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Politicians and Political Institutions

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The Welfare Effects of Tax Competition Reconsidered: Politicians and Political Institutions

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Abstract

The views on the welfare effects of tax competition differ widely. Some see the fiscal externalities as the cause for underprovision of public goods, while others see tax competition as means to reduce government inefficiencies. We build a model that allows for both views by taking politics seriously. Using a comparative politics approach we show that tax competition among presidential-congressional democracies is typcially welfare improving, while harmful among parliamentary democracies if under the latter the marginal benefit of the public good is sufficiently high. The results hold when politicians seek re-election because of exogenous benefits of holding office. By contrast, when politicians hold office only to extract rents, tax competition is harmful if politicians are sufficiently patient.

1

1   Introduction

In the debate on tax competition two rather extreme views dominate both in the academic literature and in the policy arena. In the canonical tax competition model benevolent governments set tax rates without taking into account the effect national tax policy has on other countries' tax bases. As a result, a fiscal externality arises that makes competition harmful in the sense that tax rates are set too low and public goods are underprovided in equilibrium (e.g., Zodrow and Mieszkowski (1986) and Wilson (1986); Wilson (1999) surveys the literature). This view is in sharp contrast to the thinking of conservative policymakers and the Public Choice literature who argue that competition in general, and competition among governments in particular, is beneficial because it reduces government waste and disciplines politicians (see, for instance, Brennan and Buchanan (1980), or McLure (1986)).

   The focal point in this study is to ask how competition over mobile capital affects voter utility under different institutional settings. In order to answer this question we set up a benchmark model of tax competition that incorporates the two views expressed above. Citizens (voters) delegate decisions about fiscal policy to politicians whose concerns are self-interested rather than benevolent. The political process must determine the level of taxation and public goods supply, taking into account that tax policy in other countries jointly determine the international division of capital. Voters hold their legislators accountable for past performance in first-past-the post elections and thus partly discipline politicians. The conflicts of interest between voters and politicians and the competition over mobile tax bases are resolved differently under different political institutions.

   We compare the outcomes of increasing capital tax competition under two different political regimes, namely presidential-congressional and parliamentary democracy, in a setting where politicians value rents and reelection to office. Building on the formal approach for a closed economy by Persson, Roland and Tabellini (2000), a presidential-congressional system features shifting majorities in the legislature that are issue dependent (here the revenue and expenditure sides of the government budget). The majority that passes tax policy may differ from the majority passing the expenditure allocation. Thus shifting majorities limit the possibility of rent-seeking and increases accountability of elected policy makers. By contrast, in a parliamentary democracy a cohesive majority passes the entire budget in one vote. In a closed economy the cohesive majority in a parliamentary regimes tends

to deliver more public goods than under a presidential system because it appeals to voters from all supporting legislators' districts. Yet, the system has also a negative consequence because the majority coalition is powerful and therefore tends to extract more rents.

Our first central result is derived in a model where the benefits of reelection are exogenous (e.g., the joy of power). Introducing tax competition among many countries with identical political structures is typically beneficial under the presidential system, but harmful under the parliamentary regime when consumers value public goods sufficiently. Under a presidential system tax competition leaves public good supply unaffected, and when it reduces taxes (which happens when capital is sufficiently responsive to tax changes) makes citizens better off. Under the parliamentary regime the underprovision in public goods in the closed economy (due to rent-seeking) is further aggravated by competition over mobile capital and this latter effect is not compensated by falling rents to politicians if public goods are very desirable to citizens.

We extend the model into a dynamic setting and analyze the factors that influence a politician to seek reelection. In the static version politicians benefit both from rents extracted from the current budget and from holding office in the future, where the latter is an exogenous gain. In our dynamic version the *only* benefit from staying on in power is the present value of extracting rents in the future. Our second main result shows that the welfare effects of tax competition depend on the objective function of politicians (joy of power vs. rent extraction), as well as their patience measured by the degree of discounting future rent extraction. Under the presidential-congressional system tax competition fails to generate welfare improvements when politicians are merely interested in extracting rents and are sufficiently patient. We focus on the presidential system on purpose because our second main result contrasts with our first main result, demonstrating the importance of politicians' objectives and patience, plus their interplay with political institutions.

Our finding may be surprising at first glance. Shortsightedness of politicians is usually viewed as detrimental to welfare. Here it is as well, as high discounting of future office holding requires a high *level* of rents in the current period. Our point, however, is that the *change* in rents is what matters for the welfare evaluation of tax competition. Increasing international capital mobility is beneficial for citizens if per period rents are high due to impatient politicians and are therefore reduced by tax competition.

There are relatively few studies that have formally modelled the role of

self-interested politicians in the context of tax competition. Edwards and Keen (1996) consider a policy maker who values rents and citizen welfare, and ask whether tax coordination improves consumer welfare. The answer depends on the utility functions of the policy maker and the representative consumer as well as the degree of capital mobility. Eggert and Sorensen (2006) extend the idea of Edwards and Keen by endogenizing government inefficiency in the form of public sector wages. Using a probabilistic voting model politicians use public sector wages to become more attractive to certain voters. Unlike our model, however, elections and/or political institutions are not modelled explicitly in these papers. Our comparative politics perspective is therefore unique and shows that political institutions matter and interact with the factors driving politicians to seek reelection.

There are other papers that are more peripheral to our analysis and that also examine welfare effects of tax competition. Lorz (1998) shows that wasteful lobbying is reduced with increasing tax competition. Rauscher (1998) finds that Leviathan may be tamed by interjurisdictional competition if a government uses benefit taxes, e.g., user charges. Besley and Smart (2001) investigate in an adverse selection model when tax competition may help in identifying bad politicians. Finally, Wildasin and Wilson (2001) analyze the welfare effect of lobby groups that compete for political favors by relating contributions to the government's subsequent choice of tax rates in a single and many-region case.

