

# Capital Tax Competition with Inefficient Government Spending

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## **Abstract**

Models of international tax competition typically assume the existence of a benevolent government. This paper presents a model which integrates the view of government as source of inefficiency with an analysis of distorting taxes on capital investment, savings and labor income in a common theoretical framework. The model yields the conclusion that the effects of international tax coordination on the welfare of residents can be ambiguous because the costs of inefficient public good supply are lowered but wasteful government consumption is increased. However, the above finding is derived when the residence-based capital tax is not available. In contrast, government use of taxes clearly is inefficient from the viewpoint of residents in the presence of residence-based capital taxation.

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# 1 Introduction

Models of capital tax competition usually assume the existence of a benevolent government that maximizes the welfare of residents subject to a public budget constraint, using the set of taxes available as control variables. A core result of the early models is that each country lowers source-based capital taxes in the Nash equilibrium to attract internationally mobile capital. The outcome then is inefficient in the sense that public goods are not provided according to the Samuelson rule [cf. Zodrow and Mieszkowski (1986)]. As an implication, non-coordination of tax policy reduces a country's consumption possibilities.

A counterexample against this result is made by Razin and Sadka (1991) in a small country model with endogenous labor and capital supply. Basically, they conclude that symmetric Nash equilibria are (second-best) efficient if residence-based capital taxes and wage taxes are available. This somewhat surprising result is related to the production efficiency theorem of Diamond and Mirrlees (1971). The adaptation to the tax competition issue yields the conclusion that taxes which distort production decisions - source-based capital taxes - will not be used in the symmetric Nash equilibrium when taxes on the incomes of all factors subject to choice by households - residence-based taxes on savings and wage taxes - exist [Eggert and Hauffer (1999)]. Interestingly, as Bucovetsky and Wilson (1991) prove, the Nash equilibrium with positive source-based and residence-based capital taxes continues to be (third-best) efficient, provided that three conditions are met: *(i)* labor and capital supply is endogenous, *(ii)* the wage tax is absent and *(iii)* countries are equally large. The intuition is that the source-based capital tax serves as a direct substitute for the unavailable wage tax in a world with distortionary taxation.

In contrast to the approach of the tax competition literature which focuses on the potentially detrimental impacts of decentralization, it is argued both in the policy debate [c.f. Commission of the European Communities (1998)] and by economists that tax competition may, however, also be beneficial since decentralization and not international coordination is potentially more adequate to reduce monopoly power of institutions. The Leviathan argument is based on Brennan and Buchanan (1977), who stresses the need to limit the growth of the public sector. This view is related to the public choice perspective, which developed a theory of government failure and suggests that the political process is not working efficiently [cf. Eichenberger and Frey (1996)]. In this perception of governments, international competition is welcomed as a suitable mean to limit the waste of resources.

Perhaps the first paper which is concerned about both clearly contrasting views

is Persson and Tabellini (1992). They prove that tax competition not necessarily reduces the size of government. Instead, voters delegate their decisions to a government with a strong preference for higher budgets to compensate voters for the negative effects of globalization. When the compensation mechanism works, tax competition is not a problem.<sup>1</sup> However, if the preferred policy program is not available, then tax competition can again be beneficial or harmful for residents, implying that the different kinds of distortions must be considered for the overall conclusion whether international tax coordination or a reduction in the size of institutions by means of tax competition is useful. Perhaps the most cited paper which is concerned about both the inefficiency of governments and the capital tax competition issue is Edwards and Keen (1996). As a guideline for constitutional recommendations they derive rules for an optimal tax system from the viewpoint of residents.<sup>2</sup> Their main result is that, starting from the Nash equilibrium, a tax increase followed by international tax coordination is beneficial for the resident if the welfare loss due to tax competition is greater than wasteful government consumption at the margin. However, the analysis is essentially based on the model of Zodrow and Mieszkowski in which factor supply is exogenous and, hence, taxes on labor and savings are lump-sum.

