris paribus, be to decrease the size of government. As the tax-wedge variable is a complex and composite outcome measure, it is likely to be observed with a time lag.

To estimate the association between the level of tax distortion, proxied by an indicator of the marginal tax wedge, on the (contemporaneous) size of government, the following empirical model was employed,

$$TAXGDP_{it} = \eta_i + \sum_{j=0}^{1} \alpha_j WEDGE_{it-j} + PRES * WEDGE_{it-1}\boldsymbol{\beta} + \mathbf{X}'_{it}\boldsymbol{\gamma} + \delta Z_t + u_{it}, \quad (9)$$

where $TAXGDP_{it}$ is the total tax revenue as percentage of GDP,[26] $WEDGE_{it-j}$ is the marginal

[24] Becker and Mulligan (2003) provide an overview of the different proxies for tax efficiency that have been proposed in the literature. These include agricultural dependence (Becker and Mulligan 1998), "modernization" (Peltzman 1980), "corporatism" (Summers et al. 1993; Alesina and Perotti 1997), and population and per capita income (Easterly and Rebelo 1993). In addition, Becker and Mulligan (2003) suggest using the revenue raised by social security, payroll, and sales taxes, as a ratio to other tax revenue; and the ratio of the "economy-wide" average individual income tax rate to the top statutory individual income tax.

[25] The variable is collected from the OECD dataset Taxing Wages: <http://www.oecd-ilibrary.org/taxation/data/oecd-tax-statistics_tax-data-en>.

[26] The $TAXGDP_{it}$-variable is the "Revenue, excluding grants"-variable from the World Development Indicators,

tax wedge in the two periods t and $t-1$, $PRES * WEDGE_{it-1}$ is an interaction term between the presidential indicator and the one-year lagged tax wedge indicator, and $\mathbf{X}'_{it}$ is the transpose of the vector of control variables.[27] Furthermore, Z_t is a time indicator, and u_{it} is an error term assumed to be i.i.d.. The vector of constitutional indicators contains dummy variables for the constitutional features of the form of government (presidential regimes: $PRES = 1$; parliamentary regimes: $PRES = 0$) and the electoral system (majoritarian systems: $MAJ = 1$; proportional systems: $MAJ = 0$).[28]

Table 1 shows the results from using model (1) to estimate the relationship between the tax wedge and the size of government. The first three columns (columns (1)–(3)) display the between estimates, that is the cross-section estimates resulting from averaging the variables within the countries, while the latter five columns (columns (4)–(8)) display country fixed effects estimates. Furthermore, a trend term is included in columns (6)–(8), while columns (7) and (8) also include time fixed effects.

Reading Table 1 from left to right, a first observation is that the regression results indicate that in the pure cross-section (i.e., in the between estimates) both the tax wedge and the average income tax rate are positively associated with the size of government. This is not surprising, as average and marginal tax rates are likely to be correlated. However, controlling for the level of income, trade openness, and demographic composition, the (contemporaneous) tax wedge variable is no longer significant, indicating that this variable correlates with the controls, and in particular with the share of elderly in the population ($PROP65$). Adding the constitutional dummies, there is further indication that the (contemporaneous) tax wedge is not a statistically significant determinant of the size of government, while the results on the constitutional features correspond well with the existing findings in the literature: presidential forms of government

and measures the central government revenue, excluding grants, as % of GDP. While having a federal structure may affect the incentives of the central government and hence policy outcomes, there are several reasons for focusing on the size of the central, rather than the general, government in the current context. First, the theory abstracts from the interplay between different levels of government, and addresses the incentives implicit in the central government's legislative process. Second, the related empirical literature has focused on the central level of government, hence, doing the same here facilitates comparison with this literature. Third, panel data on central government revenues and expenditures is both more reliable and available than general government data, and general government expenditures and revenues are often not comparable across countries and over time. Persson and Tabellini (2003: 37–38), who discuss this issue much more in detail, report a very high (about 0.9) correlation coefficient between the size of the central and general government, and also find that centralization of spending (measured as the ratio between central and general government spending) is not correlated with the form of government.

[27] The control variables are those that have been found to be most closely correlated with the size of governments across countries (see Persson and Tabellini 2003), and include: the level of per capita income (measured in purchasing power parities), openness (approximated by a trade-in-GDP variable, measuring the value of exports and import as a percent of GDP), and demographic composition (i.e., the share of the population between 15 and 64 years of age, and the share above 64 years). Data on per capita income and the share of trade in GDP is from the OECD: <http://www.oecd-ilibrary.org/>, while the demographic variables are from the WDI (World Bank): <http://data.worldbank.org/data-catalog/world-development-indicators>.

[28] The constitutional classification is adopted from Persson and Tabellini (2003), and classifies presidential [Presidential = 1] only as regimes in which the confidence of the legislative assembly is not necessary for the executive to stay in power (even if an elected president is not chief executive, or even if there is no elected president. Majoritarian regimes [Majoritarian = 1] are those in which all the members of the lower house in a country are elected under plurality rule. See Persson and Tabellini (2003) for further details about the classification and sources.

Table 1: Tax Wedges and the Size of Government in OECD, 2000 to 2008: BE and FE-estimates.

