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WHY EUROPE SHOULD LOVE TAX COMPETITION - AND THE U.S. EVEN MORE SO

Eckhard Janeba
Guttorm Schjelderup

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ABSTRACT

Is global competition for mobile capital harmful (less public goods) or beneficial (less government waste)? This paper combines both aspects within a generalized version of the comparative public finance model (Persson, Roland and Tabellini, 2000) by introducing multiple countries and endogenous tax bases. We consider the role of political institutions and compare parliamentary democracies (Europe) and presidential-congressional systems (USA) to show that increasing tax competition is likely to improve voter welfare, even if public good supply decreases because rents to politicians also fall. The conditions for voter welfare to improve are less stringent under the presidential-congressional system than under parliamentary democracies. Increasing tax competition lowers voter welfare if the only benefit to politicians is to divert resources from the government budget and the future is valued highly.

Eckhard Janeba
Department of Economics
University of Colorado
Boulder, CO 80303-0256
and NBER
janeba@colorado.edu

Guttorm Schjelderup
Department of Economics
Norwegian School of Economics
and Business Administration
5045 Bergen
Norway
guttorm.schjelderup@nhh.no

1 Introduction

Increasing mobility of capital both among regions and countries has been an important phenomenon around the world over the last two decades. For some academics and policymakers this has been reason for concern since governments often compete for investment through tax incentives that ignore the detrimental effect on other regions. In the now vast literature on tax competition, as originated by Zodrow and Mieszkowski (1986) and Wilson (1986), and surveyed by Wilson (1999), this so-called fiscal externality gives rise to too low tax rates and underprovision of public goods in equilibrium. In more popular terms it is also considered a threat to the modern welfare state, a position that is shared by many people and governments in Europe as well as by the political left in the United States.

This view is in sharp contrast to the thinking of conservative policymakers and the Public Choice literature (e.g., Brennan and Buchanan 1980, or McLure 1986) who argue that competition in general, and competition among governments in particular, is beneficial because it reduces government waste and disciplines politicians. Policymakers tend to overspend and absorb government resources for their own objectives and with little or no benefit to citizens. While this view is more popular in the U.S. than in Europe, it is shared to some extent by those Europeans who are concerned about too much spending and waste of resources at the European Union level.

It is perhaps surprising that the tax competition literature and the Public Choice approach by and large have failed to examine both arguments within a single framework.[1] The traditional tax competition literature assumes benevolent governments and therefore the only distortion is the fiscal externality. The closed economy, or complete centralization of all government activity, thus leads to a first-best optimum, while openness due to the fiscal externality adversly affects welfare. By contrast, the Leviathan view of government assumes in the extreme that no tax revenue benefits voters. Hence, a reduction in tax revenue due to government competition must be good.

Both approaches are obviously caricatures. *The first objective* of our research is to provide a framework that gives each side a legitimate chance of winning the intellectual debate over the net benefits of increasing international capital mobility. In other words,

[1] The few exceptions that exist, and which differ from our approach, are discussed further below.

we examine the effect of increasing capital mobility (or globalization) on the relative strength of the economic distortion as a result of fiscal externalities and the political distortions arising from selfish policymakers. As our title suggests, we show that increasing competition is likely to improve voter utility, although it is not guaranteed.

The political response to increasing tax competition has differed greatly between Europe and the U.S.. In the European Union there is a long-standing debate about coordination or even harmonization of tax policies. While policies are not fully harmonized at the European level, there exist commonly agreed accounting rules for corporate profits, minimum tax rates for value added taxes, some agreements to coordinate the taxation of interest income, and continuing debates and proposals over harmonization of capital tax rates. The response is quite different from the debate in the U.S., where competition among states is usually considered a key element of the federal system (for a critical view on certain forms of tax competition in the U.S., see Holmes 1995 and Burstein and Rolnick 1995). This positive view is perhaps a reflection of the influential article by Tiebout (1956), who argued that independent decision making by states leads to an efficient outcome. Also, at the international level the U.S. has been much more skeptical with regard to the coordination of international tax policies, which, for example, became quite clear during the recent OECD initiative to ban harmful tax practices (OECD 1998, 2000).

Our second objective is to provide an explanation for these two different political responses across the Atlantic. We argue that the key to understanding the difference in responses lies in the political and budgetary institutions in the U.S. and Europe. The role of political institutions has been emphasized in the work of Persson, Roland and Tabellini (2000) and Persson and Tabellini (2000). In this literature - sometimes called comparative public finance - it is shown both theoretically and empirically that parliamentary democracies differ from presidential-congressional democracies in terms of tax levels, public goods provision, government waste and transfer payments. In particular, parliamentary democracies have higher taxes, higher public goods provision, and higher government waste than presidential-congressional democracies. The reason for these differences lies in the separation of powers in the budget making process. In a U.S. style presidential-congressional system, fiscal decisions are made at committee levels led by powerful, but different chairmen. By contrast, parliamentary democracies - the most common form of democracy in Europe - typically provide a more cohesive government by forming a coalition that jointly passes the entire government budget.

We use a modified version of the comparative public finance approach and generalize it by introducing multiple countries whose governments compete for mobile capital. In contrast to Persson, Roland and Tabellini (2000) taxation is distortionary, as in the traditional tax competition literature. Tax rates, public good supply as well as rents to politicians are shaped by the extent of international competition, reelection concerns of policymakers, and the budgetary decison making rules (i.e., parliamentary vs. presidential-congressional regime). We consider two versions of the model. In the base model politicians seek reelection because it gives them an exogenous benefit from holding office in the future. This one-shot game has a dynamic interpretation if politicians place relatively little emphasis on diverting government resources for their own purposes and are mostly motivated by the exogenous benefits from holding office (e.g., the joy of being in power). In the second version of the model politicians are only motivated by the power to extract government resources for themselves. The outcomes under the two versions are similar but not identical. In particular, the second version makes increasing tax competition harmful under both regimes if politicians value the future sufficiently.

Using the comparative public finance approach to study tax competition for mobile capital offers a number of novel and perhaps surprising insights. First, in a closed economy voters must allow politicians some diversion of tax revenue for their own benefit for them to seek reelection. The alternative to reelection is worse for voters because politicians implement high taxes that are used solely for their own benefit (even if this implies no reelection). In a parliamentary democracy, public goods provision is at its first-best level. Although the legislators who form the political majority consider only the benefit of public goods provision for their own electoral districts, the voters in these districts pay only proportionally to the financing. Common for both regimes is that the equilibrium is not efficient due to positive rents to legislators. In this sense our approach does not stack the deck against the view that increasing tax competition is beneficial.

Second, we undertake two types of comparisons under each political regime. We initially compare the equilibrium in an open economy with the one in a closed. The open economy consists of an arbitrary number of identical countries that have the same political system (reflecting the dominance of parliamentary democracies in Europe, or the dominance of the presidential-congressional system among U.S. states). The purpose is to see if tax competition is harmful and how the two regimes might differ. In addition, we undertake comparative statics with respect to the number of countries under each political

system once there are at least two countries. Increasing the number of countries allows us to capture the notion of increasing tax competition or globalization, as the elasticity of capital supply increases from each country's perspective. In both cases of comparison, our focal point is on the qualitative effects of opening up the economy. Of particular interest is how voter utility is affected under the two regimes.

In the base version of the model we show that under a mild condition opening up the economy reduces tax rates on mobile capital under both political regimes. In contrast to the traditional view on tax competition, however, this does not necessarily imply a loss in voter utility because the rents to politicians that are diverted from the government budget fall as well. We identify two channels for why rents fall. In equilibrium rents equal the maximum tax revenue politicians can obtain for themselves when forgoing reelection (minus the exogenous benefits of holding office in the future). Increasing tax competition lowers the maximum tax revenue because tax rates in the rest of the world decline, making it harder to raise revenues. The second channel is the result of adding countries while holding tax rates constant everywhere. When more countries compete to attract capital, the capital stock falls in a country where politicians do not seek reelection.

It is worth pointing out that it is the fall in rents to politicians that may have been overlooked in Europe, where the fear of falling tax rates on capital income (see Sorensen 2000) may have been taken to imply less government services by the same amount. If the loss in rents is large enough, an increase in private consumption can outweigh the potential loss in public good provision. Yet, the fact that the fall in rents to politicians does not guarantee an increase in voter utility is in contrast to the Leviathan view of government. In a world of parliamentary democracies, the public good level falls when opening up the economy. Without further assumptions we cannot sign the effect on voter utility. An example shows, however, that utility in an open economy can be lower than in a closed economy. By contrast, in a world of presidential-congressional democracies the public good supply is unaffected by the separation of budgetary powers. Voter utility is higher in the open economy. At the expenditure setting stage, taxes have already been determined. Thus, public good supply equals the exogenous benefits from holding office when policymakers are reelected. In this sense, the presidential-congressional system appears to have an advantage.

Once there are more than two countries, increasing the number of countries has similar

qualitative effects, that is, tax rates and rents to politicians fall. Somewhat different to the previous point is the fact that in a world of parliamentary democracies voter utility increases under some condition, which is satisfied, for example, if the marginal product of capital (in terms of a second factor) is a positive constant. By contrast, we do not need to impose a similar condition to guarantee an increase in voter utility in a world of presidential-congressional democracies. Public good supply is constant and tax rates fall. Again, this appears to make the presidential-congressional system better suited for increasing competition.

We then reconsider these results in a model where all benefits of holding office are endogenous and result from diverting government revenues. Many of our earlier results continue to hold. Different is that under a presidential-congressional system the public good supply is no longer constant, but tends to fall when competition intensifies. More generally, an increase in the number of countries has a more ambiguous effect on voter utility under both regimes. When politicians greatly discount the benefits of holding future office, and thus current-period rents must be high for them to seek reelection, increasing tax competition is good. The opposite holds when the future is highly valued, because tax competition then mostly aggravates the underprovision problem without much affecting the rents to politicians.