This paper introduces endogenous factor supply in an adaptation of Edwards and Keen (1996). This allows to contrast the view of government as a source of inefficiency with the more recent tax competition literature, which emphasizes the useful role of the residence-based capital tax. In this model, the scope for coordination is primarily a question of the constraints put upon the set of distorting taxes. Some combinations of taxes generate ambiguous and some, most interestingly, unambiguous results.

First, we show that the welfare effects of tax coordination may be positive or negative. This result is broadly in line with the analysis of Edwards and Keen (1996). However, the above finding is derived when the residence-based capital tax is not available. In contrast, neither residents nor the government benefit from coordination when a residence-based capital tax is in the set of tax instruments. This in turn implies that residents on no account can benefit from tax competition even in situations when wasteful government consumption is high and the intuition

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<sup>1</sup> Schulze and Ursprung (1999) survey the tax competition and political literature and conclude as an overall result that tax competition likely is not alarming, partly due to the compensation effect.

<sup>2</sup> Fuest (1998) extends the framework by taking account of the bargaining between bureaucrats and politicians.

would call for decentralization. It is interesting to note that the result does not depend on the policy maker's preferences.

Hence, endogenising the capital stock by switching to a model with endogenous savings alters results qualitatively. An increase in efficiency costs generally works through three different channels in this model: (i) One channel is endogenous factor supply which gives rise to taxed induced substitution between goods consumed by households. (ii) The second channel is international capital mobility which leads to a rise of the perceived elasticity of tax bases in the tax competition environment. (iii) The third channel is government consumption, which depicts an inefficient waste of resources from the perspective of residents.

The paper is structured as follows. Section 2 portrays the model. Section 3 analyses the welfare implications of tax competition in three scenarios which differ in their pairwise combinations of the three distorting taxes. We conclude with some remarks on the implications and the limitations of our analysis.

## 2 The Model

The analysis integrates a Leviathan government into a standard model of symmetric capital tax competition with endogenous factor supply. Consider  $N$  identical jurisdictions, each with a representative consumer who lives for two periods. In the first period, the consumer divides a given endowment  $e$  between current consumption  $c_1$  and savings  $s$  in order to finance some part of second period consumption  $c_2$ . During the second period, in which private production takes place, the individual chooses labor supply  $l$ . Also in the second period, the government raises the tax revenue required to finance the local public good  $g$  and, following Edwards and Keen (1996), own consumption.<sup>3</sup> The utility function is assumed to be well-behaved and separable between the public good and private consumption

$$u = u(c_1, c_2, l; g). \quad (1)$$

Normalizing the price of  $c_2$  to unity, the intertemporal budget constraint is

$$c_2 = (1 + \rho)(e - c_1) + \omega l, \quad (2)$$

where  $\rho$  denotes the net interest rate and  $\omega$  the net wage rate. Solving the problem given by (1) and (2) in the usual way yields the consumption functions in both

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<sup>3</sup> Government behavior will be introduced below in detail.

periods  $c_1(\omega, \rho)$ ,  $c_2(\omega, \rho)$  and the labor supply function  $l(\omega, \rho)$ . These and the direct utility function (1) support the indirect utility function  $v(\omega, \rho; g)$ .<sup>4</sup>

Let  $w$  denote the gross wage rate,  $R$  the world interest rate and  $r$  the gross interest rate in each country. Since there are two margins of substitution on the side of the consumers and one on the side of producers, three distorting taxes can be introduced:

$$\begin{aligned} t^s &= r - R && \text{source-based capital tax,} \\ t^r &= R - \rho && \text{residence-based capital tax,} \\ t^w &= w - \omega && \text{wage tax.} \end{aligned} \tag{3}$$

Our central departure from Edwards and Keen (1996) is that we model the factor supply decisions of households. To explore the tension, it is worth to notice that an internationally coordinated increase in source-based capital taxes works like a lump-sum transfer from the public to the government in the model of Edwards and Keen (1996), since the world capital stock is given in their model. In contrast, in the framework used here, capital and labor supply is endogenous and the three taxes introduced are distorting both in a tax competition environment and under coordination.