Est. method	BE	BE	BE	FE	FE	FE	FE[1]	FE[1]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$WEDGE$	0.31	0.18	0.09	0.02	0.02	0.02	0.03	0.02
	(0.08)**	(0.11)	(0.12)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
$AV.INC.TAX$	0.46	0.43	0.42	0.15	0.14	0.13	0.11	0.15
	(0.13)**	(0.14)**	(0.15)**	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)*
$PRES$			-3.96					
			(2.79)					
MAJ			-2.31					
			(2.23)					
$L.WEDGE$				-0.01	-0.05	-0.04	-0.05	-0.05
				(0.02)	(0.03)	(0.03)	(0.03)*	(0.03)*
$L.WEDGE\_PRES$					0.16	0.15	0.15	0.17
					(0.08)*	(0.08)	(0.08)	(0.08)*
$L.WEDGE\_MAJ$					0.11	0.11	0.10	0.09
					(0.05)*	(0.05)*	(0.05)*	(0.05)
$INCOME/CAPITA$		0.02	0.02					-0.05
		(0.02)	(0.02)					(0.02)**
$TRADE/GDP$		0.02	0.02					-0.03
		(0.03)	(0.03)					(0.01)**
$PROP1564$		0.01	-0.08					0.20
		(0.49)	(0.49)					(0.22)
$PROP65$		0.61	0.64					0.23
		(0.32)*	(0.32)*					(0.32)
$Time$	-	-	-	No	No	Yes	Yes	Yes
# Observations	266	266	266	236	236	236	236	236
# Countries	30	30	30	30	30	30	30	30
R^2	0.69	0.75	0.78	0.02	0.07	0.07	0.14	0.21

Note: BE and FE are the between and the fixed effects estimators, where superscript "1" indicates that year fixed effects are included. Standard errors in parentheses. * and ** indicate statistical significance at 5% and 1%, respectively. In the BE-regressions, the R-squared statistic refers to the between variation, while it refers to the within variation in the FE-regressions.

and majoritarian systems are both negatively correlated with the size of government (albeit not statistically significant in this small cross-section of countries). As expected, the average income tax rate is positively correlated with the level of government tax revenues (statistically significant at the 1% level).

It was argued above that tax wedges are likely to affect policy with a lag, due to informational delays in the policymaking process. The regressions in columns (4) through (8) exploit the panel's time dimension to investigate this hypothesis. Note that all five of these regressions employ country fixed effects, hence any potential time-invariant idiosyncrasies associated with the size of government should be accounted for. As a consequence, as the constitutional dummies are time-invariant within the present sample of countries and years, these are absorbed in the country fixed effects and are hence not included as separate regressors in the specifications.

Column (4) is a first take on estimating the effect of the one-year lagged tax wedge variable, and the results suggest that the effect is negative, as expected, but not statistically significant at any conventional level of significance. Moreover, regression (4) has only limited explanatory power, as it is capable of explaining no more than 2% of the total within-country variation in the size of government tax receipts (as indicated by the R^2-statistic).

In Column (5), the tax wedge variable interacts with the dummy for a presidential form of government. In addition, a dummy for the electoral system is also included. The results reported in Column (5) suggest that constitutional features indeed appear to be significant determinants. For the default category, which are the countries with a parliamentary form of government and a proportional electoral system, the lagged tax wedge variable is associated with a negative effect, significant at the 10 % level of significance. The point estimate, -0.05, implies that a 10-percentage point increase in the marginal tax wedge leads to a reduction in the size of government of about 0.5 percentage points in the following year. This result can be interpreted as an indication that countries with a parliamentary form of government and a proportional electoral rule to a larger extent internalize the deadweight losses associated with high marginal tax wedges. Examining the result in Column (4) on the effect of a presidential form of government, the estimate suggests that the effect of the marginal tax wedge on the size of government is positive ($-0.05 + 0.16 = 0.11$). This latter effect, however, is not robust, as it critically hinges on the inclusion of the electoral rule that is not included in the specification (this regression not displayed in the table). Similarly, the point estimate of the interaction between the majoritarian dummy and the tax wedge variable also suggests the majoritarian systems are less responsive to tax costs than the parliamentary-proportional systems.

In Columns (5) through (8), the robustness of the constitutional effects are investigated further: first, by adding a trend variable to account for common trends in fiscal policy; second, by adding year fixed effects to make sure that the effects are not driven by any single year specific shocks, and; third, by adding the whole battery of controls. The results suggest that the constitutional effects, and in particular the effects associated with the form of government, are robust to these specifications. The constitutional effects are significant at the 5-% level of significance, and their contribution in the regressions is to increase the overall explanatory power (as indicated by the R^2-statistic) of the model by some 5%, going from 2% to 7%. In the full specification (Column (8)), the constitutional effects accounts for some 20% of the explained variation, as these increase the R^2 from 17 to 21 (regression not displayed). For comparison, this contribution is stronger than the contribution of any of the groups of control variables: per capita income, trade, and the demography variables. Decomposing the constitutional effects, the form of government contributes to the explanatory power of the model by some 3% of the total variation in the full specification, while the contribution of the electoral system is some 2%. The evidence is hence suggestive that out of the two constitutional variables, the form of government can potentially explain more of the total variation in the effect of the lagged tax wedge indicator on the size of government tax revenues across countries than can any of the

other included regressors.

5.2 Cross-country patterns in the growth and variability of the size of government

Reviewing the literature, it appears: (1) that the growth in the size of government indeed has been much stronger in countries with a parliamentary form of government (Persson and Tabellini 2003; Becker and Mulligan 2003); and, (2) that taxation has become more efficient over time.[29] The former pattern is illustrated in Figure 1, plotting the size of government in eight parliamentary and seven presidential countries between 1960 and 1998.[30] Observation (1), given the robustness of (2), is consistent with the notion that the size of government in parliamentary regimes is more responsive to changes in the distortions from taxation than in presidential regimes, under the assumption that the tax distortions are not systematically associated with the form of government. The possibility that distortions of taxation could be systematically correlated with the form of government can be investigated empirically by considering the distribution of top statutory marginal tax rates across regime types. The data is indicative that this does not seem to be the case.[31]

[29] Cross-country panels on key indicators of the distortions from taxation are not available in the literature. Less direct measures, however, indicate a decline over time (as suggested by Becker and Mulligan 2003). One reason why taxation has become more efficient is the increased use of the value-added tax (VAT), which constitute: "more or less flat taxes that raise government revenue more efficiently (Becker and Mulligan 2003, p. 304)". Additionally, technological constraints are negatively correlated with development, which has a positive trend in most developed countries (Peltzman 1980). Although cross-country panels on tax distortions are scarce in supply, extensive research has been done on U.S. data to construct long time series on comprehensive marginal tax rates. Within the time range in the present paper (1960–1998), there is evidence of a decrease in the average marginal effective income tax rate after 1981, and in the average marginal Social Security tax rate after 1978 (Stephenson 1998). Moreover, the average marginal tax rates were between 1 and 2 percentage points higher in 1960 than in 1994. In sum, the evidence in the literature is not conclusive, but there seems to be considerable support for a fall in the distortionary costs of taxation over time.

