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Exchange-of-Information Clauses in International Tax Treaties

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Abstract

This paper examines bilateral double taxation treaties, with an emphasis on information exchange among tax authorities. A major objective is to understand which countries are more likely to sign a tax-relief treaty and when information-exchange clauses will be added to a treaty. A simple model with two asymmetric countries and repeated interactions among governments is used. The paper shows that no information exchange clause may be added to a tax treaty when there is a reciprocity requirement, when there is a high cost of negotiation, when there is a cost of providing information, or with one-way capital flows. It is also shown that an information clause increases the gains from a tax relief treaty, but may make it less sustainable.

Keywords: International tax treaties, tax competition, exchange of information.

JEL Code: F42, H77, H87.

1. Introduction

With the increase in capital mobility, the international coordination of capital income taxation has become a prominent policy issue in the last decade. However, several countries have cooperated on tax issues for many decades, mainly through bilateral tax treaties. Nowadays, there exist approximately a thousand such treaties around the world.[1] One of the prime objectives of these treaties is the relief of the double taxation which is typically experienced by cross-border capital flows. Another important aspect is the issue of mutual assistance, or exchange of information, among tax authorities.[2]

Information sharing among tax authorities is an important element of an efficient international tax system, since governments usually cannot monitor investment abroad and tax avoidance is widespread. Although cooperation on information exchange could take several forms, in practice it is usually added as an additional clause in a bilateral tax treaty. Countries signing such a treaty typically adopt a structure based on the OECD Model Convention on Income and Capital that deals with tax rates and tax bases. In addition, they can add a clause on information exchange (art. 26; see OECD, 1994).[3] For example, practically all treaties involving the United States include such a clause (See Beams, 1992). A typical feature in the application of this clause is the condition of reciprocity.

As treaties represent cooperative agreements, it seems natural to apply game theory to analyze them. However, while a growing literature is using this approach to examine the

issue of capital income taxation,[4] little attention has been devoted to these cooperative agreements (Gordon, 1992, and Janeba, 1995, are exceptions). In this paper, we use a model similar to those presented in the literature to identify some factors that would make a country more or less likely to sign a tax-relief treaty and analyze the issue of information exchange in international capital income tax treaties.

In principle, a government has few incentives to provide information to foreign tax authorities on foreign investors. On the one hand, this makes investment in the country less attractive to foreigners if they avoid taxes at home; on the other hand, this might imply smaller revenues for the government. Nevertheless, several countries provide this information. This issue was raised in Bacchetta and Espinosa (1995) who show that large countries have an incentive to transmit information through strategic motives. In their model governments play a two-stage game: they set, first, the degree of information transmission and, second, the tax level. As information sharing modifies the tax base in each country, it softens the extent of tax competition and may be optimal in the non-cooperative solution. This approach, however, is not valid for small countries.

Another reason to supply information, explored in this paper, is the repeated interaction among tax authorities. Providing information may be beneficial if the other country is also providing it. To analyze such an issue, it is necessary to examine repeated games instead of one-shot games typically used in the literature. In such a framework, an information sharing clause will be adopted if the tax treaty including the clause is sustainable.

The analysis of repeated games is usually complex and often does not provide clear conclusions. Nevertheless, by introducing some realistic assumptions we are able to derive unambiguous results. Moreover, we deal with asymmetric countries, which gives us a richer and more relevant set of results than in typical symmetric analyses. We consider two different instruments in this game: taxes on non-residents and the level of information provided. The framework we use is a simple two-country model with repeated interactions among optimizing governments.

We begin with analyzing double-taxation relief treaties for a given level of information and describe the conditions to sign such a treaty. This analysis enables us to predict which countries are more likely to sign a treaty: in particular, countries with more sophisticated inspection procedures, lower levels of tax credit and not too elastic foreign capital flows.

Subsequently, we study the effect of adding an information-exchange clause to a tax-relief agreement in two steps. First, we ignore its effects on the sustainability of a tax treaty and show that cooperation on information is generally desirable. However, we identify several cases where there may be no cooperation. In a second step, we look at the interaction between the terms of the agreement on non-resident taxes and information exchange. We show that, although desirable, an information sharing clause could make a tax-relief treaty harder to sustain in equilibrium. This result justifies why such a clause is not systematically included in a tax treaty.

The paper is organized as follows. Section 2 presents the model. In Section 3 the conditions for a tax-relief treaty to be optimal are derived. Section 4 examines the incentives to cooperate on information transmission ignoring the effects on the sustainability of tax agreements, while Section 5 studies these effects and the interaction between the two decision variables. Section 6 offers concluding remarks.

2. The Model

We consider a two-country world with a continuum of individuals in each country (home and foreign). Individuals live for one period and a new generation is born each period. Population is equal for each generation and is normalized to one. Foreign country variables are denoted with an asterisk.

An individual born at time t receives an endowment of 1 at the beginning of the period. He invests it and consumes the after-tax gross return from investment at the end of period t. The individual also enjoys the use of a publicly provided good and his utility function is:

$$U(c_t, g_t) = u(c_t) + v(g_t)$$

where c_t is consumption of an individual at time t and g_t is the amount of public expenditure per capita. Functions u and v are assumed to be increasing and concave.

In both countries there exists a constant-returns-to-scale technology with a given net return of r, assumed constant throughout the analysis. The depreciation rate is equal to one, so there is no capital accumulation. The individual born at time $t-1$ can invest at home in quantity D_t or abroad in quantity $F_t (D_t = 1 - F_t)$. The actual return on each type of investment differs for two reasons. First, there is a net cost of investing abroad. We assume that the total net cost of foreign investment is represented by a continuous and convex function $\eta(F_t)$,[5] with $\eta(0) = 0$ and $\eta''' \geq 0$. This net cost of investing abroad is not necessarily positive: while foreign investment bears a mobility cost, it may also provide benefits in addition to the net return.[6] The other difference between foreign and domestic returns is the tax treatment. While all domestic investment can be monitored, we assume that a given proportion k, $0 \leq k \leq 1$, of investment abroad cannot be monitored directly by the domestic government.[7] Monitoring can be achieved with the help of the foreign government that provides information to the domestic government. If λ^* represents the proportion of non-monitored investment on which the foreign government transmits information, the proportion of monitored foreign investment is then $1-k(1-\lambda^*)$;[8] hence $k(1-\lambda^*)$ represents the proportion of tax evasion. Domestic investment pays the domestic tax rate. Monitored foreign investment pays both the domestic and foreign tax rate on non-residents, minus any deduction from double taxation relief measures. Finally, non-monitored foreign investment only pays the foreign tax rate. This taxation system corresponds to a residence-based system with exception and with tax evasion (see Mintz and Tulkens, 1996).