Next, turn to a description of the production side. In each country, the consumption good is produced in period two under conditions of perfect competition with a constant-returns-to-scale production technology  $f(k, l)$ . Using the first-order condition of the firms' maximization problem after implicit differentiation of the zero-profit condition  $f(k, l) - wl - rk = 0$  yields the slope of the factor price frontier. Denoting derivatives here and in the following by subscripts, we get

$$w_r = -(k/l) < 0, \quad w_{rr} = -\frac{\partial(k/l)}{\partial r} > 0. \tag{4}$$

Due to the definition of the three taxes introduced in (3), the government faces the following budget constraint

$$\begin{aligned} T &= t^r [e - c_1(\omega, \rho)] + t^w l(\omega, \rho) + t^s k(w, r) \\ &= t^r [e - c_1(\omega, \rho)] + [t^w - t^s w_r(r)] l(\omega, \rho), \end{aligned} \tag{5}$$

where (4) has been used in the last line of (5). Suppose, the government, a term which we use broadly, consists of different groups which may compete against each

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<sup>4</sup> Due to the separability of the direct utility function, factor supply is independent of  $g$ , but the level of the public good enters the indirect utility function.

other while pursuing their self-interests. In line with Edwards and Keen (1996) we do not model the bargaining process explicitly but assume that the outcome could result in a waste of resources. Hence, if the outcome of the bargaining game is inefficient, a part of total tax revenue is consumed by the government itself and only the remainder is used for public good supply which enters the utility function of the household. Let  $h$  denote wasteful government consumption. Therefore,  $T = h + g$  must be fulfilled to keep the public budget balanced. With these definitions, the Lagrangian of the government's maximization problem reads

$$\mathcal{L} = v(\omega, \rho, g) + \tilde{v}(h) + \lambda(T - g - h), \quad (6)$$

where  $\lambda$  denotes the Lagrange-multiplier and  $\tilde{v}(h)$  represents the gain of the government from wasteful consumption of tax revenue. We should emphasize that this characterization of the government objective function is essentially ad hoc, but is a convenient approach to analyze a wide variety of situations in an analytical model which combines capital tax competition in a world with distorting taxes with the issue of government failure. The objective function (6) includes the two extreme views of government behavior. For  $\tilde{v}_h = 0$  the government is completely benevolent and for  $\tilde{v}_h \rightarrow \infty$  the view of a government as a resource consuming pure tax maximizer is adopted. In between the boundaries exists a wide range of possible parameterizations.

Using Roy's identity, the tax definitions given in (3) and the symmetry assumption of the model, which implies that savings  $e - c_1$  equal the capital stock  $k$  in the Nash equilibrium, the first-order conditions of the government problem are

$$\mathcal{L}_{t^r} = l w_r + \tilde{v}_h h_T T_{t^r} + \lambda T_{t^r}, \quad (7a)$$

$$\mathcal{L}_{t^w} = -l + \tilde{v}_h h_T T_{t^w} + \lambda T_{t^w}, \quad (7b)$$

$$\mathcal{L}_{t^s} = l w_r + \tilde{v}_h h_T T_{t^s} + \lambda T_{t^s}, \quad (7c)$$

$$\mathcal{L}_g = v_g - \lambda, \quad (7d)$$

where the following definitions have been used

$$T_{t^r} \equiv -l w_r - t^r [c_{1\omega} w_r R_{t^r} + c_{1\rho} (R_{t^r} - 1)] + \eta [l_\omega w_r R_{t^r} + l_\rho (R_{t^r} - 1)] - t^s l w_{rr} R_{t^r}, \quad (8a)$$