[30] The sample is based on the panel data in Persson and Tabellini (2003), and consists of all the countries for which there is data available over the whole time period of their panel (1960–98). The eight parliamentary countries in the sample are: Finland, Greece, India, Italy, Malaysia, New Zealand, Sweden, and the United Kingdom. The seven presidential countries are: Chile, Equador, Peru, Philippines, Sri Lanka, the United States, and Venezuela. The reader is referred to Persson and Tabellini (2003) for a more precise definition of the regime classification and data sample.

[31] Tables 5 through 7 in the online appendix <http://www.bi.no/en/Research/Academic-homepage/?ansattid=/a0810301> presents summary statistics on top statutory marginal tax rates across regime types in the period 1960-1998, which is indicative that the two are not robustly correlated. Data on the highest marginal corporate- and individual income taxes are available in the World Bank's WDI database, albeit not earlier than 1998.

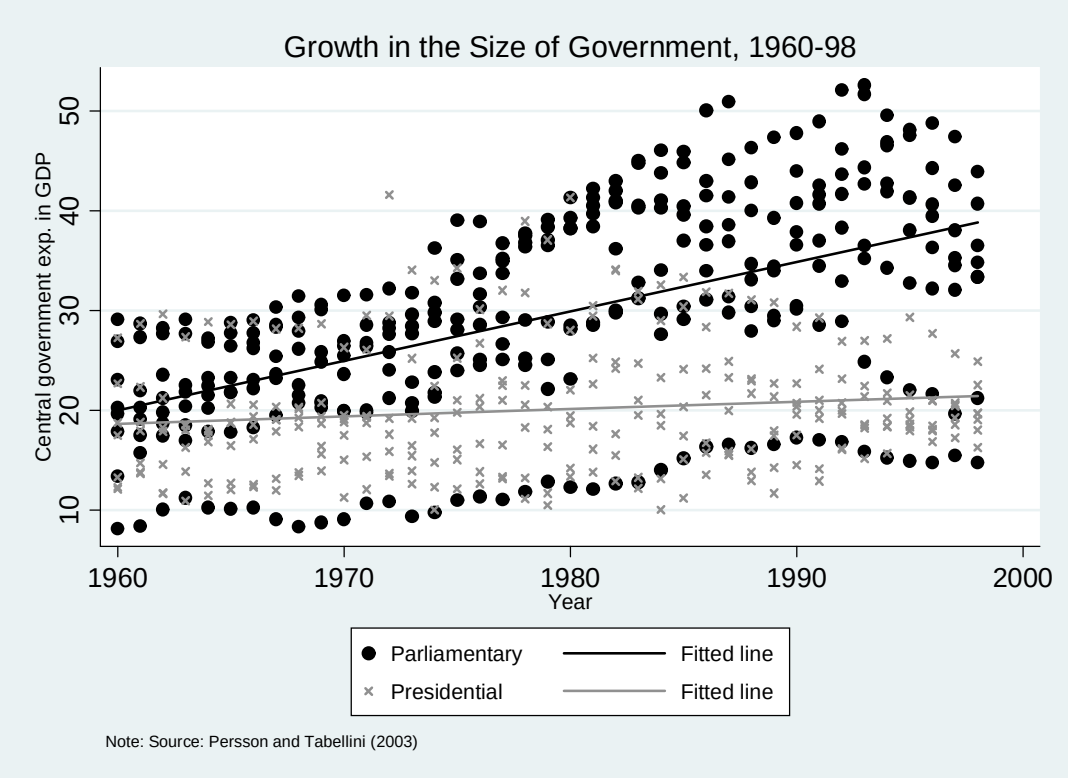

Figure 4

In addition to the indications of the stark differences in the growth of government, Figure 1 is suggestive of a higher variability in the size of government among the parliamentary than among the presidential systems. The statistics presented in Table 2 documents the patterns seen in Figure 1, and shows that the mean percentage growth in the size of government, measured as the ratio of central government expenditures to GDP (*cgexp*), over the period 1960 to 1998 (d6098), was almost five times stronger (63.1% versus 13.0%) in the subsample of parliamentary systems compared with the presidential systems. Moreover, by 1960 the variation in the size of government was already somewhat higher among the parliamentary countries (with a standard deviation of 6.9, versus 5.7 among the presidential countries), and grew to more than three times as high by 1998 (9.7% versus 2.9%).

The upper panel of Table 3 expands the sample to include all the countries for which there exist annual data for either 1960 and 1998, implying the 1960-samples and the 1998-samples have different compositions, while the lower panel (indicated by an asterisk) only includes OECD countries. The total sample size in the upper panel is 19 in 1960 and 46 in 1998, of which about two-thirds are parliamentary countries. The subsample of OECD countries in the lower panel is smaller, with only 10 countries in 1960, and 16 countries in 1998. Note that the United States is

Table 2: Summary statistics for relative size of government on a time-consistent sample.

	Presidential			Parliamentary		
	1960	1998	d6098 (%)	1960	1998	d6098 (%)
Mean *cgexp*	17.7 (7)	20.0 (7)	13.0	19.8 (8)	32.3 (8)	63.1
St.dev. *cgexp*	5.7	2.9		6.9	9.7	

Note: The parentheses indicate sample size.

Table 3: Growth and Variation in the Size of Government in Presidential and Parliamentary Systems.