Our analysis extends the comparative politics literature in the tradition of Persson and Tabellini (2000) and Persson, Roland and Tabellini (2000) who contrast the two political regimes in a closed economy setting with non-distortionary lump sum taxes. In the open economy it is well known that capital taxes are distortionary and affect location decisions. The role of perks in office vs. monetary benefits to politicians is analyzed in detail by Diermeier, Keane and Merlo (2005), who show that policy motivations and perks play an important role in the decision to enter a career as politician.

The outline of the analysis is as follows. In section 2 we set up a standard tax competition model and expand it to allow for a single, self-interested policy maker. In section 3 we use this model to analyze the effect of tax competition in a world with parliamentary democracies or presidential-congressional democracies, by dividing each country into three electoral districts. Section 4 endogenizes the benefit of reelection and analyzes the role of patience of politicians. The last section concludes.

4

2 The benchmark model

We consider a standard tax competition model with N symmetric countries who compete for mobile capital by setting a capital tax. Production in country i is described by a production function $f(K_i, L_i)$, with K_i being the amount of capital and L_i being a second factor (say labor or entrepreneurial services), where the latter is inelastically supplied and internationally immobile. The production function exhibits constant returns to scale in capital and labor. Suppressing the second factor in notation, marginal product of capital is positive but decreasing $f'' < 0 < f'$. Output produced is used for private consumption or transformed into a public good g at a marginal rate of transformation of one. K is the amount of capital owned by citizens in each country, and hence the total world stock of capital is NK.

In an open economy with perfectly mobile capital, the marginal returns net of tax are equalized across countries so that

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

where ρ is the equilibrium return on capital, t_i is the tax per unit of capital in country i, and - as seen from (1) - the amount of capital used in country i, K_i, depends on all tax rates. In what follows 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. We assume throughout that N is large, so that the after-tax return on capital is taken as given by each country in the open economy. The equilibrium after-tax return to capital is endogenous however, and is determined by all tax rates.

A representative citizen located in country i derives utility from public goods provision g_i and private consumption c_i. We assume specific preferences given by

$$u(c_i, g_i) = c_i + \begin{cases} \alpha g_i \text{ if } g_i \leq g^* \\ \alpha g^* \text{ if } g_i > g^* \end{cases} \tag{2}$$

where $\alpha \geq 1$ is a constant and g^* denotes the satiation level (assumed to be less than maximum production in a closed economy $f(K)$). The utility function (2) implies a constant marginal benefit of the public good up to g^*, and allows us to use α as a simple parameter of interest in our later analysis. The existence of the satiation level g^* will define the first-best level of public good provision. Private consumption is given by

$$c_i = f(K_i) - f'(K_i) K_i + \rho K, \tag{3}$$

where the first two terms in (3) represent the income from the second factor when K_i is employed, and ρK is capital income net of taxes.

In the remainder of this section we explore two scenarios. First, we consider a benevolent politician who maximizes the utility of the country's representative citizen. Second, we introduce a self-interested politician who likes to divert money from the government budget, but who gains from reelection and is thereby partially disciplined. In both scenarios we compare the closed economy with the open economy (N large), showing that under a benevolent politician the closed economy dominates the open one, while the reverse can happen with a self-interested politician.

Welfare maximizing government   A single politician conducts policy on behalf of all citizens by maximizing utility subject to the budget constraint

$$t_i K_i = g_i.$$

In a *closed economy*, the after-tax return on capital (1) reduces to $f'(K) - t = \rho$, where the subscript has been omitted, and (3) becomes $c = f(K) - tK$. The benevolent policymaker maximizes (2) subject to the simplified private budget constraint and the government budget constraint. When $\alpha > 1$, utility is increasing in the tax rate as long as $g \leq g^*$, and hence the optimal public good level is set equal to the satiation level g^*. The tax rate adjusts to balance the government budget. Utility in the optimum is first best and is given by

$$U_{cl}^B = f(K) + g^*(\alpha - 1), \tag{4}$$

where subscript and superscript refer to the closed economy with a benevolent government.

In contrast, the maximization problem in the *open economy* is to maximize (2) subject to (1), (3) and the government budget constraint, where K_i is now a function of all tax rates. The problem can be solved in a standard way (inserting for g from the government budget constraint, deriving the first order condition with respect to t_i, and then imposing symmetry). An interior solution, i.e. public good provision less than g^*, yields

$$\alpha = \frac{1}{1 - \varepsilon_i} > 1, \tag{5}$$

where $\varepsilon_i \equiv -\frac{t_i}{K_i}\frac{\partial K_i}{\partial t_i}$ is the elasticity of capital demand in country i with respect to the country's tax rate. The left side represents the marginal benefit of extending public good supply by one unit, whereas the right side gives the marginal cost of doing so. The marginal cost is higher than one due to the fiscal externality, which depends on the elasticity of capital demand. Condition (5) defines implicitly the equilibrium tax rate and via the government budget constraint the level of public good provision.

In terms of citizen welfare it is well known from the literature (Zodrow and Mieszkowski, 1986, and Wilson, 1986) that the open economy leads to lower utility because of underprovision of public goods. This is true here as well if the satiation level is large enough so that the tax revenue in the open economy implied by (5) is not enough to provide g^*.

PROPOSITION 1. With a welfare maximizing government the open economy (tax competition) is (weakly) worse than the closed economy (no tax competition). The open economy is strictly worse if g^* is sufficiently large.

Self-interested government Now we replace in each country the benevolent planner by a single, selfish politician. Following the approach by Persson, Roland and Tabellini (2000), a politician in country i maximizes the rents derived from holding office as given by the utility function,

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

where R is the exogenous benefit from being reelected, p_i is the probability that the politician is reappointed, and r_i 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 the transformation of rents into utility. For now we interpret R as the 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.). Later we endogenize R by making it the expected discounted value of future endogenous diversions from the government budget. In contrast to Persson, Roland and Tabellini (2000) we ignore for the time being cash transfers to voters. We return to this aspect further below. The assumption is innocuous in the present analysis as long as the marginal benefit of the public good α is higher than one, which is the marginal benefit of a transfer.