$$T_{t^w} \equiv l - t^r [c_{1\omega} (w_r R_{t^w} - 1) + c_{1\rho} R_{t^w}] + \eta [l_\omega (w_r R_{t^w} - 1) + l_\rho R_{t^w}] - t^s l w_{rr} R_{t^w}, \quad (8b)$$

$$T_{t^s} \equiv -l w_r - t^r [c_{1\omega} w_r (R_{t^s} + 1) + c_{1\rho} R_{t^s}] + \eta [l_\omega w_r (R_{t^s} + 1) + l_\rho R_{t^s}] - t^s l w_{rr} (R_{t^s} + 1). \quad (8c)$$

The term  $\eta \equiv t^w - t^s w_r$  in (8) can be interpreted as the effective tax rate on wage income and the terms  $R_{t^i}$  describe the derivatives of the world interest rate with respect to the taxes  $t^i$ . To determine the derivatives  $R_{t^i}$  consider the net capital exports for a country, given by the function  $b$ , and let asteriks denote foreign variables. The condition for world capital market clearing then is

$$b(R, t^r, t^s, t^w) + (N - 1) b(R, t^{r*}, t^{s*}, t^{w*}) = 0.$$

Net capital exports are zero in the symmetric Nash equilibrium in *each* of the  $N$  countries. However, each jurisdiction *perceives* the international capital allocation to be affected by own tax changes. Using (4), net capital exports are given by  $b(R, t^r, t^s, t^w) = e - c_1(\omega, \rho) + w_r(r) l(\omega, \rho)$ . Implicit differentiation then yields

$$R_{t^i} = \frac{-1}{N} \frac{b_{t^i}}{b_R} \quad \forall \quad t^i \in \{t^r, t^s, t^w\}, \quad (9)$$

where the derivatives of the net capital export function are

$$b_{t^r} = c_{1\rho} - w_r l_\rho, \quad b_{t^w} = c_{1\omega} - w_r l_\omega, \quad b_{t^s} = -w_r b_{t^w} + l w_{rr}, \quad b_R = b_{t^s} - b_{t^r}. \quad (10)$$

For some of the following analysis it will prove helpful to employ compensated instead of Marshallian functions. Using the slope of the factor-price frontier (4) and the symmetry assumption  $e - c_1 = k$  in the Slutsky equations allows to define

$$\phi \equiv (e - c_1) l_\omega - l l_\rho = k l_\omega^c - l l_\rho^c = -l (w_r l_\omega^c + l_\rho^c), \quad (11a)$$

$$\psi \equiv (e - c_1) c_{1\omega} - l c_{1\rho} = k c_{1\omega}^c - l c_{1\rho}^c = -l (w_r c_{1\omega}^c + c_{1\rho}^c), \quad (11b)$$

where compensated functions are denoted by an upperscript  $c$ . When first-period consumption is a Hicksian substitute with leisure - hence,  $c_{1\omega}^c$  and  $l_\rho^c$  are negative - the market equilibrium is asymptotic stable. Using (4) and  $c_{1\omega}^c < 0$ ,  $l_\rho^c < 0$  in (11) then directly implies that both  $\phi > 0$  and  $\psi > 0$ , a result which will be used throughout the following analysis.

### 3 Coordination of Tax Policy

Now turn to a welfare analysis of tax competition and consider three scenarios in which governments have access to pairwise combinations of the taxes  $t^w$ ,  $t^s$ , and  $t^r$ . However, the main focus is not to extend the number of fiscal environments considered in Bucovetsky and Wilson (1991), but to incorporate inefficient government spending in all three tax scenarios. In each case, we contrast the results derived for different parameterizations of  $\tilde{v}_h$ . The main question is: Starting from the non-cooperative tax competition equilibrium in which only distorting taxes exist, is tax coordination beneficial for residents or governments?