	Presidential			Parliamentary		
	1960	1998	d6098 (%)	1960	1998	d6098 (%)
Mean *cgexp*	16.8 (8)	20.3 (19)	21.0	21.2 (11)	32.4 (27)	47.4
St.dev. *cgexp*	5.9	**5.4**		7.7	**9.8**	
Mean *cgexp**	17.5 (1)	20.9 (3)	19.5	23.6 (9)	35.3 (15)	49.8
St.dev. *cgexp**		6.8		6.1	6.9	

Note: The parentheses indicate sample size. * indicates that the sample is restricted to include only member countries of the OECD.

the only presidential country in the OECD sample in 1960; in 1998 Mexico and Switzerland are added to the sample of presidential countries. The numbers in Table 3 indicate that the average percentage growth in the size of government (d6098) was more than twice as high in the group of parliamentary countries than in the group of presidential countries. In the group of OECD countries the difference in the growth of government is somewhat larger (49.8% versus 20.9%). The evidence in Table 3 also illustrates large differences in the within-regime variation of the size of government; in 1998, the standard deviation in the size of government was more than 70% larger among the parliamentary countries than among the presidential countries.

The cross-sectional sample of OECD countries is clearly too small to facilitate rigorous statistical inference, even if a precise measure of tax distortion was available. One particular worry is that the two groups of countries differ substantially in their overall quality of institutions and level of democracy. Table 4 addresses this issue by limiting the sample to include only those countries that did not experience nondemocratic episodes in the period between 1960 and 1998.[32] Again the numbers clearly indicate a much stronger growth in the size of government among the parliamentary countries.

In sum, the evidence in Tables 2–4 seems to be consistent with the model's main predictions. The average growth in the size of government, which coincides with indications of an overall increase in the efficiency of taxation, has been much stronger in countries with a parliamentary form of government as opposed to a presidential form of government. Moreover, the relatively higher variability in the size of governments among the parliamentary countries suggests that

[32] Nondemocratic episodes here refer to years in which the Polity IV-score is negative (Marshall and Jaggers 2009).

Table 4: Growth and Variation in the Size of Government: Strictly Democratic Sample.

	Presidential countries			Parliamentary countries		
	1970	1998	d7098	1970	1998	d7098
Mean *cgexp*	19.5 (4)	21.6 (4)	10.7	26.4 (13)	35.3 (13)	33.7
St.dev. *cgexp*	5.2	2.5		2.4	11.1	

Note: The parentheses indicate sample size.

these regimes are much more sensitive to variation in the underlying determinants of the size of governments when the efficiency of the tax system are included.

5.3 Interpretation

The empirical patterns discussed above appear consistent with the proposed theory. The empirical analysis should not, however, be accorded a causal interpretation. The data and empirical inference is thus suggestive, but not conclusive, that the proposed theory is consistent with observed patterns, and the current theoretical analysis and predictions may serve as a candidate hypothesis to understand these empirical regularities.

There do indeed exist a large number of competing and/or supplementary hypotheses and theories on growth in the size of government. The alternative theories on the size of government found in the literature include: the hypothesis of an increasing price and an inelastic demand for government (Baumol 1967); the insurance aspect of government programs in the face of the risk that accompanies an open economy (Rodrik 1998); the idea that new entrants into the voting population are lower income workers who demand higher taxes and redistribution (Meltzer and Richard 1981, 1983); the higher cost of political support that follows social and economic equalization (Peltzman 1980); the formation and pressure from interest groups (Olson 1965, Becker 1983); the pressure of government agents to maximize the size of their agencies' budgets (Niskanen 1971); the expansionary dynamics of political succession (Kimenyi and Shughart 1989); the internal dynamics which may follow from the mechanism that larger bureaus can better manipulate their budgets relative to smaller bureaus (Mueller 2003); fiscal illusion (Buchanan 1967); "fly-paper effects" (Hines and Thaler 1995); and the monopoly view of government (Brennan and Buchanan 1977). Some of these theories are partially taken into account in the panel data investigation above, such as the role of openness (c.f. the inclusion of the $TRADE$ variable in the panel regressions). However, many of these theories are difficult to account for empirically (due to data scarcity), and some may also be closely associated with the particular form of government.

Most of the determinants of the size of government surveyed above can potentially explain some of the observed variation in the size of government across countries, or within specific countries over time. It is less clear whether these variables can offer a plausible explanation for the strong divergence in the growth of government between parliamentary and presidential systems since the 1960s. For example, one compelling hypothesis is that cross-country differences

in public policy has a deeper cultural determinants associated with cross-country variations in preferences. Alesina and his various coauthors (Alesina et al. 2004; Alesina and Angeletos 2005; Alesina and La Ferrara 2005) find that preferences—or, the beliefs about the fairness of social competition (see also Kristov et al. 1992)—can explain U.S. vis-a-vis continental European perceptions about income inequality and choices of redistributive policies. Such differences will in turn be reflected in the size and composition of government, and are hence a candidate explanation for the variation in public policy across countries. This hypothesis is, however, less capable of explaining why the size of government has grown so much faster in Europe (in fact, almost three times as fast in Europe than in the United States during the 1960–1998 period), unless preference and belief differentials have changed substantially over the past 40 or so years. This is not very plausible.

6 Concluding remarks

By taking into account the economic distortions associated with taxation, the present analysis demonstrated that if the marginal distortion exceeded some endogenously defined threshold, which is an equilibrium outcome in the model, the presidential form of government could be associated with a larger size of government than the parliamentary form of government.

This result contrasts with the existing theory's prediction that presidential systems unambiguously promote a smaller size of government than do parliamentary systems. The reason for the different results is the very different incentives the two political systems promote when it comes to the internalization of two fundamentally different sources of tax costs. While the presidential regime type entails a comparatively stronger incentive to hold legislators accountable for the *diversionary* costs of taxation, the broader representation under the parliamentary system provides a stronger incentive to internalize the *distortionary* costs of taxation. This difference may suggest an institutional tradeoff associated with accountability: by creating incentives to hold the legislators accountable for economic diversion through the dispersion of agenda-setting powers, the incentives for holding the same agenda setters accountable for the economic distortions of taxation may be weakened.