More precisely, domestic taxes are payable at rate t_t on the return to domestic investment D_t and to monitored foreign investment $(1 - k(1 - \lambda_t^*))F_t$. A withholding tax $t_{NR,t}^*$ is also imposed on the return to F_t by the foreign government. The latter tax can be credited in proportion a towards domestic taxes if returns are monitored. After this deduction, the effective tax rate on monitored returns for domestic taxpayers is $t_t + (1 - a)t_{NR,t}^*$.

Consumption in period t can be written as:

$$\begin{aligned} c_t \;=\; & 1 + (1 - t_t)r(1 - F_t) + (1 - t_t - (1 - a)t_{NR,t}^*)((1 - k(1 - \lambda_t^*))r F_t \\ & + (1 - t_{NR,t}^*)k(1 - \lambda_t^*)r F_t - \eta(F_t) \end{aligned}$$

i.e., consumption is equal to the initial endowment, plus the after-tax return on each type of investment (domestic, foreign monitored, and foreign non-monitored), minus the cost

of investing abroad. Let us define by p_t the proportion of monitored foreign investment, $p_t \equiv 1 - k(1 - \lambda_t^*)$; and by x_t the additional tax paid if foreign investment is monitored, $x_t \equiv t_t - at_{NR,t}^*$. Then consumption can be written as:

$$c_t = 1 + (1 - t_t)r + [t_t - t_{NR,t}^* - p_t x_t]r F_t - \eta(F_t) \tag{1}$$

We assume that $t_t - t_{NR,t}^* > p_t x_t$ and $t_t^* - t_{NR,t} > p_t^* x_t^*$; otherwise, there would be no incentive for tax evasion.[9] As public expenditure g_t is decided by the government, utility maximization by the individual amounts to the maximization of consumption with respect to foreign investment. By setting the derivative of c_t with respect to F_t equal to zero we get:

$$F_t = \eta'^{-1}\{r[t_t - t_{NR,t}^* - p_t x_t]\} \tag{2}$$

From this equation we obtain the capital allocation of assets between home and foreign country as a function of the parameters of the model, the tax rates and the level of information exchange. We can see that the level of investment abroad depends negatively on $t_{NR,t}^*$ and positively (for $\lambda^* < 1$) on t_t.

As the government is not allowed to issue any debt, public expenditure at time t is financed with the various capital income taxes. We assume that there is no tax clearing system, i.e., governments keep the tax income raised from foreign investment. The government budget constraint can be written as:

$$g_t = t_t r(1 - F_t) + t_{NR,t} r F_t^* + p_t x_t r F_t \tag{3}$$

The domestic government must set the level of three variables: the non-resident tax $t_{NR,t}$, the amount of information transmitted to the foreign government, λ_t, and the tax on domestic investment, t_t. As international tax treaties do not consider domestic taxes, we assume that t_t is always set non-cooperatively. Taxes on non-residents can be set either non-cooperatively or cooperatively through a tax treaty. The level of information exchange can be set non-cooperatively, in which case it is equal to zero (increasing λ decreases F^*); or cooperatively in addition to a tax treaty. Hence cooperation on λ_t is conditional on cooperation on $t_{NR,t}$.

We assume that the government's objective function is the discounted welfare of present and future generations.[10] The discount factor is assumed constant and equal to δ. If we let W be the indirect utility function of a representative individual, substituting (1) and (3) we have $W(t_t, t_{NR,t}, \lambda_t; t_t^*, t_{NR,t}^*, \lambda_t^*) = U(c_t, g_t)$. Consequently, the government's objective function at time t is:

$$\max_{t_i, \lambda_i, t_{NR,i}} \sum_{i=t}^{\infty} \delta^{i-t} W(t_i, t_{NR,i}, \lambda_i; t_i^*, t_{NR,i}^*, \lambda_i^*) \tag{4}$$

W is assumed to be twice continuously differentiable and strictly globally concave.

If countries had a one-period horizon, the solution to both countries optimization would be given by the Nash equilibria of the one-shot game, $(t, t_{NR}^{nc}, \lambda^{nc}, t^*, t_{NR}^{*nc}, \lambda^{*nc})$. It is easily verified that in a Nash equilibrium of the static game, there is no individual incentive to provide any information to a foreign country and that the non-cooperative level of information

sharing is zero, i.e., $\lambda^{nc} = 0$, $\lambda^{*nc} = 0$. In this model, providing information unilaterally does not provide any gain, while it makes inward investment less attractive and therefore reduces government revenue.

Considering only a one-shot game is not realistic; this ignores the fact that a government has to consider the future reaction of other governments to its choice of tax rates or behavior concerning information transmission. To explicitly consider this possibility of reaction we make the model dynamic: the simultaneous-move game will be played repeatedly. For repeated games with an infinite horizon, the Folk theorem asserts that a multiplicity of outcomes are sustainable, including the one-shot outcome. Since there are equilibrium outcomes which are Pareto superior to the one-shot outcome, cooperation could be sustained as an equilibrium of the non-cooperative repeated game.

Countries may sign a cooperative tax-only treaty specifying the variables $(t_{NR,t}, t^*_{NR,t})$. They can also sign a tax-cum-information treaty on the variables $(t_{NR,t}, \lambda_t, t^*_{NR,t}, \lambda^*_t)$. To be signed, a treaty must be sustainable in the sense that the agreed upon values must be an equilibrium of the repeated game. The nature of an international tax treaty is such that a country may breach the agreement whenever it goes against its incentives (there is no legal enforcement).[11] When a country breaches a treaty, the other party has no legal obligation to comply with it. In other words, a tax treaty must be incentive compatible for all the countries involved. In general, many equilibria are sustainable. For simplicity, we focus on those where governments repeat each period their optimal strategy. Consequently, the treaty variables are constant over time and we can omit the time subscript.