Our paper relates to a small literature that studies tax competition in models where Benevolence and Leviathan coexist. Edwards and Keen (1996) assume rent-seeking politicians who also care about the supply of public goods. In their model reelection concerns are not modeled and, as a consequence, the outcome of tax competition depends on an assessment of the relative strength of Leviathan versus Benevolence (where the weights are exogenous). Rauscher (1998) points out the possibility that tax competition may tame a Leviathan if the government employs user charges to finance government provided goods. This result does not hold, however, if lump sum taxes are available. Gordon and Wilson (2001) use a model where residents initially set taxes, while rent-seeking government officials thereafter decide on the distribution of expenditures. Residents set salaries to government officials in order to curb rent-seeking activities. Officials can be ousted from office only if they spend more of their budget on perks than do officials in other regions (yardstick competition a la Besley and Case, 1995). In this model competition to attract mobile households reduces wasteful behavior by government officials, and increases public expenditure and resident utility.

Voting is introduced explicitly in Persson and Tabellini (1992) who study a two-country model where each government levies a source tax on mobile capital to finance government transfers. A fall in the cost of investing abroad (i.e., increasing competition) puts downward pressure on tax rates. At the same time, however, there is a second, political effect in place since policy is chosen by a policymaker who represents the preferences of the median voter. Tax competition is shown to make the median voter select a more leftist government, whose distributional preferences call for higher taxes on capital, and this partly mitigates the tendency of tax competition to lower taxes on capital. In Besley and Smart (2001), politicians fall into two categories: benevolent or rent-seeking. Imperfect information prevents voters from identifying the latter type. They show that yardstick competition is most likely to be welfare improving for voters when it is more likely that politicians are benevolent, and detrimental to welfare if it is more likely that politicians are rent-seeking.

Finally, Wildasin and Wilson (2001) construct a model where the "political market structure" is endogenous and dependent on economic integration. Politics are introduced by allowing different groups to form lobbies (like in Grossman and Helpman, 1994) and these groups compete for political favors by relating contributions to the government's subsequent choice of tax rates. The government maximizes a weighted average of contributions and welfare (each region's income). In this setting the equilibrium in a single region is efficient, whereas this is not the case in the many-region tax equilibrium. In the latter case there are 'wasteful' contributions to politicians, and social welfare may increase or decrease depending on how income is distributed (between capitalists and workers) and thus on the construction of welfare. A related point is made by Lorz (1998) who shows that wasteful lobbying is reduced with increasing tax competition, and thus leads to higher welfare. We emphasize that none of the papers reviewed above focuses on the different political and budgetary institutions and how these may affect the outcome of tax competition.

The rest of the paper is structured as follows. In section 2 we set up the general tax competition model and solve for the first-best optimum under a social planner. We consider a world with parliamentary democracies in section 3, while the presidential-congressional system is analyzed in section 4. In the following section we turn to a dynamic version of the model in which all rents from holding office are endogenous. Section 6 concludes.

2 The Model

We employ a standard tax competition model with N symmetric countries who compete for mobile capital by setting a tax on capital. Different from the standard model is that we pay close attention to the micro-political foundations of government decision making. Similar to Persson, Roland and Tabellini (2000), but in an open economy with endogenous tax setting, we consider two legislative forms of government, a parliamentary regime and a presidential-congressional system, in which elected policymakers decide on tax rates and government expenditures. Politicians are selfish and therefore want to divert government resources away from proving public goods, but policymakers are partially kept in check because of reelection concerns. We characterize the outcome of tax competition in each of the two political regimes as a function of the number of countries involved. The latter allows us to capture the notion of globalization.

Our model considers a setting with N identical countries. We assume that each country has three identical electoral districts ($d = 1, 2, 3$), and that each district has its own group of voters of size unity. The political process within a district is such that it appoints through voting a legislator ($l = 1, 2, 3$) as the representative to the country's legislature. In our simplified setting we assume that the incumbent legislators are already appointed and the agenda setting powers are assigned by nature. Yet, all legislators are seeking reelection. The two political systems considered differ in terms of how agenda setting powers are distributed and how the three legislators decide on public policy, an aspect we study in more detail below.

Production in country i is described by a production function $f(k_i)$, with k_i being the amount of capital per unit of a second factor used in country i. The second factor is inelastically supplied and internationally immobile. In slight abuse of terminology we refer to k_i as capital. The production function has the properties $f' > 0$, $f'' < 0$. Output can be used for private consumption or transformed into a public good at a marginal rate of transformation of one. The total world stock of capital (in terms of the second factor) is $\bar{k}$ and, due to symmetry, $k \equiv \bar{k}$ is the amount of capital owned by the three groups of voters in each country. Capital is assumed perfectly mobile, and in the competitive equilibrium, capital flows between the countries until the marginal returns net of tax are

equalized across countries, that is,

$$f'(k_i) - t_i = \rho, \qquad \forall\ i\ \in\ \{1, ...N\}, \tag{1}$$

where ρ is the equilibrium return on capital and t_i is the tax per unit of capital in country i. The amount of capital used in country i, k_i, depends on all tax rates. We use notation $k_i(t_i, t_{-i})$, where the first entry refers to the tax rate in country i, and the second entry is the vector of tax rates in all other countries. When all countries have the same tax rate, k_i is equal to k. For the most part of our analysis we consider only a capital tax rate. In the concluding section, however, we briefly discuss the inclusion of a second tax instrument.

Voting group d in country i derives utility from private consumption c_i^d and public goods provision g_i, where g_i is the level of public goods provision that benefits all voting groups in country i. We assume that preferences are quasi-linear in private consumption. Since in each district there is one representative voter, the utility of a voter located in district d in country i is given by

$$u_i^d = c_i^d + H(g_i) = \frac{f(k_i) - f'(k_i)\, k_i + \rho k}{3} + H(g_i), \tag{2}$$

where $[f(k_i) - f'(k_i)\, k_i]/3$ is the income from the fixed factor to each of the three groups of voters when k_i is employed, and $(\rho k)/3$ is capital income to each group net of taxes. The function $H(g_i)$ satifies the usual properties $H' > 0$ and $H'' < 0$, as well as the Inada condition $H'(0) \to \infty$.[2] For future refernce it is useful to notice that for a common tax rate $t_i = t$ for all i, the international capital market equilibrium is symmetric, $k_i = k$, and (2) reduces to

$$u_i^d = \frac{f(k) - tk}{3} + H(g_i). \tag{3}$$

The government in each country makes a decision on its tax rate on capital, the level of public good, and the rents accruing to politicians. The public budget constraint in country i is

$$t_i k_i = g_i + \sum_{l=1}^{3} r_i^l \equiv g_i + \mathbf{r}_i, \tag{4}$$

[2]For most of our results we could allow $H'' = 0$, but this would complicate the exposition without adding much. In an example in section 3, however, we will use a linear utility function.

where r_i^l captures the possible diversion of resources by legislator l, and $\mathbf{r}_i$ is the vector containing the rent of each legislature in country i. Rents are a pure waste from the voter's perspective and benefit only politicians. The amount of rents that can be diverted in equilibrium will be shaped by reelection concerns, the political system, and the number of countries competing for capital.

Before we undertake the detailed analysis of the decision making under different political institutions it is useful to examine how a social planner would allocate resources. If a social planner was to maximize global welfare subject to national budget constraints, she would solve the problem

$$\max_{\{q_i,....q_N\}} \left(\sum_{J=1}^{3} u_i^J \left(\mathbf{q}_i \right) + .. + .. \sum_{J=1}^{3} u_N^J \left(\mathbf{q}_N \right) \right)$$

subject to the restrictions (1),(4) and $\sum_{i=1}^{N} k_i = N\bar{k}$, where $\mathbf{q}_i = \{t_i, g_i, \mathbf{r}_i\}$ is a policy vector. The solution is

$$\mathbf{r}_i = 0, \qquad H'\left(g_i\right) = \frac{1}{3}, \qquad t_i = \frac{H'^{-1}\left(\frac{1}{3}\right)}{k}, \tag{5}$$

for all $i \in \{1, ...N\}$. Since rents to politicians are of no benefit to voters, diversion of public funds is zero under a social planner. The provision of public goods follows the Samuelson condition. The marginal utility from the public good equals one third because the marginal rate of transformation is one and there are three districts in each country so the sum of marginal utilities is given by $3H'\left(g_i\right)$. Finally, equation (5) also describes how taxes should be set in order to raise the necessary revenue to comply with an optimal provision of the public good.

The benchmark case of a social planner serves to illustrate how tax policy is conducted under a traditional utilitarian approach. In the next sections we investigate the policy outcome under the two most common democratic political systems: a parliamentary democracy and a presidential-congressional regime.

3 The Parliamentary Regime

The political process in a parliamentary regime (indexed by P) is characterized by a cohesive majority in parliament on which the government can count to pass its legislative

proposals. Since there are three districts each represented by a single legislator, the construction of a government implies teaming up two legislators. The government's budget proposal may either be done by one single minister who will seek support for the budget from the second minister, or by delegating budgetary tasks to each minister (say by allowing one minister to set the tax rate and the other to control the expenditure side). The exact making of the budget is not crucial to our results since the two alternative set ups have in common that each minister has veto power against the other minister.[3] This is the key difference to the presidential-congressional system where tax and expenditure decisions are separated and different coalitions can be formed for each decision.

The sequencing of events has an impact on the bargaining power of each minister and thus who derives most rents from being in office, but this is of immaterial interest as will be clear later. The main point we make here is that the joint responsibility of budget making means that the two ministers have a joint incentive to collude against voters. Yet legislators have an interest to act partially in the interest of voters because they value reelection. If they fail to meet the minimum utility that voters demand, voters punish the incumbent by electing an otherwise identical challenger. To model the political process we assume that in each country the incumbent legislators' decide on policies in a bargaining game with the following sequence:

1. Nature randomly selects two legislators $\{a_i,\ m_i\}$ as coalition partners. Legislator a_i is responsible for the whole budget and legislator m_i is the junior coalition partner.

2. Voters in each district of country i decide their reelection strategy by setting reservation utilities $\left\{\bar{u}_i^d(t_{-i})\right\}$ for every possible tax vector t_{-i}.

3. Minister a_i proposes the following budget $\mathbf{q}_i^P = \left[t_i,\ g_i,\ \left\{r_i^l\right\}\right]$, such that $t_i k_i\left(t_i, t_{-i}\right) \geq g_i + \mathbf{r}_i$, where all elements are constrained to be nonnegative.