### 3.1 Source-Based Capital and Wage Taxes Available

In this first of our three scenarios the residence-based capital tax is not available [ $t^r = 0$ ]. Combining (7b) and (7c) we form  $w_r \mathcal{L}_{tw} + \mathcal{L}_{ts}$ , then we use (9)-(11) to yield the tax structure in the symmetric Nash equilibrium

$$\frac{t^s}{t^w} = \frac{\phi}{N\psi + (1-N)(\phi w_r - l^2 w_{rr})}. \quad (12)$$

According to (12) both capital taxes are levied at positive rates when the number of countries is finite, since, from (4), the factor price frontier is negatively sloped. However, the number of countries  $N$  is relevant for the tax structure given by (12) and, hence, the degree of international tax competition is important when only source-based capital and wage taxes are in the set of available taxes.<sup>5</sup>

We now prove that, starting from the initial Nash equilibrium, an simultaneous increase in tax rates via international tax coordination measures is beneficial from the perspective of a pure revenue maximizing government [ $\tilde{v}_h \rightarrow \infty$ ]. The prove is intuitive. First notice that there is no motive for trade in the model due to the symmetry assumption. The best that a revenue maximizing government can do is to replicate the closed-economy equilibrium. According to (12) the tax structure in the Nash equilibrium [ $N > 1$ ] deviates from the benchmark of a closed economy [ $N = 1$ ]. Unambiguously, tax competition reduces the efficiency of the tax system. Hence, the revenue maximizing Leviathan, only interested in reducing the efficiency costs of the tax system and neglecting the inefficiencies due to its own wasteful consumption, benefits from tax coordination in the underlying tax scenario.

This leads us to the question whether the tax structure (12) is efficient from the viewpoint of a government which is at least partially interested in the welfare of residents, i.e. we derive results for a wide range of parameterizations [ $0 \leq \tilde{v}_h < \infty$ ]. To determine whether tax coordination is beneficial notice that, by conditions (7b) and (7c), a change in  $t^w$  or  $t^s$  has a zero first-order effect on the objective function of the government. However, factor supply of the whole world can be affected through an intervention in tax policy. Since net capital exports are zero in the model due to the symmetry assumption, the marginal gain of a worldwide increase in taxes  $t^s$  and  $t^w$  is given solely by the terms multiplying  $R_{ts}$  and  $R_{tw}$  in (7c) and (7b), respectively. Isolating the coefficients of  $R_{ts}$  in the first-order condition for the source-based capital tax (7c) we have, after employing (9)-(11) and rearranging

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<sup>5</sup> Equation (12) shortens to  $t^s/t^w = 0$  in the small country case when  $N \rightarrow \infty$ . Then the wage tax serves as the only source of public revenue, at least at the margin [cf. Razin and Sadka (1991)].

terms,

$$(\lambda + \tilde{v}_h h_T) \frac{(-c_{1\omega} w_r + l_\omega w_r^2 + l w_{rr}) (t^w \phi - t^s (\phi w_r - l^2 w_{rr}))}{N (\psi - \phi w_r + l^2 w_{rr})}. \quad (13)$$

Similarly manipulating the first-order condition for the wage tax (7b) by isolating the coefficients of  $R_{t^w}$  and using (9)-(11) gives

$$(\lambda + \tilde{v}_h h_T) \frac{(c_{1\omega} - l_\omega w_r) (t^w \phi - t^s (\phi w_r - l^2 w_{rr}))}{N (\psi - \phi w_r + l^2 w_{rr})}. \quad (14)$$

The interpretation of (13) and (14) is straightforward. Starting from the initial Nash equilibrium, each government has the necessary incentives to agree to an internationally coordinated rise in the rates of taxes  $t^s$  and  $t^w$  if, and only if, the respective equation has a positive sign.