The non-cooperative setting of domestic tax rates simply implies, in an interior solution, that $\frac{\partial W}{\partial t} = 0$. In other terms we have:

$$u'(c)\frac{dc}{dt} + v'(g)\frac{dg}{dt} = 0 \tag{5}$$

Let us define by MRS the marginal rate of substitution between consumption of the private and the publicly provided good, MRS $\equiv u'(c)/v'(g)$. This measures the slope of the indifference curve for the representative consumer, which represents the relative valuation of consumption of c and g. When the government sets taxes optimally we get from the first order condition (5) that $\frac{u'(c)}{v'(g)} = -\frac{dg/dt}{dc/dt}$. Then, from (1), (2) and (3) we find that in equilibrium MRS < 1. This inequality implies that taxes are distortionary, i.e., that it takes more than one unit of the private good to increase consumption of the publicly provided good by one unit.

Regarding the two other decision variables, we will study the treaties $(t_{NR}, \lambda, t^*_{NR}, \lambda^*)$ which are sustainable in a repeated game through Nash reversion strategies: governments cooperate until one of them deviates, and deviation triggers a permanent retaliation to the non-cooperative one-shot outcome. When a government contemplates the possibility of deviating, it takes into account, on the one hand, the one period gains it obtains, and on the other, the welfare forgone by triggering retaliation from the following period onwards. Formally, a treaty $(t_{NR}, \lambda, t^*_{NR}, \lambda^*)$ will be immune to deviations by the home country if the following condition holds:[12]

$$\frac{W(t_{NR}, \lambda, t^*_{NR}, \lambda^*)}{1-\delta} \geq W(t^d_{NR}, \lambda^d, t^*_{NR}, \lambda^*) + \frac{\delta W(t^{nc}_{NR}, \lambda^{nc}, t^{*nc}_{NR}, \lambda^{*nc})}{1-\delta} \tag{6}$$

The term on the left-hand side is the present value of welfare obtained when complying with the treaty. When the home government considers deviation, it will deviate optimally so that the first term on the right hand side is domestic welfare when the home country uses its best response (t^d_{NR}, λ^d), while the foreign government has not reacted yet and therefore complies with the terms of the treaty. After the deviation is observed, both countries revert to the one-shot solution forever after; the second term on the right hand side gives the present value of welfare along that punishment path. Thus, the inequality simply states that it is better to comply with the treaty than to deviate optimally and trigger a retaliation. We may write inequality (6) as:

$$W(t_{NR}, \lambda, t^*_{NR}, \lambda^*) \geq (1-\delta) W(t^d_{NR}, \lambda^d, t^*_{NR}, \lambda^*) + \delta W(t^{nc}_{NR}, \lambda^{nc}, t^{*nc}_{NR}, \lambda^{*nc}) \qquad (7)$$

Note that the size of the discount factor δ is important because it affects the relative weights put on the future welfare losses (second term on the right hand side) and the present gain from a deviation (first term on the right hand side).

Similarly, for a treaty to be incentive compatible for the foreign country:

$$W^*(t_{NR}, \lambda, t^*_{NR}, \lambda^*) \geq (1-\delta^*) W^*(t_{NR}, \lambda, t^{*d}_{NR}, \lambda^{*d}) + \delta^* W^*(t^{nc}_{NR}, \lambda^{nc}, t^{*nc}_{NR}, \lambda^{*nc}) \qquad (7^*)$$

In this general set-up, a treaty will not be signed when one of the discount factors δ or δ^* is too low, unless there is no gain from deviating in the first period ($W(t^d_{NR}, \lambda^d, t^*_{NR}, \lambda^*) = W(t_{NR}, \lambda, t^*_{NR}, \lambda^*)$). For example, when a government is short-sighted, it will value the gains from breaching a treaty today more highly than the costs of having no treaty in the future. In this case, no treaty may be signed. However, there are other factors that will determine when a treaty is signed and whether an information clause is included. The rest of the paper is devoted to analyze more precisely these factors. The following section examines the conditions under which a tax-only treaty is signed and Section 4 determines when a clause of information exchange is added to the treaty.

3. Tax-Only Treaties

We now examine treaties on t_{NR} and t^*_{NR}, assuming that λ and λ^* are equal to their non-cooperative value of zero. The main question in this section is to know when countries will sign a double taxation where taxes on non-residents are decreased, that is, where $t_{NR} \leq t^{nc}_{NR}$ and $t^*_{NR} \leq t^{*nc}_{NR}$.[13] For this purpose, first we have to understand when it is optimal to decrease (and not to increase) taxes on non-residents. Second, we have to determine whether a treaty is incentive compatible.

As a preliminary step, however, we examine the non-cooperative solution, where $\frac{\partial W}{\partial t_{NR}} \geq 0$ and $\frac{\partial W^*}{\partial t^*_{NR}} \geq 0$.[14] As consumption does not depend on t_{NR}, the optimal tax amounts to maximizing government revenue given by (3), simply by maximizing $t_{NR} r F^*$. Nevertheless, the tax rate cannot be higher than one. Hence we have:

$$t^{nc}_{NR} = \min\left\{1, -\frac{F^*}{\partial F^*/\partial t_{NR}}\right\} \qquad t^{*nc}_{NR} = \min\left\{1, -\frac{F}{\partial F/\partial t^*_{NR}}\right\} \qquad (8)$$

In general, non-resident taxes decided non-cooperatively can be either too high or too low. If they are too low for both countries, there will be no incentive to sign a double taxation relief treaty. As is well known, the difference between the optimal and the non-cooperative level of taxes depends on the externalities to the foreign countries that are not taken into account in the Nash solution. In this case, the externalities are measured by the impact of t_{NR} on W^*:

$$\begin{aligned}\frac{\partial W^*}{\partial t_{NR}} &= u'^*(c^*)\frac{\partial c^*}{\partial t_{NR}} + v'^*(g^*)\frac{\partial g^*}{\partial t_{NR}} \\ &= -[u'^*(c^*)(1-a^*p^*) + v'^*(g^*)a^*p^*]rF^* \\ &\quad - v'^*(g^*)(t^* - p^*x^*)r\frac{\partial F^*}{\partial t_{NR}} \qquad (9)\end{aligned}$$

The latter part of the equality is made of two terms. The first term is a *tax exportation* effect[15] reflecting a negative externality due to lower after-tax income (and thus consumption) and lower government revenue, due to tax credits, in the foreign country. The second term is a *capital flight* effect, which implies a positive externality ($\frac{\partial F^*}{\partial t_{NR}}$ is negative): capital flowing out of the foreign country is smaller so that the foreign government's tax base is larger.