7

The timing of decisions is as follows. Voters set and commit to a reelection rule that specifies the minimum utility level that is required for them to reelect the politician. Then the incumbent politician sets fiscal policy including rent diversion, taking into account the policy setting in all other countries. Finally, voters decide on reelection. If utility is less than the specified minimum in the first stage, an identical challenger is voted into office.

To focus on the conflict of interest between the politician and voters (citizens), we assume that within each country voters coordinate their actions. A politician's reappointment is then based on the simple retrospective voting rule,

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

where $\bar{u}_i\left(t_{-i}\right)$ is the reservation utility set by voters in country i. Fiscal policy consists of the tax rate, a public good level, and rents, $q_i = [t_i, g_i, r_i]$. The voting rule assumes that voters set their reservation utilities at the same time. The modified government budget constraint now reads

$$t_i K_i = g_i + r_i. \tag{8}$$

Rents are a pure waste from the voter's perspective and benefit only politicians.

To ensure that a politician has the incentive to remain in power, voters must concede some rents equal to what the politician could secure if not running for reelection and extracting the maximum tax income given some tax vector t_{-i}. Forgoing reelection implies therefore setting $g_i = 0$ and a tax rate equal to

$$\tilde{t}_i(t_{-i}) = \arg\max_{t_i} t_i K_i\left(t_i, t_{-i}\right). \tag{9}$$

In order to avoid cluttering notation, we shall often use only $\tilde{t}_i$. The incentive constraint for re-election requires that the utility of a politician with reelection is higher than extracting maximum tax revenue for himself and foregoing reelection. Formally, it is given by $\gamma r_i + R \geq \gamma \tilde{t}_i K_i\left(t_i, t_{-i}\right)$, or

$$r_i \geq \tilde{t}_i K_i\left(t_i, t_{-i}\right) - R/\gamma. \tag{10}$$

In the *closed economy* the politician is able to confiscate capital income $(\rho = 0)$ when not running for reelection by setting the tax rate equal to $\tilde{t} = f'(K)$. The incentive constraint (10) becomes $r \geq f'(K)K - R/\gamma$. The voters

set the reservation utility in order to maximize their own utility but taking the reelection constraint into account, which therefore holds with equality. Using (10) and $\tilde{t} = f'(K)$, we can express the maximization problem as follows

$$\max_{g} U = f(K) - f'(K) K + R/\gamma - g + \alpha g,$$

as long as $g \leq g^*$. Clearly, in the optimum the public good is set at the satiation level g^* if α is greater than one and g^* is feasible. The latter requires $f'(K)K - tK = f'(K)K - g^* - r = f'(K)K - g^* - f'(K)K + R/\gamma \geq 0$, or $g^* \leq R/\gamma$. In contrast to the welfare maximization case, however, the closed economy is not first best because of the rents necessary for guaranteeing reelection. Equilibrium utility in the closed economy (using superscript L for a Leviathan type of government) therefore is

$$U_{cl}^L = f(K) - f'(K) K + R/\gamma + g^*(\alpha - 1). \tag{11}$$

Note that utility under a self-interested politician is lower than under a benevolent planner (see (4)) when rents $r = f'(K)K - R/\gamma$ are positive.

In the *open economy* the first order condition for the optimal tax rate is the same as when the government is benevolent and is given by (5). It is straightforward to show that maximized voter utility in the open economy (subscript *op*) is

$$U_{op}^L = f(K) + t_{op}^L K (\alpha - 1) - \alpha \left(\tilde{t}\widetilde{K} - \frac{R}{\gamma} \right), \tag{12}$$

where $\widetilde{K} = K(\tilde{t}, t_{op}^L)$ is the capital used if a country pursues a revenue maximizing strategy, while all other countries play along the equilibrium and the tax rate is implied by (5). In general the public good provision is less than the satiation level, and thus less than in the closed economy.

We now show that welfare in the open economy is higher than in the closed economy for some parameter values even if public goods provision is lower in the open economy. Intuitively, changes in rents to politicians that bring down tax rates may compensate individuals for the decline in public good provision. Voter utility is lower in the open economy under a self-interested government if the difference between (12)and (11)

$$\Delta^L = U_{op}^L - U_{cl}^L = \left[f'(K)K - \alpha\tilde{t}\widetilde{K} \right] + [\alpha - 1] \left[t_{op}^L K + \frac{R}{\gamma} - g^* \right], \tag{13}$$

9

is positive. We now provide conditions for this to hold. Note first that following the argument leading up to (11) the second term is nonnegative as $R/\gamma \geq g^*$. As shown in the appendix, the first term, $f'(K)K - \alpha \tilde{t}\widetilde{K}$, is positive when the production function is quadratic, but close to being linear. In this case capital responds very elastically to tax rate changes in the open economy and hence the maximum revenue in the closed economy $(f'(K)K)$ is larger than how much taxes a revenue-maximizing government in the open economy weighted by the marginal benefit of the public good $(\alpha \tilde{t}\widetilde{K})$ can extract off the equilibrium path. A high elasticity of capital with respect to taxation keeps capital tax rates in equilibrium low. This affects the maximum capital stock for a region off the equilibrium $\widetilde{K}$. Moreover it makes it more difficult for such a government to extract resources because capital flees easily.

PROPOSITION 2. *Consider a world with self interested governments and assume that the production function is quadratic.*
a) The open economy with tax competition dominates from voters' perspective the closed economy (no tax competition) when the production function is close to linear.
b) The ranking is reversed when the marginal benefit of the public good α and the satiation level g^* are sufficiently large.