4. The junior coalition partner m_i decides on whether she should support the budget. If she approves the budget, the proposal is implemented and the game goes to stage 6. If m_i vetoes the budget, the government is toppled and the game continues at stage 5.

[3]The former approach is undertaken in Persson, Roland and Tabellini (2000), while the latter is used in Persson and Tabellini (2000; ch. 10, p. 263). The results that emerge under both approaches are qualitatively similar.

5. A default policy is implemented such that

$$\bar{\mathbf{q}}_i^P = \left[\bar{t}_i k_i\left(\bar{t}_i, t_{-i}\right)/3 = r_i^l = \bar{r}_i/3 > 0,\ g_i = 0\right],$$

where $\bar{t}_i$ is the default tax rate.

6. Election. A legislator is reelected if the policy enacted meets or exceeds the voters' reservation utility in that district, as determined in stage 2. Otherwise an identical challenger is elected.

The default policy in stage 5 is a shortcut for a more elaborated game that would ensue if the government coalition breaks down. Stage 5 captures the idea that in a government crisis situation legislators can ensure some rents for themselves. Note, however, that these rents are endogenous because they are dependent on other countries' tax rates. To simplify the analysis, we assume that in the crisis situation voters don't receive any public goods.

In order to determine the policy outcome we must formulate the behavior of the legislators. We assume that each legislator maximizes the rents derived from holding office as given by the utility function,

$$v_i^l = \gamma r_i^l + p_i^l R, \tag{6}$$

where R is the exogenous benefit from being reelected - assumed to be identical for all candidates - and p_i^l is the probability that legislator l is reappointed. As before, r_i^l is the rent extracted from tax revenue collected after providing public good g_i. The inclusion of $\gamma < 1$ reflects the presence of transaction costs associated with rent-seeking.

The exogenous rent R can be given two different interpretations. First, R could be interpreted as non-budget related benefits of holding office (such as the joy of being in control, invitations to privately sponsored parties, enhanced job opportunities after quitting politics, etc.). A second interpretation is that the only benefit from holding office is the power to extract resources from the government budget. In that case R is simply the expected discounted value of future endogenous rents. For the remainder of this and the following section we stick to the first interpretation. The second interpretation is pursued in section 5, showing qualitatively similar but not identical results.

As for voter behavior, we assume that within each voting district voters coordinate their actions, but each district acts independently. A legislator's reappointment is then

based on the simple retrospective voting rule,

$$p_i^l = \begin{cases} 1 & \text{iff } u_i^d(\mathbf{q}_i, t_{-i}) \geq \bar{u}_i^d(t_{-i}), \qquad d = l \\ 0 & \text{otherwise} \end{cases} \tag{7}$$

The voting rule assumes that voters in all districts set their reservation utilities at the same time. Given the sequencing of the game politicians know the vector of reservation utilities when the budget proposal is made. Hence, they will not be reelected if they act against the interests of their constituencies. Furthermore, reservation utilities are time consistent since voters know that the incumbents (ministers) and the opponent (third legislator) are identical.[4]

We now want to derive the subgame perfect equilibrium of this game in which politicians are reelected. This typically requires voters to allow policymakers to divert some money from the government budget for themeselves. A key aspect of the analysis is to derive the incentive constraints for rent diversion consistent with reelection. A precise equilibrium definition is given in the Appendix. Loosely speaking, each agent in each country must maximize utility at each point in the sequence given the decisions of all other agents and consistent with international capital market equilibrium and domestic budget balance (private and government). It is crucial to note that under a parliamentary regime the two ministers have bargaining power against each other. There is no real separation of powers and the budget is effectively a simultaneous vote over the tax rate and the expenditure side. Because of the veto power of each minister, the two ministers are also the residual claimants on rents. To ensure that the government has an incentive to remain in power, voters must at least leave the two legislators with as much rent as both can obtain if they choose not to run for reelection and extract the maximum tax income. The latter amounts to setting $g_i = 0$ and a tax rate equal to

$$\tilde{t}_i(t_{-i}) = \arg\max_{t_i} t_i k_i(t_i, t_{-i}).$$

In order to avoid cluttering notation, we often use only $\tilde{t}_i$. The continuation value of holding office for a_i and m_i are $(\gamma r_i^a + R)$ and $(\gamma r_i^m + R)$. The incentive constraint that defines equilibrium rents is therefore given by

$$\mathbf{r}_i^P \equiv r_i^a + r_i^m \geq \tilde{t}_i k_i\left(\tilde{t}_i, t_{-i}\right) - \frac{2R}{\gamma}. \tag{8}$$

[4]For further discussion of this sequencing see Persson, Roland and Tabellini (2000).

The right hand side gives the maximum payoff in terms of tax revenue to be shared among the two 'ministers' when no money is devoted to public goods provision, minus the exogenous benefit from being reelected. The left hand side denotes the combined rents that must be given to the two 'ministers'. If (8) is satisfied, legislator a_i and m_i will seek reelection (if they can meet reservation utilities). How the rents are divided between minister a_i and m_i depends on the bargaining power of each minister, an aspect that we don't pursue further. Each minister must get at least one third of the default policy however.

We next turn to determining reservation utilities. Note that in equilibrium voters in all districts enjoy the same utility level because all consume the same amount of the public good and pay identical taxes. Symmetric reservation utilities in all districts are therefore consistent with equilibrium strategies leading to reelection of all legislators. To find the the equilibrium reservation utilities we consider the voter optimization problem in those districts whose legislators are part of the government, i.e., maximize (2) subject to the government budget constraint (4), the incentive constraint (8), the arbitrage condition in the capital market (1), capital market equilibrium and $\rho \geq 0$. The optimal policy resulting from this maximization problem gives the reservation utility that leads legislators to seek reelection by implementing exactly this policy.

The full derivation of the equilibrium policy is relegated to the appendix. Here we report the outcome and provide an intuitive interpretation. The condition characterizing the public good supply in equilibrium is given by

$$H'\left(g^P\right) = \frac{1}{3\left(1-\epsilon\right)} > \frac{1}{3}, \tag{9}$$

where $\epsilon \equiv -\frac{t_i}{k}\frac{\partial k_i}{\partial t_i}\mid_{t_i=t} > 0$ is the elasticity of capital used in country i with respect to tax rate t_i evaluated at the symmetric tax vector $t_i = t_j = t$ for all i, j. We use superscript P to denote equilibrium values under the parliamentary regime. Equation (9) reflects the trade off between increasing the supply of the public good through a higher tax on capital that drives capital out of the country, taking into account that rents are diverted and private income reduced. To further interpret our result notice from equation (8) that from a single country's perspective rents to politicians do not change as the country varies its tax rate. As a consequence, the equilibrium values of the other variables follow immediately from the government budget constraint and the utility function. Note that all

variables in the open economy are only implicitly defined, as the revenue maximizing tax rate $\widetilde{t}_i > t^P$ is itself a function of t^P. Hence, if all countries are parliamentary democracies, the equilibrium leading to reelection of all politicians is characterized by

$$\begin{aligned} g^P &= H'^{-1}\left(\frac{1}{3\left(1-\epsilon\right)}\right), \\ \mathbf{r}^P &= \tilde{t}_i k_i\left(\tilde{t}_i, t^P\right) - \frac{2R}{\gamma}, \\ t^P &= \frac{\mathbf{r}^P + g^P}{k}, \end{aligned} \tag{10}$$

and where $u^P = \bar{u}$ for all districts in all countries follows immediately by use of (10) in (3).

To gain some insight it is useful to consider first the special case of the closed economy ($N = 1$). In a closed economy capital supply is fixed ($k_i = k = \overline{k}$) and the elasticity in (9) becomes zero, implying that the tax on capital is lump sum. Because capital is fixed, all formulas simplify. In addition, the revenue maximizing tax rate in a closed economy $\tilde{t}$ is simply equal to the marginal product of capital, $f'(k)$, leaving a zero return for capital owners.

Comparing the results for the closed economy to those under a benevolent social planner (cf. (5)), it is seen that the provision of the public good is at its first-best level. Although the two ministers conduct policy on behalf of voters in 2 out of 3 districts, the benefits from public goods provision are fully internalized. Each district benefits in full from the public good, but only pays one-third of the cost. Hence, no political externality arises and the provision is jointly optimal for all voters. The first best provision of the public good is in line with the closed economy results in the traditional tax competition literature (Zodrow and Mieszkowski, 1986). Different from this literature, however, is the result that the autarky solution is not first-best overall. Politicians derive positive rents in equilibrium. The tax rate is set above the requirement for efficient provision of the public good, resulting in too little private consumption. The open economy may be better for voters than the closed economy since it entails the potential of curbing rent-seeking.[5]

[5]Our results seem to contradict findings by Persson, Roland and Tabellini (2000, p. 1148) who in a closed economy show underprovision of the public good in the parliamentary regime. The difference is

We can now compare the closed economy case to the open economy. In the following we use subscripts 1 and N to distinguish between the closed economy and the open economy with at least two countries. We obtain

Proposition 1 *If a parliamentary system is adopted worldwide, opening up the economy leads to:*

(a) *A fall in the provision of the public good* $\left(g_1^P > g_N^P\right)$.

(b) *A fall in rents to politicians* $\left(\mathbf{r}_1^P > \mathbf{r}_N^P\right)$ *and lower tax rates* $\left(t_1^P > t_N^P\right)$ *if*

$$f'(k_i) + f''(k_i)\, k_i > 0.$$

Proof:

(a) Follows immediately from (9) and strict concavity of $H(g)$, as $\epsilon|_{N=1} = 0 < \epsilon|_{N>1}$.