A necessary condition for a tax-relief treaty to be signed is that the tax on non residents is too high compared to the cooperative solution. This is the case when the expression in (9) is negative, i.e., when the tax exportation effect is larger than the capital flight effect. This is the case, for example, when the level of foreign tax credit a^* is small, as this makes the tax exportation effect larger. On the other hand, the capital flight effect is smaller when p^* is large (k^* small) or when foreign capital flows, F^* are not too elastic. A similar analysis can be made for the impact of the foreign country's tax, t^*_{NR}.

Even when externalities are negative, we have to make sure that a treaty is sustainable, i.e., that conditions (7) hold. They can be written as:

$$W(t_{NR}, t^*_{NR}) \geq (1-\delta)W(t^d_{NR}, t^*_{NR}) + \delta W(t^{nc}_{NR}, t^{*nc}_{NR}) \qquad (10)$$

$$W^*(t_{NR}, t^*_{NR}) \geq (1-\delta^*)W^*(t_{NR}, t^{*d}_{NR}) + \delta^* W^*(t^{nc}_{NR}, t^{*nc}_{NR}) \qquad (10^*)$$

Notice that $t^d_{NR} = t^{nc}_{NR}$, that is, the best response to any foreign tax on non-residents is always the non-cooperative level t^{nc}_{NR} (see (8)). In equations (10) we can see the effect of different variables on the possibilities for cooperation. It can be checked that a unilateral improvement on the fiscal inspection procedures of the home country (a decrease in k) would make cooperation easier for the home country, by making inequality (10) easier to hold (see Appendix A). Note, however, that a decrease in k also affects inequality (10*). Welfare from cooperation becomes lower for the foreign country; nevertheless, gains from short run deviations and from the punishment path also become lower. Assuming that a and η'''^{-1} are not too large, this second effect dominates the first and (10*) becomes easier to hold. Accordingly, we should find that countries with better inspection procedures, or smaller tax evasion abroad, are more likely to sign tax-relief treaties than countries with poor monitoring of investment abroad.

Another variable that governments can control is the rate of tax credit, a. A decrease in a increases cooperation welfare for the domestic country, but it also increases the welfare from violating the agreement for one period and reverting to the punishment path forever after. When η'''^{-1}, u'', and v'' are not too large, Appendix A shows that the first effect dominates. Consequently, countries with low levels of tax credit are more likely to sign double-taxation tax treaties.

A third variable that may affect cooperation is λ. The impact of information-exchange clauses is analyzed in the remainder of the paper. We will assume that both (9) and (10) hold for some value of $t_{NR} < t_{NR}^{nc}$, i.e., that both countries have an incentive to sign a tax-relief treaty. In section 5, we examine how this incentive is affected by cooperating also on information exchange.

4. Adding an Information-Exchange Clause to a Tax Treaty

As the legal basis for mutual assistance takes the form of an additional clause in a tax treaty, we analyze the incentives to exchange information given that a tax treaty is optimal for both countries. In other words, we examine whether countries want to cooperate in λ and λ^* given that they cooperate in t_{NR} and t_{NR}^*. As we will see, the optimal level of t_{NR} and t_{NR}^* will change with the levels of λ and λ^*. In this section we focus on the incentives to cooperate on information transmission, ignoring any interaction with the sustainability of the tax treaty. In the next section, we will look explicitly into this interaction.

Whether an information-exchange is included in a treaty depends on whether cooperation on information exchange is sustainable. This depends in particular on the "punishment" for violating the terms of the clause. To keep the analysis simple, we assume that if a country does not transmit information as agreed in the information-exchange clause, then the other country does not have to comply with the clause either;[16] however, the rest of the treaty is not affected. With this mild punishment, the sustainability conditions are:[17]

$$W(\lambda, \lambda^*) \geq (1-\delta)W(\lambda^d, \lambda^*) + \delta W(\lambda^{nc}, \lambda^{*nc}) \tag{11}$$

$$W^*(\lambda, \lambda^*) \geq (1-\delta^*)W^*(\lambda, \lambda^{*d}) + \delta^* W^*(\lambda^{nc}, \lambda^{*nc}) \tag{11*}$$

where the cooperative levels of t_{NR} and t_{NR}^* are omitted for convenience from the indirect utility functions.

The incentives to breach a clause (λ, λ^*) are given by $W(\lambda^d, \lambda^*)$ and $W^*(\lambda, \lambda^{*d})$. Let us examine these gains from a one-period deviation. When the home country deviates by lowering λ, the foreign government is assumed to react by decreasing λ^* to zero from the following period onwards. Furthermore, we assume that the foreign private sector cannot react immediately to the change in λ by increasing investment in the domestic country, F^*. Since information goes from government to government, it seems reasonable to assume that the foreign private sector cannot react before the foreign government to a change in λ. If this is the case, then the one-shot gain from deviation is zero: $W(\lambda^d, \lambda^*) = W(\lambda, \lambda^*)$, since there is no direct gain from changing λ and the domestic government cannot benefit

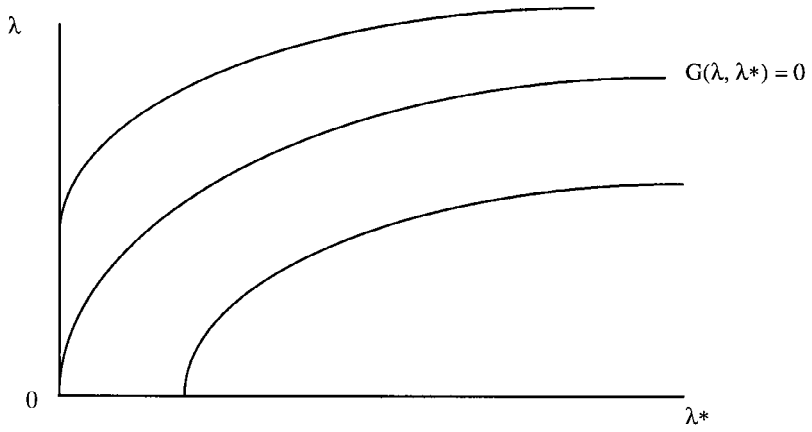


Figure 1.

in the short run from an increase in foreign investment. Consequently, the discount factors δ and δ^* play no role.