In summary, the welfare effects of tax competition under a benevolent government are negative, while positive or negative under a government run by a single, self-interested and reelection-seeking politician. Sufficient conditions in terms of the marginal benefit of the public good and the production function allow us in an intuitive way to sign the effect in either direction.

3   The Role of Political Institutions

We now show that in addition to the above factors political institutions matter for the sign and magnitude of the welfare change when opening up the economy to international capital flows. In the tradition of Persson, Roland and Tabellini (2000) we compare two political regimes, parliamentary democracy and presidential-congressional system, by introducing different legisla-

tive bargaining rules among elected policy-makers. Broadly speaking, we argue that the parliamentary regime behaves very similar to the stylized model with a self-interested politician presented in the previous section. Thus international capital flows tend to harm voters if the marginal benefit of the public good is large. By contrast, under the presidential-congressional regime voters tend to gain from international tax competition because public good supply is unaffected. When tax rates fall, rents to politicians and thus the tax burden decline and this makes voters strictly better off.

Before we explain and analyze each regime in more detail, we adapt the model from the previous section in a simple way to allow for legislative bargaining. Each country is divided into three districts such that each district owns one third of the country's original endowment of each factor. The country's legislature consists of three policymakers, one from each district. To make results comparable to our previous analysis we further assume that the public good is now a publicly provided private good. Each district receives one third of the spending at the national level. For given tax rate and public good level thus the utility of a voter in a particular district is simply one third of what it was before, and in aggregate the sum of all districts' utilities equals the original one. Moreover, the government budget constraint stays the same as well. Changes are the result of introducing political institutions relating to how fiscal policy is chosen.

We should note one difference in the set of fiscal instruments between Persson, Roland and Tabellini (2000) and our approach. Persson, Roland and Tabellini (2000) allow for regional cash transfers as an additional fiscal instrument. We will argue in section 3.3 in more detail that our omission is not problematic when the marginal benefit of the public good α is sufficiently large. The linear preferences we postulate in equation (2) imply that in equilibrium either the publicly provided private good g or regional transfers are used but not both, and for our purpose the more interesting case is the one with public good provision. The advantage of omitting the fiscal instrument here is that the exposition becomes clearer - we don't need to distinguish different levels of α and the parliamentary regime behaves very similar to the case of the self-interested government considered in section 2. This is not to say that regional transfer instrument is irrelevant, but rather tangential for our purposes.

11

3.1 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 the entire budget. 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 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.

To model the political process we assume a bargaining game with the following sequence. At stage 1 two legislators are randomly selected in each country. One legislator, named the agenda setter (a_i) is responsible for proposing a budget (tax and expenditure) in stage 3 and the second legislator (the coalition partner (m_i)) will either support or veto the budget. At stage 2 voters in each country decide on a reelection strategy by setting their reservation utilities for every possible tax vector. At stage 3 the agenda setting legislator proposes a budget for every possible tax vector t_{-i}, $\mathbf{q}_i^P(t_{-i}) = \left[t_i, \ g_i, \ \left\{ r_i^l \right\} \mid t_{-i} \right]$, such that $t_i K_i(t_i, t_{-i}) \geq g_i + \mathbf{r}_i$, where all elements are constrained to be nonnegative. At stage 4, the coalition partner decides on whether he approves the budget or not. If the proposal is rejected the government is toppled and a default policy $\left[\bar{r}_i^l = \bar{t} K_i(\bar{t}, t_{-i}) / 3 > 0, g_i = 0 \right]$ is implemented. At the final stage (5) elections occur where a legislator is reelected if the policy enacted meets voters' reservation utility in that district. A thorough description of the game is given in the Appendix.[1]

The sequence of decisions raises issues of commitment in delegation games. Voters set and commit to a re-election rule that specifies the minimum utility level that is required for them to re-elect the politician. These voting rules play the role of observable contracts, where politicians' can be held accountable since voters' commitment is credible through elections. Note that any reoptimization by voters just before election does not provide any gains to voters since in our model incumbent and challenger are identical. The

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[1]Our legislative bargaining structure follows the book by Persson and Tabellini (2000) in that we go immediately to a default policy if in stage 4 the proposal is rejected. In Persson, Roland and Tabellini (2000) a new legislative bargaining game with a newly chosen agenda setter may start after initial proposal rejection; only after another coalition breakdown the default policy kicks in. Clearly, an additional round of bargaining after a first proposal breakdown with a fresh assignment of proposal power strengthens the power of the coalition partner and hence the rent distribution among policymakers. The aspect is immaterial, however, for the overall incentive constraint that drives our results.

timing structure is the same as in Person, Roland and Tabellini (2000), and resembles a strategic delegation game with multiple Nash equilibria, where agents (politicians) are strategically allowed to represent principals (voters). As shown by Ferstman, Judd and Kalai (1991) such noncooperative games have cooperative outcomes if contracts can be observed. Since voting rules are fully observed they can be conditioned upon in the politicians'game, and it is this extra commitment that makes the cooperative outcome feasible.[2]

We now derive the subgame perfect equilibrium in which politicians are reelected (as before, no reelection leads to maximum taxation and no public good provision). The incentive constraint now parallels the one from section 2, but modified to account for the presence of two politicians. The incentive constraint that defines rents (given t_{-i}) therefore reads

$$\mathbf{r}_i^P(t_{-i}) \equiv r_i^a + r_i^m \geq \tilde{t}_i K_i\left(\tilde{t}_i, t_{-i}\right) - \frac{2R}{\gamma}. \tag{14}$$

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 (the default solution), minus the exogenous benefit from being reelected, given t_{-i}. The left hand side denotes the combined rents that must be given to the two 'ministers'. If (14) 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.