There exists an encompassing intuition that is helpful for the following interpretation of (13) and (14), which is directly related to optimal taxation theory. We identify three terms: (i) First consider the fractions in both equations. The denominators and the first terms in brackets in the numerators are positive under our assumption that first-period consumption is a Hicksian substitute with leisure, and that the labor supply curve is not backward-bending  $l_\omega \geq 0$ . The result from (12), which states both tax rates are positive, then establishes that the fractions in (13) and (14) are positive. Notice that this is a direct implication of the above result that the Nash equilibrium in source-based capital and wage taxes is inefficient. The marginal welfare costs of tax competition (MTC) are positive in the underlying tax scenario. (ii) Second,  $\lambda$  denotes the marginal utility of public good provision, which is positive according to condition (7d). In equilibrium, the Lagrange multiplier  $\lambda$  is equal to the marginal costs of public funds (MCF) perceived by residents. It is well known that the MCF reflect the sum of distortionary effects of the tax system. Further notice that under our assumptions on factor supply functions and the set of tax instruments available (no lump-sum taxes are allowed) the MCF are strictly greater one. (iii) Third, the term  $\tilde{v}_h h_T$  portrays the gain of the government from higher marginal government consumption (MGC).

According to conditions (13) and (14) the government computes  $\text{MCF} + \text{MGC}$  in order to determine the gain from international tax coordination. The higher the MCF in the Nash equilibrium are, the higher is the potential gain from coordination. However, from the viewpoint of residents, MGC captures the marginal welfare costs attributed to government failure. Residents trade the MSC with MGC and form  $\text{MCF} - \text{MGC}$  to determine whether international tax coordination is beneficial.

With this argument, we can now combine observations (i) – (iii) from above to infer from conditions (13) and (14) that, starting from the inefficient Nash equilibrium in source-based capital and wage taxes [ $MCT > 0$ ], a rise in tax rates followed by international tax coordination is beneficial for residents if, and only if,

$$(MCF - MGC) MCT > 0. \tag{15}$$

This result has a clear-cut explanation. Starting from the Nash equilibrium, coordination is beneficial for residents when the deadweight loss incurred by the tax system is higher than the marginal welfare costs of wasteful government consumption. Two interesting implications follow. First, if the government is completely benevolent or the political process is not resource consuming [ $MGC = 0$ ], then international tax coordination is unambiguously beneficial for residents in the underlying tax scenario. Second, the welfare gains of residents from tax coordination are reduced when the government is not completely benevolent. The difference  $MCF - MGC$  is hence a crucial factor in the analysis and actually determines whether tax competition is beneficial.

In contrast to Bucovetsky and Wilson (1991) in their proposition 2 international coordination of taxes not necessarily leads to a welfare improvement from the viewpoint of residents. The unambiguous relationship between international tax coordination and efficiency gains is lost if  $MGC > 0$  and the view of government as a Leviathan is adopted. Condition (15) proves that in situations with a high level of inefficient government consumption, international coordination of wage taxes and source-based capital taxes even reduces the welfare of citizens below the level reachable in a tax competition environment. However, this result critically hinges upon the government preferences and the issue of the overall effect cannot be answered definitely by an analytical assessment.

### 3.2 Source-Based and Residence-Based Capital Taxes Available

In this second scenario the wage tax is absent [ $t^w = 0$ ]. Combining (7c) and (7a) we form  $\mathcal{L}_{ts} - \mathcal{L}_{tr}$  and use (9)-(11) to yield

$$\frac{t^s}{t^r} = \frac{\psi}{l^2 w_{rr} - \phi w_r}, \tag{16}$$

according to which both taxes are set at positive rates in the Nash equilibrium under our assumption that first period consumption is a Hicksian substitute with leisure.