The previous arguments imply that for the cooperative solution (λ, λ^*) to be sustainable, the conditions are:

$$W(\lambda, \lambda^*) \geq W(0, 0) \tag{12}$$

$$W^*(\lambda, \lambda^*) \geq W^*(0, 0) \tag{12*}$$

i.e., any clause that improves the non-cooperative situation will be added to the treaty. We characterize the set of (λ, λ^*) for which inequalities (12) hold.

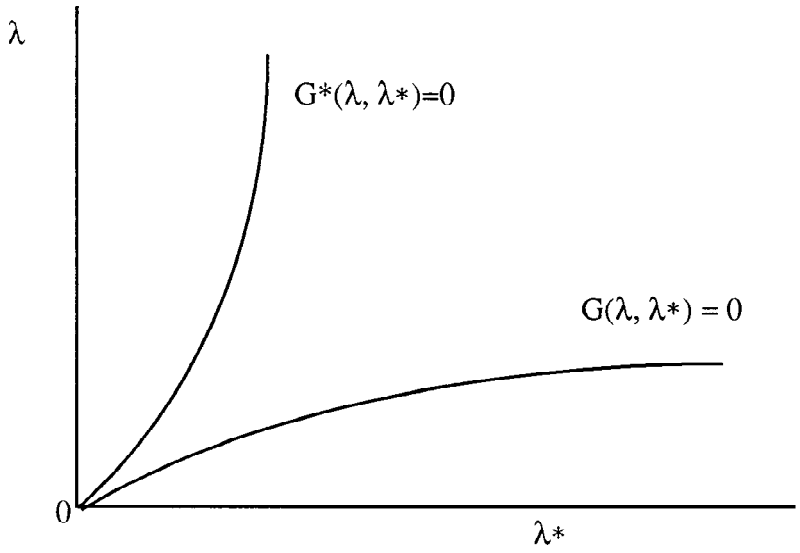
Define $G(\lambda, \lambda^*) = W(\lambda, \lambda^*) - W(0, 0)$ and $G^*(\lambda, \lambda^*) = W^*(\lambda, \lambda^*) - W^*(0, 0)$. The function G measures the gains from agreeing to (λ, λ^*) for the domestic country. We may represent the map of iso-G curves in the $\lambda - \lambda^*$ space:

The curve $G(\lambda, \lambda^*) = 0$ crosses the point (0, 0). Under a mild condition on the third derivative of the cost function $\eta(F)$ (η'''^{-1} cannot be very large[18]), the function G is concave and the indifference lines are as depicted in Figure 1. Indifference curves for the foreign country can also be depicted in the same space and are convex.

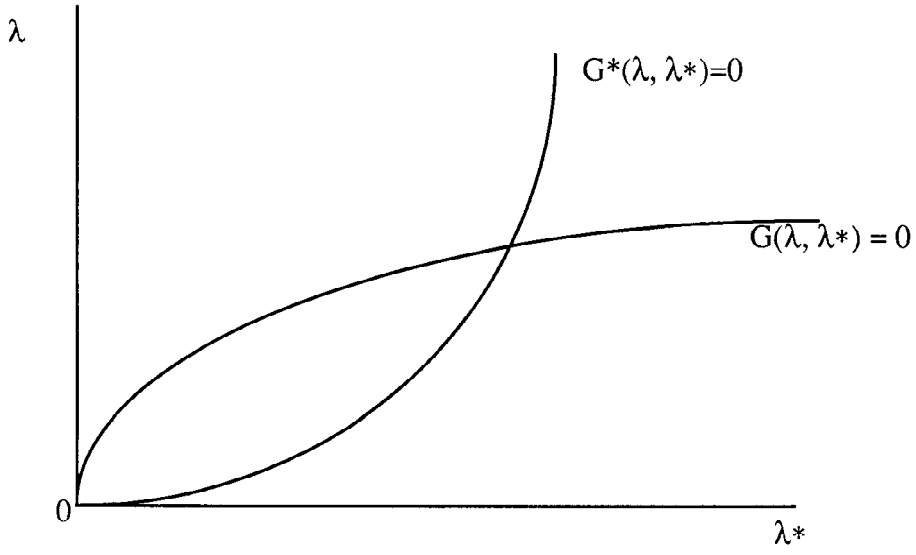
a. Optimality of Information Exchange

The position of the curves $G(\lambda, \lambda^*) = 0$ and $G^*(\lambda, \lambda^*) = 0$ will determine whether a mutual assistance clause will be included or not. In Figure 2(a) the countries do not share information, whereas in the situation depicted in Figure 2(b), countries will be willing to cooperate on information sharing.

It is easily shown that in this set-up, we are always in situation (b). Assume that countries can supply information with no direct cost (the only cost being smaller capital inflows)



(a)



(b)

Figure 2.