As in section 2, in the *closed economy* we have $\tilde{t} = f'(K)$ and using this in (14) yields rents equal to $\mathbf{r}_i^P \geq f'(K)K - \frac{2R}{\gamma}$. The utility maximization problem of a voter in any district is now the same as in section 2, with the modified incentive constraint as the only difference. The public good level is set equal to the satiation level, and the tax rate adjusts accordingly. Aggregate welfare for the country is then

$$U_{cl}^P = f(K) - f'(K)K + \frac{2R}{\gamma} + g^*(\alpha - 1). \tag{15}$$

Comparing (15) to (11) the difference arises only in the term $2R/\gamma$. Voter utility is higher here because *each* legislator values reelection. In principle one

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[2]This is different from the strand of the Cournot oligopoly literature in which it is argued that the Cournot oligopoly delegation equilibrium leads to a more competitive equilibrium (see Vickers 1985, Fersthman and Judd 1987, and Sklivas 1987). The difference lies in that contracts are no longer fully observable.

could adjust the exogenous rent, but since our main purpose is to compare across political regimes we leave it as is.

The *open economy* case can be analyzed as in the case with a single politician. Aggregate utility for a country is then

$$U_{op}^P = f(K) + t_{op}^P K (\alpha - 1) - \alpha \left(\tilde{t}_i \widetilde{K} - \frac{2R}{\gamma} \right),$$ (16)

where again the difference arises only in the term relating to the benefits of holding office in the future. A comparison of welfare levels in the open and closed economies now follows the same logic leading to Prop. 2.

We summarize our findings as follows:

PROPOSITION 3. The welfare effect of tax competition in a world of parliamentary democracies parallels the results of tax competition under a single self-interested politician in section 2, assuming that regional fiscal transfers are unavailable.

3.2 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 on 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. As under the parliamentary regime, the political process is a simultaneous bargaining game in all countries where each country takes the decisions in other countries as given.

The two first stages in this game are the same as under the parliamentary regime (i.e., the random selection of two legislators (a_i^t and a_i^g) and the setting of reservation utilities). Different is that at stage 3, one of the appointed legislators (a_i^t) proposes a tax rate t_i for every possible tax vector t_{-i}, after which all legislators vote over the proposal using majority rule at stage 4. If the proposal is rejected a default tax rate $t_i = \bar{t}$ is implemented. At stage 5 the second legislator (a_i^g) proposes an allocation of expenditures $q_i =$

$\left[g_i, \ \left\{ r_i^l \right\} \mid (t_1, ..., t_N) \right]$ subject to $t_i K_i(t_i, t_{-i}) \geq g_i + \mathbf{r}_i$, where all elements are constrained to be nonnegative, the tax vector is the one that results from stage 4, and superscript $l = 1, 2, 3$ is an index for legislators. At stage 6 Congress votes over the expenditure proposal q_i, and if rejected, a default policy $g_i = 0$ and $\bar{r}_i^l = t_i K_i(t_i, t_{-i})/3$ is enforced. In the final stage, a legislator is reelected if the policy enacted meets the voters' reservation utility in that district, as determined at stages 3-6. Otherwise an identical challenger is elected. A full set up of the sequence of moves is given in the Appendix.

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. Yet 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 derive the properties of the equilibrium in which politicians are reelected with probability one.

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 given and expenditure proposals in other countries are irrelevant. The joint incentive constraint for the agenda setter for the expenditure a_i^g and a supporting legislator m_i must satisfy

$$r_i = r_i^{a^g} + r_i^m \geq t_i K_i(t_i, t_{-i}) - \frac{2R}{\gamma}. \tag{17}$$

In contrast to the parliamentary regime, here the tax revenue is given. Assuming that the incentive constraint holds with equality we can now immediately conclude the amount of public goods available to voters is constant, that is

$$g^C = g_i = t_i K_i(t_i, t_{-i}) - r_i = \frac{2R}{\gamma}. \tag{18}$$

Equation (18) provides the key insight into the Presidential-Congressional system. The public good level is completely determined and independent of international capital mobility and equals the sum of the exogenous benefits from being reelected for the expenditure-supporting legislators. The level is a function of exogenous parameters only due to of the separation of budgetary powers. Furthermore, we can conclude that opening up the economy for international capital flows is beneficial for voters if the tax rate declines, since the gain in private consumption is not offset by a loss in public good

15

provision. As derived in the appendix, the equilibrium tax rates in the *closed* and *open* economies are given by

$$t_{cl}^C = f'(K) - \frac{3R}{\gamma K} \qquad \text{and} \qquad t_{op}^C = \frac{\widetilde{t}K(\widetilde{t}, t_{op}^C)}{K} - \frac{3R}{\gamma K}. \qquad (19)$$

Similar to the cases with a single self-interested politician and the parliamentary regime, the open economy tax rate is smaller when the maximum tax revenue $\widetilde{t}K(\widetilde{t}, t_{op}^C)$ in the open economy is less than what a politician can extract in the closed economy $f'(K)K$, assuming no reelection in both cases. This holds when the production function is quadratic but fairly close to being linear.

We summarize our findings in;

PROPOSITION 4. In a world of presidential congressional democracies the level of public goods supply is unaffected by tax competition. Tax competition improves welfare when tax rates fall, which holds when capital responds sufficiently elastically to tax rate changes.

3.3 The Role of Regional Transfers

At the begining of section 3 we noted that one difference to Persson, Roland and Tabellini (2000) is our omission of regional transfers in the set of government instruments. This assumption is motivated by the focus of the respective study. While Persson, Roland and Tabellini (2000) wish to explain the *pattern of spending* across political systems our focus is on the *welfare effects of tax competition*, and in particular on the adjustments to public good provision and rents to politicians. In the following we want to show, however, that our results go through as long as the marginal benefit of the public good α is three or larger.