(b) Comparing the rents in both situations we get $\mathbf{r}_1^P > \mathbf{r}_N^P \Leftrightarrow f'(k)\, k > \widetilde{t}_i k_i \left(\tilde{t}_i, t_N^P\right)$. Since $\tilde{t}_i(t_N^P) > t_N^P$ by definition, we have that $k > k_i(\tilde{t}_i, t_N^P)$. The politicians' rents are lower in the open economy if $f'(k)\, k \geq f'\left(k_i\left(\tilde{t}_i, t_N^P\right)\right) \cdot k_i\left(\tilde{t}_i, t_N^P\right)$ because $f'\left(k_i\left(\tilde{t}_i, t_N^P\right)\right) - \tilde{t}_i = \rho \geq 0$. This condition is satisfied if $f(k_i)\, k_i$ is non-decreasing in k_i. From our previous result plus the budget constraint it now follows that $t_1^P > t_N^P$.■

Consistent with the conventional wisdom in standard tax competition models is our finding that increasing tax competition leads to lower public good provision and tax rates on the mobile factor (Mieszkowski and Zodrow, 1986; Bucovetsky and Wilson, 1991). Different from the literature, however, is that this does not necessarily imply lower voter utility, as we discuss in more detail below. Consistent with the Leviathan and conservative view of government is that global competition is likely to reduce rents to politicians. Proposition 1 shows that the rents derived by politicans are lower in an open economy under fairly weak conditions.[6] The public choice literature (e.g. Brennan and Buchanan, 1980) argues that the size of government would be excessive and voter interest hampered

explained by the set of government instruments. In their model the government can affect voter utility by public goods provision and by direct transfers. The latter can be used more effectively to buy off voters thus leaving more rents on the table for politicians. Hence, the inclusion of transfers into the model crowds out the provision of the public good. In the concluding section we discuss the role of transfers in our model.

[6]The condition for rents to fall is not strong. It is satisfied, for example, for all functions of the form $f(k_i) = k_i^{\alpha}$, with $0 < \alpha < 1$.

in the absence of competition. In many Leviathan type models, however, reelection is not explicitly modeled and hence voter utility will always rise when taxes fall. Our approach appears richer because it encompasses the interaction of reelection concerns and the competition effect for mobile capital that endogenously determines the rent to politicians in equilibrium.

Finally, it is of great interest whether voter utility is larger in the open economy or not. In the standard tax competition model the fall in tax rate and public good supply would unambiguously show a utility loss. Not so here because rents to politicians fall as well. This opens the possibility that the tax rates fall so much that the increase in private consumption outweighs the loss in public good consumption. Without further assumptions the comparison appears ambiguous. This can be seen by writing the difference in utility as $u_1^P - u_N^P = k\left(t_N^P - t_1^P\right)/3 + H\left(g_1^P\right) - H\left(g_N^P\right)$, which by use of the government budget constraint can be restated as

$$u_1^P - u_N^P = \frac{1}{3}\left[\left(r_N^P - r_1^P\right) + \left(g_N^P - g_1^P\right)\right] + \left[H\left(g_1^P\right) - H\left(g_N^P\right)\right].$$

By Proposition 1 we know that $\left(r_N^P - r_1^P\right) + \left(g_N^P - g_1^P\right) < 0$, and $H\left(g_1^P\right) > H\left(g_N^P\right)$, so the first square bracket is negative while the last squared bracket is positive. The sign then depends on the relative magnitudes of the two effects. To sum up, utility increases only if the fall in taxes and rents that allow for higher private consumption exceeds the loss to the consumer in terms of lower public goods provision. While a general statement is not possible, we can identify an example in which utility falls when comparing the closed economy with a two-country world.

Example 1: To simplify the example we use a linear utility function $u_i = c_i + ag_i$, where $a > 1/3$ is a constant. We use a quadratic production function, $f(k_i) = k_i(1 - bk_i)$ for $b < 1/k_i$ and $f(k_i) = 0$ otherwise. These functional forms allow us to compute the tax rate in the open economy directly. Note that the closed economy is not first-best because of the positive rents to politicians. For parameter values: $a = 1.1, b = 0.2, k = 1, R/\gamma = 0.1$, utility in the closed economy is 0.287, whereas it is only 0.281 for $N = 2$. Utility is quickly rising, however, when increasing the number of countries. In fact, for $N = 3$ utility in the open economy is 0.332, which is higher than utility in the closed economy.

It is perhaps not surprising that the comparison between the closed economy and open economy with an *arbitrary* number of countries is ambiguous in terms of voter utility. A

different but related question is how increased openness (=larger N) affects the outcome of tax competition when the country is open already, i.e. $N \geq 2$. An increase in the number of countries means distributing the fixed world stock of both factors among more countries. The endowment ratio of capital over the fixed factor thus is unchanged in the process. In carrying out this comparative static analysis we treat N as a continuous variable, whereas in reality it is not. This is unproblematic for results concerning $N \geq 2$, as all variables are continuous. However, the approach implies that we cannot be sure that monotone comparative static results for $N \geq 2$ extend all the way to $N = 1$. For example, the tax rate elasticity for capital employed is strictly positive for $N = 2$, but equals zero for $N = 1$.

Before we state our next result we introduce a weak sufficient condition that enables us to sign the effect of increasing tax competition on the tax rate.

Assumption 1. The second-order derivatives $\partial^2 k_i/\partial t_i^2$ and $\partial^2 k_i/\partial t_i \partial N$ are nonpositive when evaluated at a symmetric tax vector.

Assumption 1 imposes structure on the third derivative of the production function, whose sign is *a priori* unclear. Note however that Assumption 1 is fulfilled for quadratic production functions. We may now state

Proposition 2. *Assume* $N \geq 2$ and *Assumption 1 holds. In a world where all countries have a parliamentary regime an increase in* N

(a) *lowers the tax rate on capital,*

(b) *decreases the rents to politicians,*

(c) *reduces public good supply when* $N \to \infty$, *and*

(d) *increases voter utility if* $\epsilon k - k_i(\widetilde{t_i}, t^P) < 0$. This condition holds when $f''(k_i)$ is a positive constant.

Proof. See the Appendix.

Increased openness unambiguously reduces the tax rate and the rents derived by politicians. The intuition follows the same logic as in our previous result. Moreover, as tax rates fall, public good supply tends to decrease as well. However, since rents to politicians fall, an increase in public good supply cannot be ruled out, unless we impose an additional

assumption on the number of countries. The most important result of Proposition 2, however, is that it provides a condition for voter utility to rise. To understand part (d) better, consider the following decomposition of the utility change

$$\begin{aligned}
\frac{du^P}{dN} &= -\frac{k}{3}\frac{dt^P}{dN} + H'(g^P)\frac{dg^P}{dN} \\
&= k\left(H'(g^P) - \frac{1}{3}\right)\frac{dt^P}{dN} - H'(g^P)\frac{dr^P}{dN} \\
&= H'(g^P)\cdot\left[(\epsilon k - k_i)\frac{dt^P}{dN} - \widetilde{t}_i\frac{\partial k_i}{\partial N}\right]. \qquad (11)
\end{aligned}$$

The first line of the decomposition describes the change in utility as a result of a fall in the tax rate - which increases private consumption - and the change in public good provision. The second line decomposes the latter effect into a tax revenue effect and a rent effect, where the former can be combined with the private consumption effect. Consequently, the first term in the second line is the traditional effect of increased underprovision of public goods due to $H'(g^P) > 1/3$. Note that utility is not necessarily decreasing, because rents to politicians fall as well. Rents are reduced for two reasons. First, the maximized tax revenue $\widetilde{t}k_i(\widetilde{t}, t^P)$ falls when more countries compete to attract capital thus lowering the tax rate that the rest of the world levies, that is $(\partial k_i(\widetilde{t}, t^P)/\partial t_{-i})\cdot(dt^P/dN) < 0$. Second, holding tax rates in all countries fixed, an increase in N lowers the capital stock in country i when the country chooses a tax rate $t_i > t_{-i}$, that is $\partial k_i(\widetilde{t}, t_{-i})/\partial N < 0$ (see Appendix 7.1). The last line of (11) then incorporates the rent effect and collects all terms that involve a tax rate change. Given these two effects, it is then easy to see then why Prop. 2d holds.

From our previous results we know that $k > k_i(\widetilde{t}_i, t^P)$, so that utility is increasing in N if the elasticity of capital demand with respect to the capital tax rate is small enough. One would think that this is more likely the lower is N. In fact, at $N = 1$, the elasticity is zero and utility is unambiguously rising. Example 1 shows, however, that the discreteness of the number of countries does matter. At $N = 2$ the elasticity is much higher and may lead to lower utility than the closed economy. Signing the utility change is difficult for another reason. The capital stock $k_i(\widetilde{t}_i, t_{-i})$ is a function of the number of countries as well, and therefore we cannot relate the inquality monotonically to N. The inequaliy is not empty however. When the production function is quadratic voter utility does increase.

In that case the higher discipline forced upon policymakers outweighs the loss in public good consumption due to fiscal externalities. In fact, it has proven impossible so far to find a condition under which utility falls. It is this aspect that may make the outcome of increasing tax competition more attractive than perhaps previously thought, in particular in Europe where the parliamentary regime dominates.

We now turn to investigate how increasing economic integration affects outcomes under a presidential-congressional system.

4 The Presidential-Congressional Regime

A presidential-congressional regime (indexed by C) differs from a parliamentary regime in that there is separation of powers. Typically, tax and expenditure decisions are made by different agenda setters (i.e., committees). Jointly these decisions must satisfy government budget balance however. We ensure this by assuming that decisions are taken sequentially, first the tax rate and then the decision how to split revenues between rents to politicians and public goods. To make things simple, we will abstract from the president and his potential veto powers.[7] In each country the sequencing of events is as follows:

1. Nature randomly selects two agenda setters among the incumbent legislators. Legislator a_i^t is responsible for tax setting, while legislator a_i^g allocates tax revenue.

2. Voters in each country set reservation utilities $\left\{\bar{u}_i^d(t_{-i})\right\}$ for their voting rule.

3. Congressional legislator a_i^t proposes t_i.

4. Congress votes over t_i. If two legislators support the proposal the tax rate is implemented. If the proposal is turned down, a default tax rate $t_i = \bar{t}_i$ is implemented.

5. Congressional legislator a_i^g proposes $\left[g_i,\ \left\{r_i^l\right\}\right]$ subject to $t_i k_i\left(t_i, t_{-i}\right) \geq g_i + \mathbf{r}_i$, where all elements are constrained to be nonnegative and the tax rate is the one chosen at stage 4.

[7] One could easily build this into the model (see Persson and Tabellini 2000, ch 10).