The present analysis has several limitations, which also constitute interesting avenues for future research. First, different tax systems may interact in different ways with different political systems. Second, panel data on tax efficiency is scarce and incomplete. As indicators of tax efficiency continue to be developed, however, the prospect of future empirical research within this field is indeed promising. Third, the form of government may interact with other features of the politico-economic environment, such as the federal structure (Olson 1969), the electoral rules (Persson et al. 2007), or lobbying (Helpman and Persson 2001). Finally, not only the level of taxation, but also the tax systems, may indeed be endogenous to the political institutions. Besley and Persson (2007) show how legal and fiscal capacity are determined endogenously in an intertemporal game between present and future governments, and note that: "we should see

more investment in legal and fiscal capacity in such [ref. parliamentary] democracies (p.17)". This is yet to be demonstrated, but could potentially work both as to enforce and to mitigate the mechanism investigated in the present analysis.

7 Acknowledments

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8 Appendix

8.1 Theory

8.1.1 The simple legislature

See the online appendix <http://www.bi.no/en/Research/Academic-homepage/?ansattid=/a0810301> for the definition (Definition A1) and the equilibrium (Proposition A1) of the simple legislature.

8.1.2 Equilibrium in the presidential regime type[33]

Definition A2 An equilibrium of the presidential regime type is a vector of policies

$$\mathbf{q}_t^C(\mathbf{b}_t) = \left[\tau_t^C(\mathbf{b}_t),\ g_t^C\left(\tau_t^C(\mathbf{b}_t),\ \mathbf{b}_t\right),\ \left\{s_t^{iC}\left(\tau_t^C(\mathbf{b}_t),\ \mathbf{b}_t\right)\right\},\ \left\{r_t^{iC}\left(\tau_t^C(\mathbf{b}_t),\ \mathbf{b}_t\right)\right\}\right],$$

and a vector of reservation utilities $\mathbf{b}_t^C$, such that, in any period t, when all players take as given the equilibrium outcomes of periods $t+k$, $k \geq 1$:

(I) for any given $\mathbf{b}_t$, at stage 4, at least one legislator $i \neq a_\tau$ weakly prefers accepting rather than rejecting proposal τ_t^C to any other τ_t given the expected equilibrium proposals and decisions at stages 5 and 6;

(II) for any given $\mathbf{b}_t$, a_τ prefers proposing τ_t^C to any other τ_t satisfying (I), given the expected equilibrium proposals and decisions at stages 5 and 6, to any other policy satisfying part (I);

(III) for any given $\mathbf{b}_t$ and τ_t at stage 6, at least one legislator $i \neq a_g$ weakly prefers accepting rather than rejecting the proposal

$$g_t^C\left(\tau_t^C(\mathbf{b}_t),\ \mathbf{b}_t\right),\ \left\{s_t^{iC}\left(\tau_t^C(\mathbf{b}_t),\ \mathbf{b}_t\right)\right\},\ \left\{r_t^{iC}\left(\tau_t^C(\mathbf{b}_t),\ \mathbf{b}_t\right)\right\};$$

[33] Note that the equilibrium in Proposition 1 also encompasses the case where citizens possess strong preferences for public goods, which is excluded from the discussion of the equilibrium in Persson et al. (2000).

(IV) for any given $\mathbf{b}_t$ and τ_t, at stage 5, a_g prefers the proposal

$$g_t^C\left(\tau_t^C\left(\mathbf{b}_t\right),\ \mathbf{b}_t\right),\ \left\{s_t^{iC}\left(\tau_t^C\left(\mathbf{b}_t\right),\ \mathbf{b}_t\right)\right\},\ \left\{r_t^{iC}\left(\tau_t^C\left(\mathbf{b}_t\right),\ \mathbf{b}_t\right)\right\}$$

to any other proposal satisfying condition (III) and the budget constraint;

(V) the reservation utilities b_t^{iC} are optimal for the voters, in each district i, when one takes into account that policies in the current period will be set according to $\mathbf{q}_t^C\left(\mathbf{b}_t\right)$ and takes as given the reservation utilities in other regions b_t^{-iC} as well as the identities of a_τ and a_g.

Proposition A2 *The equilibrium in the presidential regime is characterized by the following equilibrium policy vector:*

$$\tau^C=\begin{cases}1-\frac{\delta}{\left(1+\frac{2}{3}\delta\right)} & if\ nonnegativity\ on\ r\ is\ not\ binding,\ otherwise:\\ \min\left[1,\frac{1-\delta/3}{2\delta(1-\alpha)}H_g^{-1}\left(1\right)\right] & if\ \frac{1-\delta/3}{2\delta(1-\alpha)}\leq 1,\ or:\\ \min\left[1,\frac{1-\delta/3}{2\delta(1-\alpha)}H_g^{-1}\left(\frac{1-\delta/3}{2\delta(1-\alpha)}\right)\right] & if\ \ \frac{1-\delta/3}{2\delta(1-\alpha)}>1\end{cases}, \tag{10}$$

$$s^C=\begin{cases}\frac{3(1-\alpha)(1-\delta)}{1+2\delta/3} & if\ nonnegativity\ on\ r\ is\ not\ binding,\ otherwise:\\ \min\left[\frac{3(1-\delta)}{2\delta}H_g^{-1}\left(1\right),\frac{3(1-\alpha)(1-\delta)}{1-\delta/3}\right] & if\ \frac{1-\delta/3}{2\delta(1-\alpha)}\leq 1,\ or:\\ \min\left[\frac{3(1-\delta)}{2\delta}H_g^{-1}\left(\frac{1-\delta/3}{2\delta(1-\alpha)}\right),\frac{3(1-\alpha)(1-\delta)}{1-\delta/3}\right] & if\ \ \frac{1-\delta/3}{2\delta(1-\alpha)}>1\end{cases}, \tag{11}$$