The reason for this is simple. The linearity of our preferences implies that in equilibrium either public goods are provided or regional transfers are used, but not both. To see this, consider the parliamentary regime. Any proposal must be optimal from the joint view of the regions of the coalition partners. One unit of the public good g (recall that this is rather a publicly provided private good) generates a joint benefit of $2\alpha/3$, while one unit of a regional cash transfer gives a benefit of one. Hence, public good provision dominates regional transfers from the coalition's perspective when $\alpha \geq 3/2$,

and the reverse holds for α less than the critical value. By contrast, under the presidential regime the voters from the non-expenditure setting regions compete through their legislators to be included in the minimum winning coalition that passes the expenditure proposal. Bertrand competition among those two regions/legislators implies zero regional transfers for them. The region of the expenditure setter thus trades off public good provision for her constituency, which gives a marginal benefit of $\alpha/3$, and a regional cash transfer to her region whose benefit is one. Public good provision dominates the cash transfer if α is at least three.

For the above reasons regional cash transfers do not change the equilibrium allocations derived in sections 3.1. and 3.2 if $\alpha \geq 3$. It is also clear that regional cash transfers lead to less public good provision under the presidential system compared to the parliamentary regime when $3/2 \leq \alpha < 3$, an insight that is in line with the results by Persson, Roland and Tabellini (2000). The main conclusion from section 3.2 thus continues to hold: Public good provision under the presidential system is unaffected by the introduction of tax competition regardless of the value of the marginal benefit of the public good.

Taken together, our results in section 3 demonstrate that political institutions matter. In a world with parliamentary democracies voters may or may not gain from globalization, and this in turn depends in our simple model on the valuation of the public good among other things. By contrast, the presidential-congressional system is in some sense immune to globalization because the public good provision is staying constant, assuming that the benefit of holding future office is exogenous. Thus, voters gain from globalization in a world with presidential-congressional democracies if competition over mobile capital bid down tax rates.

4   Politicians: Patience and Reelection Motives

In the previous sections a legislator who is reelected derived utility $v_i = \gamma r_i + R$, where it was assumed that the utility from being reelected (R) was exogenous (as the joy of being in power). 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 office *before* nature has selected the agenda 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 to either of the three legislators. In what follows 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.

We now demonstrate that the benefits of tax competition when politicians are rent seeking depend crucially on the patience of politicians, as measured by the discount rate. While it is usually argued that the short-sightedness of politicians leads to distorted policy choices, we argue here that introducing tax competition in this situation is beneficial if politicians are sufficiently impatient. The intuitive reason for this result is that impatient politicians need large current period rents, which are sufficiently curtailed by tax competition to generate a welfare improvement. We show this in the context of the presidential system, partly because it turns out to be more tractable, partly because it fully demonstrates the role of the factors determining the reelection motivation of politicians.

We make use of a modified incentive constraint for reelection at the expenditure stage

$$r = t_i K_i (t_i, t_{-i}) - 2\delta R, \tag{21}$$

and solve for the equilibrium values by using equations (21) together with the derived values for the tax rate, rent and public good supply. Combining (19) and (20) the rent constraint is $r = f'(K) K - 5\delta R$. The continuation value of holding office equals $R = f'(K) K / (3 + 2\delta)$. The steady-state per period fiscal values are

$$r_{cl}^C = \frac{3(1-\delta) f'(K) K}{(3 + 2\delta)}, \quad t_{cl}^C = \frac{(3-\delta) f'(K)}{(3 + 2\delta)}, \quad g_{cl}^C = \frac{2\delta f'(K) K}{(3 + 2\delta)}. \tag{22}$$

It is easy to see that rents and the tax rate are falling in δ, that is, more patient politicians require less rents to seek reelection. Public good supply is now a function of the discount factor. More patient politicians lead to more public good supply. Welfare in the closed economy is

18

$$U_{cl}^C = f(K) + \frac{(\delta(1+2\alpha)-3)}{3+2\delta} f'(K) K.$$

In the *open economy* equilibrium values can be obtained in a similar fashion. The difference to the closed economy is only in the maximum tax revenue when a politician forgoes reelection, which is $\tilde{t}\widetilde{K}$. It is a function of $\tilde{t}$ and the equilibrium tax rate. Focussing on the welfare implications, aggregate welfare level is

$$U_{op}^C = f(K) + \frac{(\delta(1+2\alpha)-3)}{3+2\delta} \tilde{t}_i \widetilde{K}.$$

A comparison of the closed and open economy yields

$$\Delta^C = U_{op}^C - U_{cl}^C = (\delta(1+2\alpha)-3)\left[\frac{\tilde{t}_i \widetilde{K} - f'(K) K}{3+2\delta}\right],$$

where the sign in the squared bracket is negative when capital responds sufficiently elastically in the open economy to tax rate changes. The first bracket is positive when δ is sufficiently close to 1, while it is negative if δ is sufficiently close to zero. Since the first bracket is monotonically increasing in the discount rate, there exists a critical value of δ such that the open and closed economy give the same utility to voters.

PROPOSITION 5. *Consider a model in which the only benefit of being reelected is the possibility of extracting rents in the future. Then the welfare effects of tax competition in a world of presidential systems are negative when politicians are patient (δ close to one), but positive when they are impatient (δ close to zero).*

The result is intuitive. If politicians discount the future a lot, tax competition is beneficial to voters. Current period rents must be high which are then reduced via tax competition. Even though public good supply declines now as well, the decline in rent diversion is sufficiently strong. By contrast, when politicians are patient, tax competition is harmful. Rent diversion in any given period is small and thus tax competition reduces mostly public good supply.