6. Congress votes. If two or more legislators support the expenditure proposal, the policy is implemented. If support is absent, the default policy $g_i = 0$ and $\bar{r}_i^l = t_i k_i/3$ is enforced.

7. Elections.

Voters are allowed to condition their reservation utilities on whether their legislator is the agenda setter for either taxes or public expenditure, or for neither. Note however that voters in all three district obtain the same utility because they pay the same tax and consume the same amount of public good. The agenda setting power influences the rents of politicians though. The retrospective voting rule is the same as in (7).

We now want to derive the properties of the equilibrium in which politicians are re-elected. Voters would be worse off if politicians are not reelected and maximize tax revenue without providing public goods. Providing incentives for reelection requires sufficient rents for legislators, an aspect we now study in more detail. A precise definition of equilibrium is given in the appendix.

We start by considering stages 5 and 6 of the game where the agenda setter for the expenditure needs support from at least one of the two other legislators in order to get her proposal approved. At this point tax rates in all countries are taken as given. All it takes is to offer the supporting legislator m_i a payoff r_i^m that makes her indifferent between voting yes and being reappointed, which yields utility $\gamma r_i^m + R$, and her utility under no reelection, that is the utility under the default policy $\bar{r}_i^m = t_i k_i (t_i, t_{-i})/3$. Legislator a_i^g therefore offers m_i

$$r_i^m = \frac{t_i k_i (t_i, t_{-i})}{3} - \frac{R}{\gamma}. \tag{12}$$

We assume at this point that this rent is nonnegative, but examine further below what happens if the right hand side is negative.

In addition to the supporting legislator we need to ensure that the expenditure setter seeks reelection. The maximum threat agenda setter a_i^g can impose on voters is to collect all tax revenue $t_i k_i (t_i, t_{-i})$ for herself after paying off m_i with $t_i k_i (t_i, t_{-i})/3$. Hence, in order to provide a_i^g with incentives to run for reelection, she must be offered at least

$$r_i^{ag} \geq \frac{2}{3} t_i k_i (t_i, t_{-i}) - \frac{R}{\gamma}. \tag{13}$$

Clearly (13) is positive if (12) is positive as well. From (12) and (13) it is seen that the joint incentive constraint on rents that makes legislator a_i^g and m_i seek reelection *is*

$$r_i = r_i^{a^g} + r_i^m \geq t_i k_i \left(t_i, t_{-i}\right) - \frac{2R}{\gamma}. \tag{14}$$

Equation (14) gives the requirement that the optimal voting rule must satisfy in stage 5 of the game. Voters in the district of the expenditure setting legislator set their reservation utility compatible with the incentive constraint. Obviously they will not offer more rents to politicians because for any given tax rate voter utility is increasing in public good consumption. Combining (14) and the government budget constraint means that the amount of public goods available to voters will be

$$g^C = g_i = t_i k_i \left(t_i, t_{-i}\right) - r_i = \frac{2R}{\gamma}. \tag{15}$$

As seen from (15) the public good level is completely determined, since it is a function of exogenous parameters only due to of the separation of budgetary powers. At the expenditure setting stage, tax revenue is fixed regardless of whether politicians seek reelection or not. The equilibrium public good level is then simply the sum of the exogenous benefits from being reelected for the expenditure-supporting legislators.

Next we analyze the tax setting stages 3 and 4. Recall that by assumption $a_i^g \neq a_i^t$, so neither a_i^t nor the voters in her district are the residual claimant of tax revenue. Thus for a_i^t to be reelected, the optimal voting rule requires taxes to be set as low as possible, given (14). Since by assumption there is no difference between the two legislators that may support a_i^g at stage 6, legislator a_i^t will be included in the winning coalition with probability one half. As a consequence, for a_i^t to agree to play along the path leading to reelection, she must at least be given

$$\frac{r_i^m}{2} + \frac{R}{\gamma} \geq \frac{1}{2}\left[\frac{1}{3}\tilde{t}_i k_i \left(\tilde{t}_i, t_{-i}\right)\right], \tag{16}$$

where, as before, $\tilde{t}_i = \tilde{t}_i(t_{-i})$ denotes the revenue-maximing tax rate given tax vector t_{-i}. The left hand side of this inequality is the expected equilibrium continuation value for a_i^t of being partner in the winning coalition (divided by γ). Diverted rents given to a_i^t are weighted by one half reflecting the probability of being selected as the supporting legislator at the expenditure stage. The right hand side is the expected utility that a_i^t derives if she does not seek reelection and is voted out of office (again discounted by γ).

In that case the best a_i^t can do is to propose the tax rate that maximizes tax revenue. Since at stage 5 legislator a_i^g is the residual claimant of tax revenue after paying off legislator m_i, she will always support higher taxes, and $\tilde{t}_i$ will therefore be approved by a_i^g. Since a_i^t gets one third of tax revenue in the out-of-equilibrium case, $\tilde{t}_i k_i \left(\tilde{t}_i, t_{-i}\right)$ is weighted by one third. In addition, legislator a_i^t is a member of the winning coalition with probability one half, implying a further weighing by one half. Rewriting (16) , the rent to legislator a_i^t must be

$$r_i^m \geq \frac{\tilde{t}_i k_i \left(\tilde{t}_i, t_{-i}\right)}{3} - \frac{2R}{\gamma}. \tag{17}$$

Again we assume for now that the right-hand side is non-negative. Voters in the district of the tax-setter set their reservation utility consistent with the provision of the public good - as shown in (15)- and the incentive constraints (i.e., the rent to their legislator, as shown on the right hand side of (14)). The tax rate in the open economy is then found as the solution to (12) and (17) after imposing symmetry

$$t_N^C = \frac{\tilde{t}_i k_i \left(\tilde{t}_i, t_N^C\right)}{k} - \frac{3R}{k\gamma}. \tag{18}$$

This tax rate is supported by the third legislator who in stage 6 will be in the same situation as the tax setter.

Recall that we made the initial assumption at stages 5 and 6 that the inequality $t_i k_i(t_i, t_{-i})/3 \geq R/\gamma$ holds in country i (eq. (12)). Suppose that was not the case. All other legislators then prefer reelection over no reelection even when r_i^m is zero. In other words, overall tax revenue is so small that running away with it and being ousted from office is not a relevant alternative. This outcome is of course anticipated at the tax stage. If there exists a tax rate that will make the inequality hold, the tax setter will propose so. If adopted, the tax setter is better off because in addition to reelection and earning R she also obtains rents from the government budget with positive probability. She will find support from the third legislator (who has no agenda power) for the same reason. A similar remark applies to condition (17).[8] If all countries are presidential-congressional

[8]If the right hand side of (12) is negative, the tax setter seeks reelection even if her rent r is zero. The tax rate would then be determined by (14), (15) and the government budget constraint. We assume that in equilibrium the right hand side of (12) is nonnegative, $t^* k/3 \geq R/\gamma$, making the incentive constraint nontrivial. Alternatively, if we allowed for negative rents, politicians would pay to stay in office and still seek reelection. Under this assumption, the fixed public good supply in (15) can always be financed.

democracies, the equilibrium that leads to reelection of all legislators is characterized by (15), (18) and

$$\mathbf{r}^C = t^C k - g^C = \tilde{t}_i k_i \left(\tilde{t}_i, t^C\right) - \frac{5R}{\gamma}. \tag{19}$$

where $\tilde{t}_i(t^C)$ is the revenue-maximizing tax rate in country i given t^C is chosen in all other countries. Individual rents to legislators are found by using the equilibrium tax rate (18) in (13) and (17). Also, we can use (15) and (18) to compute the equilibrium utility level u^C, which equals also the reservation utility.

The closed economy situation is a special case, which proves useful for comparison purpose. Using the same logic as before the closed economy variables are obtained by using $\widetilde{t} = f'(k)$. The closed economy is not first-best overall because rents to politicians are diverted in equilibrium. The public good level typically is not first-best either. Similar to the parliamentary regime we can now contrast the closed and open economy:

Proposition 3 *Under a presidential-congressional system, opening up the economy:*

(a) *has no effect on the provision of public goods* $\left(g_1^C = g_N^C\right)$,

(b) *reduces rents to politicans* $\left(\mathbf{r}_1^C > \mathbf{r}_N^C\right)$, *lowers taxes* $\left(t_1^C > t_N^C\right)$, *and increases voter utility* $\left(u_1^C < u_N^C\right)$ *if* $f'\left(k_i\right) k_i$ *is increasing in* k_i.

We omit a formal proof here because part (a) follows immediately from (15) and the statements on rents and taxes follow the same logic as in Proposition 1. Voter utility must increase as taxes fall, but public good provision is unchanged. The results in Proposition 3 are stronger than those under the parliamentary regime. The condition for capital tax rates and rents to fall is the same under both regimes (although it must be admitted that these are only sufficient and not necessary conditions). The key difference, however, is that the public good level is unaffected under the presidential-congressional system. This allows us to sign unambiguously the effect on voter utility. In the parliamentary regime we showed in Example 1 that in the two-country world utility can be smaller than in the closed economy.

The next result concerns the increase in the number of countries in an open economy. We get qualitative similar results to Proposition 2, which in fact hold under weaker conditions.

Proposition 4 *In a world where all countries are presidential-congressional democracies, increased openness lowers the tax rate on capital and rents to politicians, leaves public good supply unchanged, and increases voter utility.*

Proof: The effect of N on tax rates is found by totally differentiating the tax rate expression in (18). Using the envelope condition for the revenue maximizing tax rate $\tilde{t}_i$, the effect is

$$\frac{dt^C}{dN} = \frac{\frac{\tilde{t}_i}{k}\frac{\partial k_i\left(\tilde{t}_i, t^C\right)}{\partial N}}{1 - \frac{\tilde{t}_i}{k}\frac{\partial k_i\left(\tilde{t}_i, t^C\right)}{\partial t_{-i}}} < 0.$$

In the appendix we derive comparative statics results used here. In particular we show that $\partial k_i/\partial N < 0$ when country i has the higher tax rate than all other countries. Using $\tilde{t}_i = -k_i/(\partial k_i/\partial t_i)$, the denominator reduces to $1-(k_i/k) > 0$ since $(\partial k_i/\partial t_{-i})/(\partial k_i/\partial t_i) = -1$. It is then easy to see from the government budget constraint that rents to politicians fall as well: Tax rates decline and public good supply is unchanged. For that reason it is also clear that utility must increase as the number of countries goes up.■

Increased openness is beneficial by improving private consumption possibilities without affecting public good supply. Proposition 4 is in contrast to the parliamentary regime (Prop. 2) where an increase in voter utility cannot be guaranteed, and the supply of the public good falls if competition is very hard. To sum up, Propositions 1-4 and Example 1 show that the presidential- congressional system has a (weak) advantage over the parliamentary regime. This advantage can be explained by the separation of budgetary powers under the presidential-congressional system, which fixes public good supply to be proportional to the exogenous benefit from being reelected. Although a fixed and exogenous R has a meaningful and relevant interpretation, it is of interest to consider other assumptions concerning the behavior of politicians. In the next section we use a revised version of our model to investigate the case when R is completely endogenized.