To determine whether a coordinated tax increase is beneficial from the perspective of the representative resident or the government we follow the procedure in tax scenario previously considered. Isolating the coefficients of  $R_{ts}$  in the first-order condition for the source-based capital tax (7c) and employing (9)-(11) yields after rearranging terms

$$-(\lambda + \tilde{v}_h h_T) \frac{(-c_{1\omega} w_r + l_\omega w_r^2 + l w_{rr}) \{t^r \psi + t^s (\phi w_r - l^2 w_{rr})\}}{N (\psi - \phi w_r + l^2 w_{rr})}. \quad (17)$$

Similarly, isolating the coefficients of  $R_{tr}$  in the first-order condition for the residence-based capital tax (7a) and using (9)-(11) gives

$$(\lambda + \tilde{v}_h h_T) \frac{(\psi - w_r (\phi - l c_{1\omega} + l l_\omega w_r)) \{t^r \psi + t^s (\phi w_r - l^2 w_{rr})\}}{l N (\psi - \phi w_r + l^2 w_{rr})}. \quad (18)$$

From (17) and (18) follows the corollary that, starting from the uncoordinated Nash equilibrium, there exists no Pareto improving tax coordination policy, neither from the viewpoint of residents nor from the viewpoint of the government. This statement is proved by combining the equilibrium rates of  $t^s$  and  $t^r$ , given by (16), with equations (17) and (18), which implies that the braced terms in the numerator of both equations expressions vanish. Since the fractions denote the additional distortions due to tax competition, it follows that  $MCT = 0$  holds in the Nash equilibrium when source-based and residence-based capital taxes are available for governments.

The interesting policy implication then is straightforward. A pure tax revenue maximizing government has no incentive to coordinate taxes internationally. This result stands in contrast to proposition 1 in Edwards and Keen (1996), which states that government unambiguously benefits from tax coordination. The obvious conflict in results is resolved by the observation that tax coordination is equal to a lump-sum transfer from the resident to the government in their model. In contrast, in the model employed here tax competition does not introduce any additional distortions when the two capital taxes are available.

However, even if  $MGC > 0$  and public goods are underprovided to keep the public budget balanced, there is no welfare improvement from international tax coordination obtainable for residents. This is proved formally by applying the definitions introduced in (15) to conditions (17) and (18) which shows

$$(MCF - MGC) MCT = 0, \quad (19)$$

since, from (16),  $MCT = 0$  holds. Hence, residents never benefit from international tax coordination in the underlying tax scenario. This in turn implies that, starting from a situation with internationally coordinated taxes, the introduction of tax

competition cannot lead to a welfare improvement whatever the level of wasteful government consumption is. The result follows from the intuition that internationally integrated capital markets do not pressure the government into spending resources more efficiently when both capital taxes are available for governments. This is in striking contrast to the result obtained in the first scenario which states that there exist a range of situations in which residents benefit from tax competition.

### 3.3 Residence-Based Capital and Wage Taxes Available

Finally consider a scenario in which the source-based capital tax is missing [ $t^s = 0$ ]. Combining (7a) and (7b) we form  $\mathcal{L}_{t^r} + w_r \mathcal{L}_{t^w}$ , then use (9)-(11) which shows that

$$\frac{t^r}{t^w} = \frac{\phi}{\psi}, \quad (20)$$

and thus both taxes are levied in the Nash equilibrium under our assumptions on factor supply functions.

To determine the chances for welfare improvements we proceed according to our previous analysis. Having isolated the coefficients of  $R_{t^r}$  in the first-order condition for the residence-based capital tax (7a), we use (9)-(11) to yield

$$(\lambda + \tilde{v}_h h_T) \frac{(\psi - w_r (\phi - l c_{1\omega} + l l_\omega w_r)) \{ -t^w \phi + t^r \phi \}}{lN (\psi - \phi w_r + l^2 w_{rr})}. \quad (21)$$

Similarly isolating the coefficients of  $R_{t^w}$  in the first-order condition for the wage tax (7b) and using (9)-(11) gives

$$(\lambda + \tilde{v}_h h_T) \frac{(c_{1\omega} - l_\omega w_r) \{ -t^w \phi + t^r \phi \}}{lN (\psi - \phi w_r + l^2 w_{rr})}. \quad (22)$$

Combining the tax rates in the Nash equilibrium, given by (20), in equations (21)-(22) shows that the terms in the numerators of both fractions vanish. It then is straightforward that, starting from the Nash equilibrium, neither the welfare of residents nor of the government changes due to international tax coordination.