19

5 Concluding remarks

In this paper we have shed new light on the welfare effects of tax competition by taking the politics behind fiscal policy making seriously. Politicians in our model are rent seeking but due to reelection concerns are partly interested in serving the public. For this reason we do not bias the outcomes of our analysis in either direction of the two dominant views in the literature on tax competition. In contrast to other work on the political economy of tax competition we emphasize the role of institutions in a broad sense. We first examine the effects of tax competition if politicians' motivation to seek reelection is the exogenous benefit of holding office. We show that tax competition among countries using a presidential-congressional regime leaves public good supply unaffected, which together wtih falling tax rates makes voters better off, while under the parliamentary democracy voter welfare may decline when the public good is valued sufficiently. This result may explain why tax competition is viewed more positively in the U.S. (see Burstein and Rolnick (1995) and Holmes (1995) for a contrasting view however), where the presidential-congressional system is in place, compared to continental European parliamentary democracies.

The presidential democracy may fail to generate positive effects from tax competition, however. In the second part of our paper we show that tax competition is harmful if politicians value office holding merely because of rent extraction possibilities, and discount future rents only very little. The intuition is straightforward once it is recognized that patient politicians require small per period rents to seek reelection and thus give little room for tax competition to curb political distortions. In reality, politicians are most likely motivated both by perks from office, the desire to implement their favored policies, and monetary rewards, as Diermeier et al. (2005) confirm. Our analysis shows that the precise mix together with how patient politicians are matters for whether tax competition should be seen as beneficial or detrimental.

6 Appendix

6.1 Proof of Proposition 2

For part a), consider the production function

$$f(K, L) = \beta_1 L + \beta_2 K - \beta_3 K^2 / L \tag{23}$$

which is a constant returns to scale, quadratic production function. Assume $L = 1$ and parameter values such that the marginal product of capital, $\beta_2 - 2\beta_3 K_i$, is positive and the second derivative $f'' = -2\beta_3 < 0$. When all regions other than i choose the same tax rate, the capital market equilibrium reads $K_i + (N-1)K_{-i} = NK$. Using this and (1), the responsiveness of capital employed to a tax change,

$$\frac{dK_i}{dt_i} = -\left(\frac{N-1}{N}\right)\frac{1}{2\beta_3} < 0, \tag{24}$$

is larger in absolute value the lower is β_3. In words, the "more linear" the production function, the more responsive capital becomes.

We now want to evaluate the first term in brackets of (13), that is, $f'(K)K - \alpha \widetilde{t}\widetilde{K}$. The first term is the maximum tax revenue that a government can extract in the closed economy and equals $(\beta_2 - 2\beta_3 K)K$. The second term is the maximum tax revenue in the open economy off the equilibrium path weighted by the marginal utility of the public good. The first order condition for revenue maximization in the open economy is $K_i + t_i \frac{dK_i}{dt_i} = 0$. Inserting (4) and solving for the tax rate we obtain

$$\widetilde{t}_i = \frac{2\beta_3 K_i N}{N-1}. \tag{25}$$

The capital stock $K_i(\widetilde{t}_i, t_{-i})$ is a function of the equilibrium tax rate $t_{-i} = t_{op}$ implicitly defined by the first order condition (5), $\alpha = (1-\epsilon)^{-1}$, which making use of the symmetric property and the specific functional form is equivalent to

$$t_{op} = \frac{2\beta_3 KN(\alpha - 1)}{\alpha(N-1)}. \tag{26}$$

Notice that the equilibrium tax rate is increasing in β_3. Using arbitrage condition (1) and the capital market equilibrium condition we get

$$\widetilde{K} = \frac{K(2\alpha - 1)}{\alpha} \tag{27}$$

and thus

$$\widetilde{t} = \frac{2\beta_3 KN(2\alpha - 1)}{\alpha(N-1)}. \tag{28}$$

The maximum tax revenue in the open economy is simply the product of the previous two terms, which is increasing in β_3.

We are now in a position to make the appropriate comparison: $f'(K)K > \alpha\widetilde{t}\widetilde{K}$, and thus the open economy gives higher welfare, if

$$\beta_2\alpha(N-1) > 2\beta_3 K[N(2\alpha - 1)^2 + \alpha(N-1)], \tag{29}$$

which holds for β_3 sufficiently small (but positive).

Based on the above results it is straightforward to compute the utility levels in the closed and open economies, which are

$$
\begin{aligned}
u_{cl} &= \beta_1 + \beta_3 K^2 + 2R/\gamma + g^*(\alpha - 1), \\
u_{op} &= \beta_1 + \beta_2 K + \frac{\beta_3 K^2(1 + 3N - 6\alpha N)}{N-1} + \frac{2R\alpha}{\gamma}.
\end{aligned}
$$

Note that u_{cl} is increasing while u_{op} is declining in β_3, confirming the comparison based on (13).

b) Consider the case of a large satiation level, namely $g^* = f(K) - f'(K)K + R/\gamma$, which is the maximum level consistent with nonnegative private consumption in the closed economy. Substituting into (13) and noting that $t_{op}^L \leq f'(K)$, we obtain

$$\Delta^L \leq -\widetilde{t}\widetilde{K} - (\alpha - 1)f(K) + \alpha f'(K)K. \tag{30}$$

The right hand side is typically negative for sufficiently large α. The direct effect of an increase in α $(= -f(K) + f'(K)K < 0)$ is negative. The indirect effect $(d(-\widetilde{t}\widetilde{K})/d\alpha)$ is negative as well if equilibrium tax rates increase with the marginal benefit of the public good, that is, $d\widetilde{K}/d\alpha = dK(\widetilde{t}, t_{-i})/dt_{-i} \cdot dt_{op}^L/d\alpha > 0$ (first order condition (5) applies and shows a positive relationship between α and the tax rate for a constant derivative $\partial K_i/\partial t_i$, which holds when the production function is quadratic).

6.2 The game structure under the parliamentary regime

The sequence of events under the parliamentary regime.

1. In each country $i = 1, ..., N$ 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. In each country $i = 1, ..., N$ voters in each district decide their reelection strategy by setting reservation utilities $\left\{\bar{u}_i^d(t_{-i})\right\}$ for every possible tax vector t_{-i}.