5 Endogenizing the Benefits of Holding Office

In previous sections a legislator who was reelected derived utility $v_i^l = \gamma r_i^l + R$, and R was taken to be exogenous. As alluded to above, the fixed utility from being reelected could

stem from the joy of being in power and have command over the budget. A different perspective of politicians is to assume that the *only* benefit of holding office is the endogenous rent extracted from the government budget. In that case R is the expected continuation value for a legislator at the beginning of each period of holding holding office *before* nature has selected the aganda setter. When a legislator is reappointed R is determined by

$$R = \frac{r}{3} + \delta R, \tag{20}$$

where $\delta \in (0, 1]$ is a discount factor. The current-period rent r is weighted by one third because at the beginning of a period agenda-setting powers have not been assigned yet. We omit the transaction cost of rent-seeking activities (γ), since it applies to all variables pertaining to rent seeking and thus influences the utility level of politicians, but not the incentive to seek reelection. It cancels out in the calculations. For each political regime the joint incentive constraint reads

$$r = \tilde{t}_i k_i \left(\tilde{t}_i, t_{-i}\right) - 2\delta R. \tag{21}$$

We now solve for the equilibrium values under each regime by using equations (20) and (21) together with the derived values for the tax rate, rent and public good supply under each regime, as given in sections 3 and 4.[9]

Parliamentary Democracy

Using the above steps yields $R^P = \tilde{t}_i k_i \left(\tilde{t}_i, t^P\right) / (3 - \delta)$, and substituting R^P into the static equilibrium values of the fiscal variables gives us

$$r^P = \theta \cdot \tilde{t}_i k_i \left(\tilde{t}_i, t^P\right), \quad g^P = H'\left(\frac{1}{3(1-\epsilon)}\right), \quad t^P = \frac{r^P + g^P}{k} \tag{22}$$

where $\theta \equiv 3(1 - \delta) / (3 - \delta) \in [0, 1)$, and the tax rate is implicitly defined by combining the last two conditions. Naturally, the structure of the equilibrium values here are similar

[9]Note that the main difference between this section and the previous sections is not that the present model is dynamic and the other one was not, but rather the distinction between exogenous, non-budget related rents on the one hand, and endogenous, budget-related rents on the other hand. A dynamic model in which (almost) all future rents are exogenous can be easily built, giving the same results as derived above. Condition (20) would be replaced by $R = F + \delta R$, where F is now the per-period exogenous rent from holding office. For this model the expected continuation value is $R = F/(1 - \delta)$ and the analysis would proceed as done in sections 3 and 4.

to the ones in section 3. Instead of adding a constant to the variable part $\tilde{t}_i k_i$ of the rent r, we now scale the variable part by an expression that involves only the discount factor. For that reason differentiating r^P, t^P, and g^P with respect to N does not change qualitatively any of the results we obtained in Proposition 2. Note, however, that δ has to be sufficiently large, and hence θ to be sufficiently small, so that public good supply, which can be written as $g^P = t^P k - \theta \cdot \tilde{t}_i k_i \left(\tilde{t}_i, t^P\right)$, is nonnegative in equilibrium. Voter utility can now be derived by inserting (22) into (3).

Of particular interest to us is the change in voter utility following increased openness,

$$\frac{du^P}{dN} = H'(g^P) \cdot \left[(\varepsilon k - \theta k_i) \frac{dt^P}{dN} - \theta \cdot \tilde{t}_i \frac{\partial k_i \left(\tilde{t}_i, t^P\right)}{\partial N} \right], \tag{23}$$

which corresponds to eq. (11) in section 3. Note that θ tends to reduce those terms that increase voter utility as the number of countries goes up. One insight now follows from (23). When the discount factor equals one, the scale parameter is zero and utility falls whenever tax rates decline and there are at least two countries. Intuitively, when politicians value the future as strongly as the present, the current period rent becomes arbitrarily small. An increase in competition then doesn't increase voter utility but only aggravates the underprovision problem. Furthermore, at $N = 1$ utility is unchanged when the discount rate takes its maximum value, as the elasticity is zero (whereas it was zero in section 3).

Presidential-Congressional Democracy

We can solve for the equilibrium values in a similar fashion and obtain $R^C = \tilde{t}_i k_i \left(\tilde{t}_i, t^C\right) / (3 + 2\delta)$. Fiscal policy variables in equilibrium when legislators are reelected become

$$r^C = \frac{3(1-\delta)\tilde{t}_i k_i \left(\tilde{t}_i, t^C\right)}{(3+2\delta)}, \quad t^C = \frac{(3-\delta)\tilde{t}_i k_i \left(\tilde{t}_i, t^C\right)}{k(3+2\delta)}, \quad g^C = \frac{2\delta \tilde{t}_i k_i \left(\tilde{t}_i, t^C\right)}{(3+2\delta)} \tag{24}$$

Again, differentiating r^C and t^C with respect to N yields the same qualitative results as in Proposition 4. However, the effect of a change in N on g^C now differs. Here $dg^{\acute{C}}/dN < 0$ for the same reason as in the static model and rents to policians fall. Recall that in our previous section public good supply was invariant to changes in N so that an increase in N always improved voter utility. The latter is true here only if the discount factor is

sufficiently small and the marginal benefit of the public good is (almost) linear. To see this, we differentiate utility with respect to N and obtain

$$\frac{du^C}{dN} = \frac{\partial\left(\tilde{t}_i k_i\left(\tilde{t}_i, t^C\right)\right)}{\partial N}\left(\frac{1}{3+2\delta}\right)\left[\frac{\delta-3}{3} + 2\delta H'\left(g^C\right)\right].$$

Since the first term is negative, utility is increasing if the square bracket is negative as well. For fixed and finite $H'(g)$, there exists a sufficiently small $\delta > 0$ that makes the the bracket negative. A second insight follows from noting that for δ equal one, utility is decreasing whenever there is underprovision of the public good, that is $H'(g) > 1/3$.

While the two regimes behave similar at extreme values of the discount factor, we can try to compare the set of parameter values for which under each regime utility is constant in N. A general characterization turns out to be difficult. Some insights can be offered though. Under the presidential-congressional regime, the critical value of the discount rate that defines $du^C/dN = 0$ is given by

$$\widehat{\delta}^C = \frac{3}{6H'(g^C)+1}. \tag{25}$$

The value is only implicitly defined because public good supply is a function of the tax rate, which in itself depends on the discount factor. We can derive a similar expression for the parliamentary regime, for which the critical value is

$$\widehat{\delta}^P = \frac{3(1-z)}{3-z}, \tag{26}$$

where $z \equiv \epsilon k \frac{dt^P}{dN}/(k_i \frac{dt^P}{dN} + \widetilde{t}_i \frac{\partial k_i}{\partial N}) \geq 0$. Comparing the two critical values in (25) and (26) is not trivial because in general both right-hand sides depend on all parameters. An exception is the case where the marginal utility of the public good is constant and greater than one third, in which case $\widehat{\delta}^C$ is uniquely defined and less than one. The value of z determines the size of $\widehat{\delta}^P$. When z becomes sufficiently close to zero, for example by varying the curvature of the production function and/or the number of countries, $\widehat{\delta}^P$ becomes one and the parliamentary regime thus has the higher threshold value. In fact, this scenario holds for the specific functional forms used in Example 1. The opposite result obtains if z becomes sufficiently large (e.g., equal or greater than one) and hence $\widehat{\delta}^P$ gets very small. In that case the presidential regime is superior. We summarize in

Proposition 5 *Assume the only benefit of holding office is the power to divert government revenues for own purposes.*

(a) Increasing tax competition is beneficial under both regimes if the discount factor of politicians is small, but harmful if the discount factor is sufficiently large.

(b) Under the presidential-congressional system voter utility is increasing in N for a larger set of discount factors than under the parliamentary regime iff $(6H'(g^C)+1)^{-1} > (1-z)/(3-z)$.

We conclude this section with a final observation. Note that under the parliamentary regime public good supply is zero for all $\delta's$ smaller or equal to some $\underline{\delta} > 0$. For discount rates below this value utility is then increasing in the number of countries, as only private consumption increases when tax rates fall. While utility is improving, a zero public good supply is problematic, in particular when the marginal utility of public goods is high. Such a problem does not arise under the presidential-congressional regime where public good supply is positive as long as the discount rate is positive.

6 Concluding Remarks

There is considerable dissent about the outcome of increasing competition among jurisdictions for mobile capital. Those who see individual governments as acting in the interest of their constituency believe that competition is harmful due to a fiscal externality. By contrast, the Leviathan view of government takes the position that competition is beneficial since it curbs the rent-seeking activities of politicians. This paper has set up a model that endogenizes both effects within a single framework in order to see which argument commands the field at the end of the day. In addition we study the role of political and budgetary institutions which allows us to explain different responses to increasing economic integration across the Atlantic.

A benchmark result is that voters must allow politicians some rents for them to seek reelection. As a consequence, the closed economy entails too high taxes for the first best to be achieved. This is true even though in a parliamentary democracy public good provision is at its first-best level. A closed economy under a presidential-congressional system is not efficient both because of government waste and inadequate spending on the public good. In our base model, where politicians seek reelection since it gives them (exogenous) pleasure to be in power, opening up the economy under both political regimes leads to a fall in taxes and rents to politicians. The effect on the public good and voter utility

differs slightly between regimes however. In a world with only parliamentary democracies opening up leads to a fall in public good provision, and the effect on voter utility is generally ambiguous. In contrast, under presidential-congressional regimes the supply of the public good is unaffected and voter utility rises.