$$g^C=\begin{cases}\min\left[H_g^{-1}\left(1\right),\frac{2\delta(1-\alpha)}{1+2\delta/3}\right] & if\ nonneg.\ on\ r\ is\ not\ binding,\ or\ \frac{1-\delta/3}{2\delta(1-\alpha)}\leq 1\\ \min\left[H_g^{-1}\left(\frac{1-\delta/3}{2\delta(1-\alpha)}\right),\frac{2\delta(1-\alpha)}{1-\delta/3}\right] & if\ \frac{1-\delta/3}{2\delta(1-\alpha)}>1\end{cases}, \tag{12}$$

$$r^C=\begin{cases}\frac{2\delta(1-\alpha)}{1+\frac{2}{3}\delta}-g^C\\ 0\ \ if\ nonnegativity\ on\ r\ is\ binding\end{cases}, \tag{13}$$

$$b^{a_g C}=\begin{cases}H\left(g^C\right)-g^C+\frac{2\delta(1-\alpha)}{1+\frac{2}{3}\delta} & if\ r^C>0\ \ and\ \frac{1-\delta/3}{2\delta(1-\alpha)}\leq 1\\ H\left(g^C\right) & otherwise\end{cases}, \tag{14}$$

$$b^{a_\tau C}=\begin{cases}H\left(H_g^{-1}\left(1\right)\right) & if\ \frac{1-\delta/3}{2\delta(1-\alpha)}\leq 1\\ H\left(H_g^{-1}\left(\frac{1-\delta/3}{2\delta(1-\alpha)}\right)\right) & otherwise\end{cases}, \tag{15}$$

$$b^{iC}=H\left(g^C\right),\ \ i\neq a_g,a_\tau. \tag{16}$$

All politicians are reelected.

Proof. Voters a_τ are not direct residual claimants of public funds and demand the lowest incentive compatible tax rate, given that the tax revenues are high enough to finance their optimal choice of public goods provision under the actual institutional constraints.

The tax rate is constrained downward by the legislators' incentive compatibility constraints. All legislators $i\neq a_g$ are in the winning coalition (on stages 5 and 6) in any subgame with a probability of 1/2. If the nonnegativity constraint on r is not binding, the same argument as in

the proof of Proposition A1 implies that agenda setter a_g must get (taking τ as given) at least $s^{a_g} \geq 2\tau(1-\alpha) - \delta W$, offering $s^{m_g} = \tau(1-\alpha) - \delta W$ to the junior partner, m_g. For this offer to be incentive-compatible, s^{m_g} must satisfy $s^{m_g}/2 + \delta W \geq v^d$, where $v^d = \frac{1}{2}(1-\alpha)$ represents the expected payoff in a disequilibrium history with maximized taxes and diversion. W is the equilibrium continuation value and hence an implicit function of the equilibrium tax rate. In equilibrium, incentives must be compatible such that $s^{m_g} = \tau(1-\alpha) - \delta W \geq 1 - \alpha - 2\delta W$. The implied tax rate satisfies $\tau^C \geq 1 - \frac{1}{1-\alpha}\delta W$. The equilibrium tax rate in (10), and hence also the equilibrium level of diversion in (11), follows by substituting for $W = \frac{s}{3} + \delta W$, where $s = s^{a_g} + s^{m_g} = 3\tau(1-\alpha) - 2\delta W$.

If the nonnegativity constraint is binding, on the other hand, voters a^τ can exert influence on the level of public goods provided because they know that legislator a^g will have the incentive to spend the entire budget (less the incentive compatible level of diversion) on public goods. The threshold for when the distortionary and diversionary costs of taxation implied by α and δ actively constrain the equilibrium level of public goods provision results from the voters' perceived marginal cost of public goods, $\frac{1-\delta/3}{2\delta(1-\alpha)}$, and is given by $\frac{1-\delta/3}{2\delta(1-\alpha)} = 1$:[34]

If $\frac{1-\delta/3}{2\delta(1-\alpha)} \leq 1$ and the non-negativity constraint on r is binding, it is optimal for voters a_τ to demand taxes that are high enough to finance a level of public goods provision equal to $H_g^{-1}(1)$; if a level of public goods provision equal to $H_g^{-1}(1)$ is not feasible, voters a_τ demand a tax rate equal to 1. If $\frac{1-\delta/3}{2\delta(1-\alpha)} > 1$, the perceived aggregate marginal costs of taxation are higher for voters a_τ than for voters a_g, implying that voters a_τ effectively constrain also the equilibrium level of diversion s^C by requesting a lower tax rate.

Finally, Bertrand competition for redistribution among voters $i \neq a_g$ on stages 5 and 6 implies that all residual government revenue accrue to voters a_g. However, redistribution only occurs if the nonnegativity constraint on r is not binding (i.e., if $H_g^{-1}(1) < 2\delta W$) and also $\frac{1-\delta/3}{2\delta(1-\alpha)} \leq 1$. The equilibrium level of redistribution in (13) follows directly from the government budget constraint. ■

8.1.3 Equilibrium in the parliamentary regime type

Definition A3 An equilibrium of the parliamentary regime type is a vector of policies

$$\mathbf{q}_t^P(\mathbf{b}_t) = \left[\tau_t^P(\mathbf{b}_t),\ g_t^P(\mathbf{b}_t),\ \left\{r_t^{iP}(\mathbf{b}_t)\right\},\ \left\{s_t^{iP}(\mathbf{b}_t)\right\}\right]$$

and a a vector of reservation utilities $\mathbf{b}_t^R$, such that, in any period t, when all players take as given the equilibrium outcomes of periods $t+k$, $k \geq 1$:

[34] To arrive at the expression for the marginal cost to voters a_τ of public goods, first note that it will by definition be optimal for a_g and her voters to implement (dropping superscript C) $r = 0$ when either the preferences for public goods are sufficiently strong, or when the tax costs exceed the threshold, implying that (i) $g = 3\tau(1-\alpha) - s$. Second, from the expression for the continuation value $W = s/3 + \delta W$ and the combined incentive compatibility condition $s = 3\tau(1-\alpha) - 2\delta W$, we get that $W = \frac{3\tau(1-\alpha)}{3-\delta}$ and (ii) $s = [(1-\alpha)\tau]\frac{3(1-\delta)}{1-\delta/3}$. Substituting (ii) back into (i) gives $g = [(1-\alpha)\tau]\frac{2\delta}{1-\delta/3}$, which implies that the marginal tax cost facing voter a_τ of increased public goods provision is given by $\frac{\partial\tau}{\partial g} = \frac{1-\delta/3}{2\delta(1-\alpha)}$.