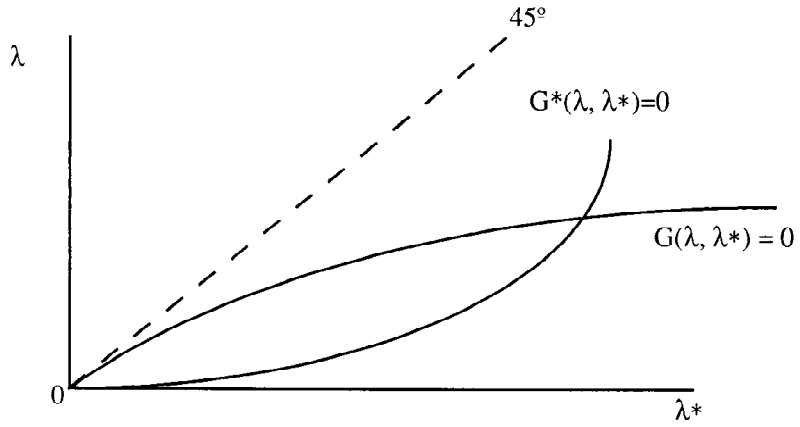


Figure 3.

and can freely determine the amount provided. Then, it is optimal to add an information exchange clause to a tax treaty, no matter how asymmetric countries may be. The proof of this result may be found in Appendix B.

The previous result states that, under mild conditions, countries always have incentives to share information. A significant feature of its proof is that it does not rely on the cooperative level of non-residents taxes. In other words, the exchange of information would be sustainable even though they do not sign a tax treaty.

An important issue is to identify the countries that are more likely to make concessions in a cooperative agreement, i.e., the countries that provide more information. While the precise bargaining behavior should be specified to determine (λ, λ^*), several conclusions can be drawn by examining the incentive compatibility constraints (12). Consider the situation depicted in Figure 3. In this case, a treaty is signed only if $\lambda^* > \lambda$, where the foreign country makes more concessions than the domestic one.

A sufficient condition for the type of asymmetry represented in Figure 3 is that the slope of the home country indifference curve lies below the 45 degree line, i.e., that $(\frac{d\lambda}{d\lambda^*})_{G(0,0)=0} < 1$. This inequality implies:

$$\frac{\partial g}{\partial \lambda} + \frac{\partial g}{\partial \lambda^*} + \text{MRS}\frac{\partial c}{\partial \lambda^*} < 0 \tag{13}$$

Inequality (13) holds when the gains from receiving information (the last two terms) are small compared to the costs of providing it (the first term). Recall, however, that the benefits always offset the costs. Moreover, the inequality can only hold for one of the two countries. Inequality (13) can be written as:

$$t_{NR}\frac{\partial F^*}{\partial \lambda} - (t - px)\frac{\partial F}{\partial \lambda^*} + (1 - \text{MRS})kxF < 0 \tag{14}$$

The latter inequality tells us which factors, in our model, determine the willingness to add an information clause. A country is less willing to make concessions, first, when

foreign (inward) capital flows are more sensitive to information exchange than domestic (outward) flows, i.e., when $\frac{\partial F^*}{\partial \lambda}$ is large in absolute value compared to $\frac{\partial F}{\partial \lambda^*}$; second, when the tax on residents, t, is low compared to the tax on non-residents, t_{NR} (but we might still have $t - px > t_{NR}$); third, when domestic investment abroad, F, is small; fourth, when foreign tax credits, a, are high; and finally, when the marginal rate of substitution between the private and the publicly provided good, MRS, is high, i.e., when the public good is less valuable. Allowing for differences in monitoring technologies, k and k^*, also affects equation (14). For example, a higher k^* (less monitoring from the foreign government) makes inequality (14) more likely to hold as $\frac{\partial F^*}{\partial \lambda}$ is higher. On the other hand, (14) is more likely to hold with a higher k as the gain from information is larger (due to lower monitoring). The explanation of the role of each of these factors is intuitive: they either decrease the value of receiving information or increase the cost of providing it.

An interesting source of asymmetry is country size. When country size tends to zero, the last two terms in inequality (14) tend to zero. As the first term is negative, inequality (14) holds as the domestic country becomes smaller. Hence, small countries are less likely to make concessions when exchanging information.

b. Reasons Not to Add an Information-Exchange Clause

The previous analysis has allowed us to identify the general conditions under which two, possibly asymmetric, countries will add a mutual-assistance clause in a tax treaty. In this section, we point out circumstances under which such a clause is not optimal. We examine two cases: the cost of providing information and the existence of reciprocity requirements.

Providing information may require significant additional resources for some countries. This is particularly relevant for developing countries that do not have a sophisticated tax system and are not well equipped to supply information, so that the cost of transmitting the information required by the terms of the treaty might be too high. Appendix C examines formally the impact of introducing a cost of providing information. The analysis shows that cooperation on information exchange might not be sustainable. This is the case when there is a high marginal cost of providing information, a high foreign withholding tax and a large elasticity of international capital flows. These variables need to be high only for one of the two countries for an information exchange clause not to be sustainable. Finally, the role of the cost of providing information is all the more important when the gains from adding an information-exchange clause are small. This is the case in particular when capital flows are small. Hence, in the presence of a cost of providing information, countries with limited capital flows are less likely to add an information clause. This implies that the magnitude of bilateral capital flows is positively correlated with the degree of information sharing, which is a feature observed in the real world.[19]

The application of a reciprocity requirement might be a second reason why countries do not cooperate on information transmission. Most treaties are standardized and the obligations of each country are the same. Hence, the information clause may impose the condition $\lambda = \lambda^*$. This restriction, however, may not be desirable if countries are very different. Consider again Figure 3. A clause with reciprocity would lie on the 45 degree line. Clearly, in the case of Figure 3 no clause with reciprocity would be added to a

treaty as this point is outside the intersection area of the upper contour sets for the two countries.

The condition for countries not to enter an information exchange treaty with reciprocity is: either $(\frac{d\lambda}{d\lambda^*})_{G(0,0)=0} < 1$ or $(\frac{d\lambda}{d\lambda^*})_{G^*(0,0)=0} > 1$. This condition is necessary and sufficient given the shape of the indifference curves. We examined the first part of the condition, $(\frac{d\lambda}{d\lambda^*})_{G(0,0)=0} < 1$, in the above subsection to determine when a country will transmit little information in a treaty. Hence, for a treaty with reciprocity not to be signed, inequality (14) or its equivalent for the foreign country must hold.[20] The factors influencing these inequalities have already been listed above. In particular, two countries of very different size are less likely to exchange information if there is a condition of reciprocity.[21]

Finally, we want to point out another reason why countries may not cooperate on information transmission. We have assumed that the value of λ reaches the foreign government before it reaches the foreign private sector. This is a reasonable assumption. Under some circumstances, however, it may be the case that, due to institutional rigidities, the foreign government cannot react changing λ^* as soon as it observes the change in λ. If the decision to change λ^* takes some time, then the private sector may react first and the gains from deviation for the domestic country will not be zero. Then, for low values of the discount factor (or for a long reaction time) cooperation on information sharing could be non-sustainable.