Hence, the conclusion is that there is no difference between the Nash and the coordinated equilibrium concerning the incentives of governments to increase the efficiency of the public sector in a tax scenario when the residence-based capital and the wage tax are in the set of tax instruments available. Even if inefficient government consumption reduces the utility of residents, the utility level in the Nash equilibrium equals the utility obtained under coordination. In contrast to our first tax scenario and in accordance with the second, residents cannot benefit from tax competition.

## 4 Conclusions

It has been shown in the previous literature on capital tax competition that the introduction of tax coordination or residence-based capital taxes unambiguously increases welfare when the government is benevolent. In this paper we nested the view of government as a benevolent dictator and the opposing view of government as a resource-consuming leviathan in a unifying tax competition framework with endogenous factor supply. Our main conclusions are twofold. (i) First we demonstrated that the overall effect of tax coordination is ambiguous when only labor and source-based capital taxes are in the set of available taxes and the government is not fully benevolent. (ii) Second, when the residence-based capital tax is available, the marginal efficiency costs of tax competition decrease. This *unambiguously* increases the possibility of the government to waste resources. Hence, the strong case in favor of residence-based capital taxes or tax coordination made in the previous literature on capital tax competition collapses when governments are not fully benevolent. Residents obtain a higher utility level in tax scenarios when the residence-based capital tax is not available, at least in the limit when wasteful government consumption is high and public good supply is low.

The question whether coordination, the enforcement of residence-based capital taxes or a higher degree of tax competition is beneficial hinges on three effects. (i) The first effect is denoted by the marginal welfare costs of tax competition, which are positive when the residence-based capital tax is unavailable. Then, tax coordination becomes potentially more attractive. (ii) The second effect depicts the marginal utility of residents from the public good, equal to the marginal social costs of public funds. This measures the marginal excess burden caused by distorting taxes. Following the production efficiency theorem, the marginal social costs of public funds are minimized when taxes on the incomes of all factors subject to choice are available. National production is maximized when the residence-based capital tax is combined with the wage tax. From the observation that the source-based capital tax implicitly is a tax on labor, this result also holds for combinations of source-based and residence-based capital taxes. (iii) The third effect is the marginal gain of the government, which depicts a welfare loss for residents.

What are the suggested implications of the results in this paper for the prospects of capital income taxation in the European Community? In a recent proposal, the Commission of the European Communities (1998) recommended a coexistence model which "foresees that each member State has the choice between two systems, the information system (provision of information to all Member States in which

the beneficiary is resident) and the withholding-tax system (levying a withholding tax of 20%).“ The results of our model suggest, however, that some degree of tax competition is useful. Hence, neither enforcing residence-based capital taxes via international information exchange nor the introduction of harmonized source-based capital taxes at an equal rate of 20% are appropriate policy measures. Instead, a minimum rate for the source-based capital tax could be desirable to ensure the minimum level of tax competition that may be required to restrict the growth of the public sector.

Of course, there are clear limits to an analytical approach of this issue. It is a difficult task to compare the utility levels of residents *between* the three Nash equilibria which differ in the set of distorting taxes. This would require to quantitatively weight efficiency cost of tax systems with the welfare costs of government spending in each of the three tax competition scenarios analyzed here. For this reason, the harmful effect of the residence-based capital tax has been clearly derived only for high levels of inefficient government spending. We were not able to show that residents unambiguously loose due to the introduction of residence-based capital taxation. However, the residence-based capital tax generally is not as attractive as previous tax competition models with a benevolent dictator suggest. The aim of this paper was to reveal the effects in a second-best framework to acquire a clear structure for further empirical analysis, needed to prove which of the competing effects, the impact of political constraints or those due to tax competition, are most relevant in the real world.

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