(I) for any given $\mathbf{b}_t$, and given the proposal made at stage 3, at stage 4, the junior partner of the coalition optimally chooses whether to accept or reject these proposals, given the reservation utilities b'_t and the expected policy outcomes in stages 5–8;

(II) the reservation utilities $b_t^{iP'}$ are optimal for the voters in each district i after a government crisis at stage 4, when one takes into account that policies will be set according to $\mathbf{q}_t^{P'}\left(\mathbf{b}_t^{P'}\right)$ as in the simple legislature equilibrium and takes as given the reservation utilities in the other regions $b_t^{-iP'}$;

(III) for any given $\mathbf{b}_t$ and $\mathbf{b}'_t$, the agenda setter in the coalition prefers

$$\mathbf{q}_t^P(\mathbf{b}_t) = \left[\tau_t^P(\mathbf{b}_t),\ g_t^P(\mathbf{b}_t),\ \left\{r_t^{iP}(\mathbf{b}_t)\right\},\ \left\{s_t^{iP}(\ \mathbf{b}_t)\right\}\right],$$

given conditions (I) and (II) and the government budget constraint;

(IV) the reservation utilities b_t^{iP} are optimal for the voters, in each district i, when one takes into account that policies in the current period will be set according to $\mathbf{q}_t^P\left(\mathbf{b}_t^P\right)$, takes as given expected $\mathbf{b}_t^{P'}$ and the fact that policies will be set according to $\mathbf{q}_t^{P'}\left(\mathbf{b}_t^{P'}\right)$ after a government crisis at stage 4, and also takes as given the reservation utilities in other regions b_t^{-iP}.

Proposition A3 *In the parliamentary regime, there is a continuum of equilibria such that:*

$$\tau^P = \begin{cases} 1 \ \ if\ \alpha \leq 2/3 \text{ and the Nash game is consistent with } r^P > 0 \\ \min\left[1, \frac{1-\delta}{1-\delta/3} + \frac{1}{3(1-\alpha)} H_g^{-1}\left(\frac{1}{3(1-\alpha)}\right)\right] \ \ if \begin{cases} \alpha > 2/3, \text{ or:} \\ \alpha \leq 2/3 \text{ and nonneg. on } r \text{ is binding} \end{cases} \end{cases}; \tag{17}$$

$$g^P = \min\left[\widehat{g}, \frac{2\delta(1-\alpha)}{1-\delta/3}\right]$$

$$\widehat{g}: \begin{cases} H_g^{-1}(1/2) \geq \widehat{g} > H_g^{-1}(1) & if\ \alpha \leq 2/3 \\ H_g^{-1}\left(\frac{1}{3(1-\alpha)}\right) & if\ \alpha > 2/3 \end{cases}; \tag{18}$$

$$s^P = s^{'} = \frac{3(1-\alpha)(1-\delta)}{1-\delta/3}; \tag{19}$$

$$r^P = \begin{cases} \frac{2\delta(1-\alpha)}{1-\delta/3} - g^P \geq 0 \ \ if\ \alpha \leq 2/3 \text{ and the Nash game is consistent with } r^P > 0 \\ 0 \ \ if\ \alpha > 2/3, \text{ or } if\ \alpha \leq 2/3 \text{ and nonnegativity on } r \text{ is binding} \end{cases}; \tag{20}$$

$$b^{a'P} = \begin{cases} H(g') - g' + \frac{2\delta(1-\alpha)}{1-\delta/3} & if\ \alpha \leq 2/3 \\ H(g') - g' - \frac{3(1-\alpha)(1-\delta)}{1-\delta/3} & if\ \alpha > 2/3 \end{cases} \tag{21}$$

$$b^{i'P} = H(g') \quad for\ i \neq a\ if\ \alpha \leq 2/3. \tag{22}$$

$$b^{iP'} = H(g') - g' - \frac{3(1-\alpha)(1-\delta)}{1-\delta/3} \quad for\ all\ i\ if\ \alpha > 2/3 \tag{23}$$

All politicians are reelected and a government crisis never occurs.

Proof. The subgame in case of a government crisis—which may be initiated by a veto from

any of the members of the government coalition—sets a benchmark, and effectively constrains the equilibrium in the parliamentary regime. In case of a government crisis, a subgame defined by stages (5) to (8), comes into force. The legislators' expected continuation value, *given a government crisis*, is defined by $E(v') = s'/3 + \delta W$. Thus, at stages 3 and 4, the junior partner m must be offered at least this much to go along with the equilibrium (and not veto the proposal from a), hence $s^{m_g} \geq E(v') - \delta W$. These conditions must hold in every period, implying that $E(v') - \delta W = s'/3 = (1-\delta) W$.

The voters are forced to accept a level of diversion defined by $s \geq s'$, independent of the equilibrium tax rate in the parliamentary regime; if the voters are more demanding, any member of the government coalition has the incentive to initiate a crisis. Consequently, in equilibrium voters demand diversion to be as low as possible, given the incentive-compatibility condition $s \geq s'$, implying that relation (19) holds with equality.