5. Does an Information-Exchange Clause Affect the Incentives to Sign a Tax Treaty?

An important issue is to understand to what extent the inclusion of an information exchange clause affects the incentives to sign a tax treaty. In section 3, we showed that two conditions are required to sign a tax-relief treaty. First, the non-cooperative tax on non-residents, t_{NR}^{nc}, must be higher than the cooperative level, t_{NR}; this is the case when expression (9) is negative. The second condition is that the treaty must be sustainable (inequalities (10)). In this section, we examine how these conditions are affected by information sharing.

First, it can be easily verified that (9) is more likely to be negative the higher is λ. This is due to the fact that p^* increases with λ (for $k > 0$). Hence, with information sharing a tax-relief treaty is more desirable. The intuition is simply that with more information exchanged, the capital flight effect is smaller.

The analysis of inequalities (10) is somewhat more complex. It also requires further specification of investors' behavior when a country deviates from a treaty. Contrarily to the case of information exchange, there is always a gain from deviating from one period as tax revenue is immediately affected. In this case, we assume that the foreign private sector can react immediately to changes in t_{NR} (while the foreign government can react only after one period). This seems a natural assumption, as withholding taxes on non-residents are readily observable and can easily be taken into account when an investment is undertaken.[22]

Given that there is a gain from deviating, the discount factor δ now matters and the method used for the analysis of information exchange, based on indifference curves, cannot be used in this context. To study the incentive compatibility constraints further, it is useful to note that domestic consumption, c, is the same with t_{NR} as with t_{NR}^d. Hence the constraint for

the domestic country (inequality (10)) can be written as:

$$\delta \geq \frac{v(g^d) - v(g)}{u(c) - u(c^{nc}) + v(g^d) - v(g^{nc})} \tag{15}$$

The latter inequality implies that there exist minimum δ and δ^*, ($\underline{\delta}$, $\underline{\delta^*}$), such that a treaty is sustainable. It can be shown that either a treaty is signed with the first-best withholding tax or no treaty is signed.[23] In other terms, the incentive compatibility constraint does not affect the level of the tax in the treaty, but only the likelihood of signing a treaty.

To examine the impact of an information clause (λ, λ^*) added to a treaty, we derive the impact of small changes in λ and λ^* on $\underline{\delta}$ (defined by (15) holding with equality). If $\underline{\delta}$ decreases, a treaty is more easily sustainable. The sign of $d\underline{\delta}$ can be found by differentiating the right-hand side of (15) with respect to λ and λ^*. It must be noticed that if a country deviates on non-resident taxes, so that in the next period the treaty will not be in place, it will also stop providing information at the same time (otherwise the deviation would not be optimal).[24] This implies that changes in λ only affect cooperation welfare. Then it is easily shown that:

$$\text{sign} d\underline{\delta} = \text{sign}\left\{-\frac{\partial g}{\partial \lambda} d\lambda - \left[\frac{\partial g}{\partial \lambda^*} + \underline{\delta}\text{MRS}\frac{\partial c}{\partial \lambda^*} - (1-\underline{\delta})\frac{v'(g^d)}{v'(g)}\frac{\partial g^d}{\partial \lambda^*}\right] d\lambda^*\right\} \tag{16}$$

The first term on the right-hand side represents the impact of λ of $\underline{\delta}$. Sine $\frac{\partial g}{\partial \lambda} < 0$, this impact is positive, i.e., a rise in λ increases $\underline{\delta}$. Therefore, if a treaty is just sustainable because the incentive compatibility condition binds, a small unilateral increase in λ would cause the condition for the home country not to hold and would make a treaty non-sustainable. The reason is that an increase in λ decreases the gains from cooperation, while the right hand side of (10) is not affected. While a change in λ only affects cooperation welfare, a change in λ^* affects both cooperation welfare and the gains from one period deviation. The effect on cooperation welfare is given by the first two terms in square brackets and is clearly positive. The last term in square brackets represents the impact on one period deviation and is negative. Consequently, an increase in λ^* increases the gain from deviation for the home country and therefore $\underline{\delta}$.

An information clause has therefore two opposite effects on $\underline{\delta}$. The total effect is ambiguous in general and depends on all the parameters in the model. Thus, there are circumstances where an information clause could make a tax treaty non-sustainable. We have shown in the previous section that the decrease in welfare due to the increase in λ may be more than compensated by the increase in λ^*. We ignored, however, the effect we are now considering: the increase in information provided by the foreign government strengthens the incentives to breach the agreement, possibly making it non-sustainable.

To summarize, the exchange of information makes a tax treaty more desirable, since information sharing increases the welfare from cooperation on non-resident taxes, but it also increases the benefits from defecting. This implies that when incentive compatibility conditions (10) hold with slack, then information clauses may be added. However, if countries find the agreement on taxes just sustainable, then information sharing may be omitted from the treaty to avoid making defection too attractive.

6. Conclusion

The exchange of information among tax authorities is bound to receive more attention in the future, both by taxpayers and by tax authorities. In this paper, we use a simple, but general, framework that allows to understand various aspects of information exchange. We identify conditions under which information sharing is optimal. When these conditions are satisfied, tax authorities choose a cooperative agreement if they interact on a repeated basis. The specific form of cooperation we consider is an additional clause in a bilateral double-taxation treaty, as this is the most commonly used in practice (many of our results are nonetheless valid for other forms of cooperation). We determine characteristics a country should have to be more likely to make information concessions in a treaty. In our model, a country is more willing to cooperate on information exchange when foreign (inward) capital flows are less sensitive to information sharing than domestic (outward) flows, when the tax on residents is high compared to the tax on non-residents, when domestic investment abroad is high, when foreign tax credits are low and, finally, when the rate of substitution between the private and the publicly provided good is high. There are circumstances, however, when information exchange may not be optimal. The cases examined in the paper are reciprocity clauses with asymmetric countries, one-way capital flows, and the costs of transmitting information. An interesting aspect, related to the type of cooperation considered, is to understand how a double-taxation treaty is affected by a clause of mutual assistance. We show that such a clause increases the gains from a tax treaty, but it could make it non-sustainable.