3. In each country $i = 1, ..., N$ minister a_i proposes a budget for every possible tax vector t_{-i}, $\mathbf{q}_i^P(t_{-i}) = \left[t_i, \ g_i, \ \left\{r_i^l\right\} \mid t_{-i}\right]$, such that $t_i K_i(t_i, t_{-i}) \geq g_i + \mathbf{r}_i$, where all elements are constrained to be nonnegative.

4. In each country $i = 1, ..., N$ the junior coalition partner m_i decides on whether to accept or reject the proposal $\mathbf{q}_i^P(t_{-i})$ in its country for all possible t_{-i}, taking as given the decision of junior ministers in all other countries. In a country whose minister rejects the proposal $\mathbf{q}_i^P(t_{-i})$ the government is toppled and chooses the default tax rate $\bar{t}$. If the minister approves the budget, its tax rate is given through the joint determination of all tax rate proposals, as provided in stage 3, where the default tax rate applies in those countries where the junior minister rejects the budget proposal.

   The division of tax revenue between public good provision and rents then follows from the budget proposal in stage 3 for countries where the budget was accepted, while in countries where the government is toppled the default policy $\left[\bar{r}_i^l = \bar{t} K_i(\bar{t}, t_{-i})/3 > 0, g_i = 0\right]$ is implemented.

5. 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.

Some remarks are in order. First, the default policy for countries where the junior minister rejects the proposal is a shortcut for a more elaborated game that would ensue if the government coalition breaks down. The default policy vector 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 do not receive any public goods. In section 7, however, we discuss the alternative

assumption that politicians must deliver some minimum public good level, without affecting results qualitatively.

Our second remark deals with the determination of tax rates. Note that in stage 3 each country is forced to provide a tax proposal for all possible tax vectors in the rest of the world, which can be represented as a functional relationship $t_i = t_i(t_{-i})$ for all i. Note that some elements of the vector t_{-i} may be the default tax rate. Since each country's tax then depends on all countries' tax rates, the problem is of the standard fixed point nature. A fixed point exists if the relationship $t_i(t_{-i})$ is continuous for all countries and the set of tax rates is nonempty, compact and convex, an assumption we make.

6.3 The game structure under the presidential-congressional regime

As under the parliamentary regime, the political process is a simultaneous bargaining game in all countries where each country takes the decisions in other countries as given:

1. In each country $i = 1, ..., N$ nature randomly selects two legislators $\{a_i,\ m_i\}$ as coalition partners. Legislator a_i^t is responsible for tax setting, while legislator a_i^g allocates tax revenue.

2. In each country $i = 1, ..., N$ voters in each district decide their reelection strategy by setting reservation utilities $\left\{\bar{u}_i^d(t_{-i})\right\}$ for every possible tax vector t_{-i}.

3. In each country $i = 1, ..., N$ minister a_i proposes a tax rate t_i for every possible tax vector t_{-i}.

4. In each country $i = 1, ..., N$, Congress votes on whether to accept or reject the proposed tax rate $t_i(t_{-i})$ for all possible t_{-i}, and taking as given the decision of Congress in all other countries. In a country whose Congress rejects the tax rate $t_i(t_{-i})$, a default tax rate $t_i = \bar{t}$ is implemented. If Congress approves $t_i(t_{-i})$, the tax vector $\{t_i\}_{i=1,...,N}$ is given through the joint determination of all tax rate proposals, as provided in stage 3, where the default tax rate applies in those countries where Congress rejects the tax rate proposal.

5. In each country $i = 1, ..., N$, the congressional legislator a_i^g proposes an allocation of expenditures $q_i^C = \left[g_i, \ \{r_i^l\} \mid (t_1, ..., t_N)\right]$ subject to $t_i K_i (t_i, t_{-i}) \geq g_i + \mathbf{r}_i$, where all elements are constrained to be nonnegative and the tax vector is the one that results from stage 4.

6. In each country $i = 1, ..., N$, Congress votes over the expenditure proposal q_i^C. If the expenditure budget is rejected, a default policy $g_i = 0$ and $\bar{r}_i^l = t_i K_i(t_i, t_{-i})/3$ is enforced.

7. Election. A legislator is reelected if the policy enacted meets or exceeds the voters' reservation utility in that district, as determined at stages 3-6. Otherwise an identical challenger is elected.

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).

6.4 Equilibrium taxation under the Presidential-congressional system

To show that the tax rate declines we first need to determine the equilibrium tax rate. Since the public good level is given we can derive equilibrium taxation by completely determining equilibrium rents. Consider in more detail the problem of how the agenda setter for the expenditure has to buy support from a legislator. 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

$$r_i^m = \frac{t_i K_i (t_i, t_{-i})}{3} - \frac{R}{\gamma},$$ (31)

and takes the remainder for himself.

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 (17). 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

$$\frac{r_i^m}{2} + \frac{R}{\gamma} \geq \frac{1}{2} \left[\frac{1}{3} \tilde{t}_i K_i \left(\tilde{t}_i, t_{-i} \right) \right] \text{ or } r_i^m \geq \frac{\tilde{t}_i K_i \left(\tilde{t}_i, t_{-i} \right)}{3} - \frac{2R}{\gamma}, \qquad (32)$$

The left hand side of the first 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 be approved by a_i^g. Legislator a_i^t gets one third of tax revenue in the out-of-equilibrium case, and therefore the maximium tax revenue $\tilde{t}_i K_i \left(\tilde{t}_i, t_{-i} \right)$ 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.

Voters in the district of the tax-setter set their reservation utility consistent with the provision of the public good - as shown in (18) - and the incentive constraints (i.e., the rent to their legislator, as shown on the right hand side of (17)). The tax rate in the open economy is then found as the solution to (31) and (32) after imposing symmetry. This tax rate is supported by the third legislator who in stage 6 will be in the same situation as the tax setter. Doing this for the closed and open economy gives condition (19) in the main text.

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