Intensified competition over capital (i.e., more countries compete) yields similar results. Voter utility rises in a setting with parliamentary regimes if the marginal product of capital is a positive constant. Under presidential-congressional systems a rise in voter utility is guaranteed. A general insight from our study is therefore a slight presumption in favor of the presidential-congressional system. The difference in results between the two political systems is driven by the separation of budgetary powers (presidential-congressional regime) or the lack of it (parliamentary regime). We also consider an alternative formulation of political behavior where the motive of politicians for reelection is driven by the power to siphon off resources from public budgets for their own benefit. This behavioural assumption yields similar, but not identical results. In particular, the latter assumption seems to make it more likely that tax competition is harmful under both political systems if the future is not discounted too heavily.

In our analysis we have made a number of simplifying assumptions, two of which we would like to discuss in further detail below, suggesting that the thrust of our results should survive in more general settings. The first pertains to introducing a second tax instrument in addition to the capital tax. Such a tax, levied on the immobile factor would clearly eliminate the fiscal competition problem because a tax on an immobile and inelastically supplied factor is lump sum. The equilibrium would not be first-best due to rents obtained by politicians. Yet the main question of our analysis - the effect of increasing competition for mobile capital - could not be meaningfully answered in such a framework. To remedy this shortcoming, one could allow for elastic supply of the second factor, which may represent labor.

In a model setting with elastic supply of the second factor and a fixed world stock of capital, a decline in capital tax rates - induced by more competition - is likely to reduce overall tax revenues, as in our model. In a symmmetric equilibrium capital employed is unchanged implying that gross wages are constant. Therefore a positive labor supply response (that would increase revenues from the labor tax) cannot be expected. In addition, any increase in the labor tax becomes more costly with increasing N because the result-

ing decline in labor supply triggers a bigger outflow of capital. The loss in government revenue has different consequences under the political regimes. As in our base model, in a presidential-congressional regime taxes are already set when representatives choose expenditures. We therefore expect public good supply to be unaffected by globalization in the more general setting as well. By contrast, the simultaneous choice of taxes and expenditures under a parliamentary democracy is likely to translate into lower public good provision, and thus a potential decline in voter utility.

Returning to the case with only capital taxes, a second expansion of the model is to consider an additional expenditure instrument. Following Persson, Roland and Tabellini (2000) politicians use tax money to make transfers to their regional constituencies. The separation of powers in a presidential-congressional regime allows the expenditure-setting legislator to direct transfers to her voters who trade off transfers with the provision of a public good. The lack of separation under a parliamentary democracy leads to more public good provision because voters in the majority districts internalize the benefits of the provision of the public good among themselves. With quasilinear preferences (linear in private consumption) a fall in tax revenue due to increasing tax competition would *prima facie* reduce transfers under both regimes, and not public good provision. Note, however, that transfers need to be nonnegative, implying that when the constraint is binding, public good supply would fall. Whether and when the constraint is binding or not depends in a nontrivial way on the parameters of the model. What can be said, however, is that for a given amount of spending on transfers and the public good, the constraint is more likely to be binding under the parliamentary regime precisely because public good supply is higher in the Persson, Roland and Tabellini (2000) framework. This tends to make the parliamentary regime more prone to negative effects from globalization.

Our base model has both positive and normative implications. In particular, increasing competition for mobile capital reduces the size of the government and overall paints a fairly positive picture of the effects of globalization. This is in explicit contrast to Rodrik (1998) who argues that more openness leads to bigger governments and, most likely, lower welfare. The difference can readily be explained, yet it is interesting. More openness in Rodrik's work leads to higher external risk (measured by the volatility of the terms of trade times the trade-in-GDP share), to which governments respond by increasing the public sector either through more government employment or bigger transfer payments to individuals. Obviously, we ignore the risk argument of increasing openness and therefore

perhaps overestimate the implications of our model, regarding both the fall in the size of government and its positive welfare implications. Since the size of government as share of GDP has been relatively stable in most industrialized countries over the last two decades, Rodrik's point seems well taken.[10] On the other hand, Rodrik does not address the issue that we do: How can governments raise revenues to finance the welfare state when tax bases become more mobile? Rodrik's empirical finding that more open economies have bigger governments is based on data from the late 1980s and early 1990s. The dramatic increase in international capital mobility over the last decade may eventually undermine the desire to increase the government sector. Whether people will be worse off or not, then depends on the relative strength of increasing, unmitigated external risk on the one hand and less government waste on the other hand.

7 Appendix

7.1 Useful Comparative Statics Results

Often we are interested in the situation where country i sets tax rate t_i and all other countries choose a common tax rate t_{-i}. We first derive how changes in tax rates affect the capital stock in country i, followed by how for given tax rates an increase in the number of countries affects k_i. The latter means distributing the fixed world supply of both factors to more countries on an equal basis.

All comparative static results are derived by totally differentiating the arbitrage condition (1) together with the condition for capital market equilibrium. In the situation where all countries other than i choose the same tax rate $t_j = t$, capital market equilibrium requires $k_i + (N-1)k_j = N\overline{k}$. We obtain

$$\left.\frac{\partial k_i}{\partial t_i}\right|_{t_i \neq t_j = t} = -\left.\frac{\partial k_i}{\partial t_j}\right|_{t_i \neq t_j = t} = \frac{(N-1)}{(N-1)f''(k_i) + f''(k_j)} < 0. \tag{A1}$$

[10] Note that tax rates on capital have fallen in many industrialized countries over the last two decades. See Sorensen (2000) for a more detailed discussion.

In a symmetric tax situation, these expressions simplify to

$$\frac{\partial k_i}{\partial t_i} = -\frac{\partial k_i}{\partial t_j} = \frac{1}{f''(k)} \frac{N-1}{N} < 0,$$

where $k = \overline{k}$. Furthermore we obtain

$$\frac{d\rho}{dt_i} = f''(k_i) \frac{\partial k_i}{\partial t_i} - 1 < 0,$$

which in the symmetric case reduces to $-1/N$.

For the same general situation we consider also an increase in the number of countries while holding all tax rates constant, that is, we consider adding countries that choose the same tax rate $t_j = t$ for all $j \neq i$. This changes the capital stock in country i if country i has a different tax rate in place than the rest of the world. Formally,

$$\left.\frac{\partial k_i}{\partial N}\right|_{t_i \neq t_j = t} = \frac{f''(k_j) \cdot (k_i - k)}{(N-1) \cdot [(N-1) f''(k_i) + f''(k_j)]}. \tag{A2}$$

It is easy to see that k_i increases (decreases) when $k_i > (<) k$, which is equivalent to saying that $t_i < (>) t_j = t$.

7.2 Parliamentary regime

We define an equilibrium in the parliamentary regime (P) as follows:

Definition 1. *An equilibrium in the parliamentary regime is characterized by a policy vector*

$$\mathbf{q}_i^P(\bar{\mathbf{u}}_i(t_{-i})) = \left[t_i^P(\bar{\mathbf{u}}_i(t_{-i})),\ \left\{\mathbf{r}_i^P(\bar{\mathbf{u}}_i(t_{-i}))\right\},\ g_i^P(\bar{\mathbf{u}}_i(t_{-i}))\right]$$

and the reservation utilities $\bar{\mathbf{u}}_i^P(t_{-i})$ and $\bar{\mathbf{u}}_i^{P'}(t_{-i})$ for all countries i, such that for any policy vector and reservation utilities in any other country j ($i \neq j$), the expected equilibrium outcome satisfies:

A. *for any given vectors $\bar{\mathbf{u}}_i(t_{-i})$ and budgetary proposal at stage 3, the junior coalition partner m optimally chooses to veto or accept any proposal, given the expected reservation utilities $\bar{u}_i^{d'}(t_{-i})$ and the expected policy outcome in stage $\hat{6}$, and given the expected policy outcomes and reservation utilities in all other countries;*

B. *the reservation utilities* $\bar{u}_i^{dP'}(t_{-i})$ *are optimal for the voters in each district* d *in country* i *after a government crisis at stage 4, conditional on that policies are set according to* $\bar{\mathbf{q}}_i^{P'}\left(\bar{\mathbf{u}}_i^{P'}(t_{-i})\right)$, *that reservation utilities* $\bar{u}_j^{dP'}(t_{-i})$ *are optimal for voters in each district* d in *country* j *after a crisis, and taking into account that policies in all other countries are set according to* $\bar{\mathbf{q}}_j^{P'}\left(\bar{\mathbf{u}}_j^{P'}(t_{-j})\right)$ and $i \neq j$;

C. *for any given reservation utility* $\bar{\mathbf{u}}_i(t_{-i})$ *and* $\bar{\mathbf{u}}_i'(t_{-i})$ *(and likewise* $\bar{\mathbf{u}}_j'(t_{-i})$ *and* $\bar{\mathbf{u}}_j'(t_{-i})$, $i \neq j$*), the agenda setting minister* a_i *prefers*

$$\mathbf{q}_i^P(\mathbf{u}_i(t_{-i})) = \left[t_i^P(\bar{\mathbf{u}}_i(t_{-i})),\ \left\{\mathbf{r}_i^P(\bar{\mathbf{u}}_i(t_{-i}))\right\},\ g_i^P(\bar{\mathbf{u}}_i(t_{-i}))\right]$$

given conditions A and B, $t_i k_i(t_i, t_{-i}) = g_i + \mathbf{r}_i$, and $\mathbf{q}_j^P(\mathbf{u}_j(t_{-i})), i \neq j$;

D. *the reservation utilities* $u_i^{dP}(t_{-i})$ *are optimal for the voters in each district* d *in all countries* i*, taking into account that policies are set according to* $\mathbf{q}_i^P\left(\mathbf{u}_i^P(t_{-i})\right)$, *takes as given* $\bar{\mathbf{u}}_i^{P'}(t_{-i})$, *that policies after a government crisis are set according to* $\bar{\mathbf{q}}_i'\left(\bar{\mathbf{u}}_i^{P'}(t_{-i})\right)$, *and takes as given optimal reservation utilities in each district in all other countries as well as crisis policies in all other countries* $j \neq i$.