Consider the voters of the government coalition, voters a and m. To go along with the equilibrium, their equilibrium reservation utilities, b^i, $i = a, m$, must weakly dominate the reservation utilities in case of a crisis, $E(u')$. Hence, $b^i = 1 - \tau + H(g) + r^i \geq E(u')$, which, using the expression for W in the proof of proposition A1 (see online appendix) can be written: $b^i \geq H(g') + \frac{2\delta(1-\alpha)}{3-\delta} + g'/3$. Additionally, the reservation utilities of these voters must be mutually consistent for these equilibrium utilities to be best responses in a Nash game for redistribution. Thus, the equilibrium in the parliamentary regime is characterized by multiple equilibria; any equilibrium policy vector optimizes b^a, given any b^m.

The problem facing voters a is defined by

$$\max_{g, r^a, r^m, \tau} \left[1 - \tau + H(g) + r^a\right], \tag{24}$$

subject to:

$$1 - \tau + H(g) + r^m \geq b^m \geq H(g') + r'/3; \tag{25}$$

$$\tau \leq 1; \tag{26}$$

$$r^a \geq 0; \tag{27}$$

$$r^m \geq 0. \tag{28}$$

The solution to the Kuhn Tucker problem facing voters a, defined by equations (24) through (28), is consistent with the equilibrium policy vector given by equations (17) through (23). ■

Inserting for s' in the budget restriction and solving for τ, gives $\tau = \frac{g}{3(1-\alpha)} + \frac{r^a}{3(1-\alpha)} + \frac{r^m}{3(1-\alpha)} - \frac{2\delta/3}{3(1-\alpha)(1-\delta/3)} + \frac{1-\delta}{1-\delta/3}$. Reinserting into the object function of voters a, and optimizing, results in the following necessary Kuhn Tucker optimality conditions:

$$-\frac{1}{3(1-\alpha)} + H_g + \lambda\left[-\frac{1}{3(1-\alpha)} + H_g\right] - \mu\frac{1}{3(1-\alpha)} = 0; \tag{29}$$

$$-\frac{1}{3\left(1-\alpha\right)}+1+\lambda\left[-\frac{1}{3\left(1-\alpha\right)}\right]-\mu\frac{1}{3\left(1-\alpha\right)}+\omega^{a}=0; \tag{30}$$

$$-\frac{1}{3\left(1-\alpha\right)}+\lambda\left[-\frac{1}{3\left(1-\alpha\right)}+1\right]-\mu\frac{1}{3\left(1-\alpha\right)}+\omega^{m}=0; \tag{31}$$

where λ, μ, ω^{a}, and ω^{m} are the multipliers of equations (25) through (28), respectively. Equations (30) and (31) imply that $\lambda=1+\omega^{a}-\omega^{m}$. Equations (29) and (30) imply that

$$g^{P}=H_{g}^{-1}\left(\frac{1+\omega^{a}}{2+\omega^{a}-\omega^{m}}\right). \tag{32}$$

If $\tau<1$ ($\mu=0$), then $\frac{1}{3(1-\alpha)}=\frac{1+\omega^{a}}{2+\omega^{a}-\omega^{m}}\Longleftrightarrow\omega^{a}=\frac{3\alpha-1-\omega^{m}}{2-3\alpha}$. The solution is thus critically depending on the value of the tax cost parameter α:

a : When $\alpha>2/3$, $\omega^{a}=\frac{3\alpha-1-\omega^{m}}{2-3\alpha}$, $\omega^{m},\omega^{a}\neq0$, and pure redistribution is too expensive ($r=0$). The optimal level of public goods provision is found by substituting $\omega^{a}=\frac{3\alpha-1-\omega^{m}}{2-3\alpha}$ into equation (32), which gives that $g^{P}=H_{g}^{-1}\left(\frac{1}{3(1-\alpha)}\right)<H_{g}^{-1}\left(1\right)$. To see this, note that any positive amount of redistribution would violate voter demands, as defined in equation (25); that is, the voters in at least one of the constituencies $i=a,m$ would prefer a government crisis to an outcome with a positive level of redistribution.

b : When $\alpha\leq2/3$, $\omega^{a}=\frac{3\alpha-1-\omega^{m}}{2-3\alpha}$ is impossible, and there are two possible outcomes:

i) If $\omega^{m}=\omega^{a}=0$, then $\lambda=1$ and $g^{P}=H_{g}^{-1}\left(1/2\right)$. If $\omega^{m}=0$, then $H_{g}^{-1}\left(1\right)<g^{P}=H_{g}^{-1}\left(\frac{1+\omega^{a}}{2+\omega^{a}}\right)<H_{g}^{-1}\left(1/2\right)$. If $\omega^{a}=0$, then $g^{P}=H_{g}^{-1}\left(\frac{1}{2-\omega^{m}}\right)<H_{g}^{-1}\left(1/2\right)$. In this last case, by eq. (25), $g^{P}\geq g'$, depending on whether the nonnegativity constraint on r is binding.

ii) If $1/3\leq\alpha\leq2/3$, voters a and m may want the government to shut down redistribution and to implement $\tau<1$ and $g_{\alpha>2/3}^{P}$, where $g_{\alpha>2/3}^{P}\equiv H_{g}^{-1}\left(\frac{1}{3(1-\alpha)}\right)$, even if the nonnegativity constraint on redistribution is not binding, depending on the outcome of the Nash game over redistribution. In particular, redistribution will be shut down if, for the weaker part of the two groups (say voters m), $1-\tau_{\alpha>2/3}^{P}+H\left(g_{\alpha>2/3}^{P}\right)>H\left(g_{\alpha\leq2/3}^{P}\right)+r_{\alpha\leq2/3}^{P,m}$, where, $\tau_{\alpha>2/3}^{P}$ is the level of taxes needed to sustain $g_{\alpha>2/3}^{P}$ (given the incentive compatible level of diversion), $g_{\alpha\leq2/3}^{P}$ is as defined in *bi*), and $r_{\alpha\leq2/3}^{P,m}$ is the level of redistribution consistent with any given Nash outcome between voters a and m. Hence, $H_{g}^{-1}\left(1\right)\leq g_{\alpha>2/3}^{P}\leq H_{g}^{-1}\left(1/2\right)$, and there exist multiple equilibria, dependent on the Nash outcome.

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