Derivation of Equation (9). The maximization problem under the parliamentary regime is

$$\max_{t_i, g_i}\ u_i = \frac{f(k_i) - f'(k_i)\, k_i}{3} + \rho\frac{k}{3} + H(g_i)$$

subject to

$$\mathbf{r}_i = \tilde{t}_i k_i\left(\tilde{t}_i, t_{-i}\right) - \frac{2R}{\gamma}, \quad t_i k_i(t_i, t_{-i}) = g_i + \mathbf{r}_i,\ \rho = f'(k_i) - t_i \geq 0,\ \text{and}$$

the capital market clearing condition. The rate of return ρ must be positive in the optimum because a small reduction in t_i that makes ρ slightly positive implies a large inflow of capital. By the Inada conditions we know that the supply of g_i is non-negative. Substituting the rent constraint in the government budget constraint, and this in turn into $H(g_i)$, we obtain a maximization problem without constraints in one control variable t_i. The corresponding first-order condition is then

$$\frac{-f''(k_i)\, k_i \frac{\partial k_i}{\partial t_i} + k\frac{\partial \rho}{\partial t_i}}{3} + H'(g_i) \cdot \left[k_i + t_i \frac{\partial k_i}{\partial t_i}\right] = 0.$$

Using symmetry of equilibrium, properties from section 7.1, and the definition of the tax rate elasticity of capital demand, this reduces to equation (9). The other variables are now implicitly defined by the government budget constraint and the individual utility function.

Proof of Proposition 2. Our first step in proving Proposition 2 is to derive the effect of N on the equilibrium tax rate. The latter is implicitly defined by the first-order condition (9), using the government budget constraint to replace the public good, $g^P = t^P k - r^P = t^P k - \widetilde{t} k_i(t_i, t^P) + 2R/\gamma$. Total differentiation gives

$$\frac{dt^P}{dN} = \frac{\frac{1}{3}(1-\epsilon)^{-2}\frac{\partial \epsilon}{\partial N} - H''\left(g^P\right)\frac{\partial g^P}{\partial N}}{H''\left(g^P\right)\frac{\partial g^P}{\partial t^P} - \frac{1}{3}(1-\epsilon)^{-2}\frac{\partial \epsilon}{\partial t^P}} < 0,$$

where by Assumption 1 $\frac{\partial \epsilon}{\partial t^P} = -\frac{1}{k}\left[\frac{\partial k_i}{\partial t_i} + \frac{\partial^2 k_i}{\partial t_i^2}\right] > 0$ is the partial effect on ϵ of one country increasing its tax rate in a symmetric equilibrium, and $\frac{\partial \epsilon}{\partial N} = -\frac{t}{k}\left(\frac{\partial^2 k_i}{\partial t_i \partial N}\right) > 0$ is the effect of N on the tax rate elasticity in the symmetric equilibrium holding tax rates constant. Furthermore, the partial derivatives $\partial g^P/\partial t^P = k - \widetilde{t}\partial k_i(t_i, t^P)/\partial t^P = k + k_i \cdot [(\partial k_i/\partial t_{-i})/(\partial k_i/\partial \widetilde{t})] = k - k_i > 0$ and $\partial g/\partial N = -\widetilde{t} \cdot \partial k_i/\partial N > 0$ give the direct effects of a change in the tax rate and the number of countries on public good supply, holding tax rates constant in the latter case.

Next we consider the effects on politicians' rents, which in equilibrium are $\mathbf{r}^P = \tilde{t}_i k_i\left(\tilde{t}_i, t^P\right) - \frac{2R}{\gamma}$. Using the envelope condition for $\tilde{t}_i$ and substituting for the revenue-maximizing tax rate, we obtain

$$\frac{d\mathbf{r}^P}{dN} = \tilde{t}_i\left[\frac{\partial k_i}{\partial t_{-i}}\frac{\partial t^P}{\partial N} + \frac{\partial k_i}{\partial N}\right] < 0,$$

where we used our previous result on equilibrium tax rates, $\partial k_i/\partial t_{-i} > 0$ is the effect on k_i when all other countries raise taxes, and $\partial k_i/\partial N < 0$ is the effect of N on k_i, holding all tax rates constant, when $t_i > t_j = t$ for all countries j other than i (see our derivations at the beginning of the appendix). Thus rents fall.

We next do comparative statics on g^P using previous results, which yields

$$\frac{dg^P}{dN} = \frac{dt^P}{dN} \cdot k - \frac{d\mathbf{r}^P}{dN} = \left[k - k_i\left(\tilde{t}_i, t^P\right)\right]\frac{dt^P}{dN} - \tilde{t}_i\frac{\partial k_i\left(\tilde{t}_i, t^P\right)}{\partial N}.$$

The sign appears ambiguous because the first term is negative (the tax rate falls), while the second one is positive, reflecting that an increase in the number of countries lowers the maximum revenue politicians can extract when they don't seek reelection. For $N \to \infty$, however, we see from (A2) that $\partial k_i/\partial N$ converges to zero, leading to a decline in public good supply.

The final step is the derivation of du^P/dN. In the symmetric equilibrium utility in a representative country is given by (3). Differentating this and using our previous results yields

$$\begin{aligned}\frac{du^P}{dN} &= -\frac{k}{3}\frac{dt^P}{dN} + H'\left(g^P\right)\frac{dg^P}{dN} \\ &= \frac{1}{3\left(1-\epsilon\right)}\left[\epsilon k - k_i\right]\frac{dt^P}{dN} + H'\left(g^P\right)\cdot\frac{\partial g^P}{\partial N}.\end{aligned}$$

Since $\partial g^P/\partial N > 0$ (because politicians' rents fall for given tax rates), utility is increasing if the square bracket is negative. We can write

$$\epsilon k - k_i = (N-1)\cdot\left[\frac{\widetilde{t}_i}{(N-1)f''(k_i) + f''(k_j)} - \frac{t^P}{N\cdot f''(k)}\right],$$

where k_j is the typical capital stock in all countries other than i that have the same tax rate. We can sign the term in square brackets when the production function is quadratic and hence f'' is a constant. In that case $\epsilon k - k_i$ reduces to $(N-1)(\widetilde{t}_i - t^P)/Nf''(k) < 0$. We can conclude that $du^P/dN > 0$.

7.3 Presidential-Congressional System

We define an equilibrium in the presidential-congressional regime (C) as follows:

Definition 2. *An equilibrium in the presidential-congressional regime is characterized by a policy vector*

$$\mathbf{q}_i^C\left(\bar{\mathbf{u}}_i\left(t_{-i}\right)\right) = \left[t_i^C\left(\bar{\mathbf{u}}_i\left(t_{-i}\right)\right),\ \left\{\mathbf{r}_i^C\left(t_i^C\left(\bar{\mathbf{u}}_i\left(t_{-i}\right),\bar{\mathbf{u}}_i\left(t_{-i}\right)\right)\right),\ g_i^C\left(t_i^C\left(\bar{\mathbf{u}}_i\left(t_{-i}\right),\bar{\mathbf{u}}_i\left(t_{-i}\right)\right)\right)\right\}\right]$$

and a vector of reservation utilities $\bar{\mathbf{u}}_i^P\left(t_{-i}\right)$ *for all countries* i *such that the expected equilibrium outcome satisfies:*

A. *for any given vector* $\bar{\mathbf{u}}_i(t_{-i})$ *at stage 4, at least one other legislator* $l \neq a_i^t$ *weakly prefers to accept the proposed tax rate* t_i*, given the expected equilibrium proposals and the outcome at later stages of the game in country* i *as well as in any other country* j $(i \neq j)$*;*

B. *for any given vector* $\bar{\mathbf{u}}_i(t_{-i})$*, at stage 3,* a_i^t *prefers* t_i *to any other tax rate that may satisfy the requirement in* **A***, given the expected equilibrium proposals and the outcomes at later stages of the game in country* i *as well as in any other country* j $(i \neq j)$*;*

C. *for any given* t_i *and* $\bar{\mathbf{u}}_i(t_{-i})$*, at stage 5, at least one legislator* $l \neq a_i^g$ *weakly prefers to accept rather than to reject the proposal*

$$\mathbf{g}_i^C\left(t_i\left(\mathbf{u}_i\left(t_{-i}\right)\right),\ \mathbf{u}_i\left(t_{-i}\right)\right),\ \left\{\mathbf{r}_i^C\left(t_i\left(\mathbf{u}_i\left(t_{-i}\right)\right),\ \mathbf{u}_i\left(t_{-i}\right)\right)\right\};$$

given the proposals $\mathbf{g}_j^C\left(t_j\left(\mathbf{u}_i\left(t_{-j}\right)\right),\ \mathbf{u}_j\left(t_{-j}\right)\right),\ \left\{\mathbf{r}_j^C\left(t_j\left(\mathbf{u}_j\left(t_{-j}\right)\right),\ \mathbf{u}_j\left(t_{-j}\right)\right)\right\}$ for all j, $i \neq j$;

D. *for any given* $\bar{\mathbf{u}}_i(t_{-1})$ *and* t_i *at stage 5, legislator* a_i^g *prefers the proposal*

$$\mathbf{g}_i^C\left(t_i\left(\mathbf{u}_i\left(t_{-i}\right)\right),\ \mathbf{u}_i\left(t_{-i}\right)\right),\ \left\{\mathbf{r}_i^C\left(t_i\left(\mathbf{u}_i\left(t_{-i}\right)\right),\ \mathbf{u}_i\left(t_{-i}\right)\right)\right\}$$

to any other proposal satisfying **C** *and the budget constraint, taking into account proposals in all other countries* $j \neq i$*;*

E. *the reservation utilities* $u_i^{dC}(t_{-i})$ *are optimal for all voters in each district* d *in all countries, and takes as given that policies in the current period are set according to* $\mathbf{q}_i^C\left(\mathbf{u}_i^C\left(t_{-i}\right)\right)$ *for given reservation utilities in all districts in all countries, as well as the identity of all* a_i^t *and* a_i^g *in all countries.*

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