An important issue is the impact of international capital markets integration on tax treaties and information exchange. Our simple framework suggests that the issue is complex and depends on the meaning of capital markets integration. Does it imply mainly an increase in the magnitude of capital flows, captured by η' in our model? Or an increase in the elasticity of capital flows to return differentials, captured by η''? Is the increase in capital flows uniform across countries or are there asymmetries, e.g., an increase in capital flows from developed to emerging countries? Our model gives different predictions in the various cases. For example, if η'' is larger, capital flows are more elastic and the capital flight effect is larger. This implies that tax competition becomes stronger and the need for a double-taxation relief treaty may disappear (t_{NR}^{nc} becomes too low). Regarding information exchange, an increase in the quantity of capital inflows or of its elasticity implies a smaller willingness to share information. As the opposite holds true for capital outflows, what matters is whether capital market integration increases or decreases asymmetries among countries. A more careful analysis of these issues would be of high interest.

Our paper is related to the literature on coalition formation in that, in a particular setting, we identify the incentives behind cooperation and conditions under which coalitions are sustainable. The analysis could be extended to several countries and then we could determine the equilibrium configuration of tax treaties (whether only one treaty is signed or several, whether treaties are bilateral or multilateral, and which countries participate). A first consideration is that reciprocity requirements work against multilateral treaties; if there is reciprocity, it is less likely that a group of asymmetric countries will agree on the optimal values of taxes and information exchange (diversity usually increases with the number of countries involved). On the other hand, cooperation is more easily sustainable when

the treaty states that any violation will imply a collective punishment. Another extension would be to depart from the paradigm of optimizing benevolent governments and introduce political economy considerations. It seems obvious that, at least in some countries, strong interest groups have an influence over tax decisions. These considerations would bring a new dimension to the analysis and may help deepen our understanding of international tax treaties and information exchange agreements.

Appendix

A. Analysis of the Incentive Compatibility Conditions (10)

1. Effect of k *on the Domestic Country's Incentive Compatibility Condition*

It is not difficult to see that:

$$\begin{aligned}\frac{dW(t_{NR}, t^*_{NR})}{dk} &= u'(c)\frac{dc(t_{NR}, t^*_{NR})}{dk} + v'(g)\frac{dg(t_{NR}, t^*_{NR})}{dk} \\ &= -(v'(g) - u'(c))xrF(1-\lambda^*) \\ &\quad - v'(g)\eta''^{-1}r^2(1-\lambda^*)x(t - px) < 0 \end{aligned} \tag{A1}$$

It can be verified that $|\frac{dW(t_{NR}, t^*_{NR})}{dk}|$ is decreasing in t_{NR} and, if a is not too large, decreasing in t^*_{NR}. This implies that a decrease in k would have a greater impact on the cooperation welfare than on the gains from one period deviation and reversion to the punishment path forever after. Consequently, when k decreases, (10) is more likely to hold.

2. Effect of k on the Foreign Country's Incentive Compatibility Condition

Since k has no impact on c^*, we only need to consider the effect on g^*. We have

$$\frac{dg^*}{dk} = rt^*_{NR}\frac{dF}{dk} = t^*_{NR}\eta''^{-1}r^2(1-\lambda^*)x \tag{A2}$$

This expression is increasing with t^*_{NR} if $a < \frac{t}{2t^*_{NR}}$. For η'''^{-1} small, the effect of t_{NR} on the expression is small. Then, a decrease in k decreases gains from deviation and from the punishment path even more than it decreases welfare from cooperation and condition (10*) becomes easier to sustain.

3. Effect of a on the Domestic Country's Incentive Compatibility Condition

We have:

$$\begin{aligned}\frac{dW(t_{NR}, t^*_{NR})}{da} &= u'(c)\frac{dc(t_{NR}, t^*_{NR})}{da} + v'(g)\frac{dg(t_{NR}, t^*_{NR})}{da} \\ &= -(v'(g) - u'(c))pt^*_{NR}rF - v'(g)\eta''^{-1}r^2pt^*_{NR}(t - px) < 0 \end{aligned} \tag{A3}$$

It can be verified that $|\frac{dW(t_{NR},t^*_{NR})}{da}|$ depends positively on t^*_{NR}, and does not depend on t_{NR} when η'''^{-1}, u'', and v'' are not too large. Hence, when a increases (10) is more likely to hold. Under these same conditions, the impact on (10*) is small.

B. Optimality of an Information-Exchange Clause When Information Provision Has No Cost

To show the result, we only need to prove that the slope of the indifference curve in (0,0) is higher for the home country than for the foreign one, that is, $(\frac{d\lambda}{d\lambda^*})_{G(0,0)=0} > (\frac{d\lambda}{d\lambda^*})_{G^*(0,0)=0}$. If this condition is satisfied, we are in situation (b), with some interior area between the curves $G(\lambda, \lambda^*) = 0$ and $G^*(\lambda, \lambda^*) = 0$. The above inequality can be written as:

$$\left(-\frac{\partial G/\partial\lambda}{\partial G/\partial\lambda^*}\right)_{G(0,0)=0} > \left(-\frac{\partial G^*/\partial\lambda}{\partial G^*/\partial\lambda^*}\right)_{G^*(0,0)=0} \tag{B1}$$

This implies:

$$\left(\text{MRS}\frac{\partial c}{\partial\lambda^*} + \frac{\partial g}{\partial\lambda^*}\right)\left(\text{MRS}^*\frac{\partial c^*}{\partial\lambda} + \frac{\partial g^*}{\partial\lambda}\right) - \frac{\partial g}{\partial\lambda}\frac{\partial g^*}{\partial\lambda^*} > 0 \tag{B2}$$

By evaluating equation (B2) at the non-cooperative equilibrium (0,0), we have:

$$\begin{aligned}(1-\text{MRS})(1-\text{MRS}^*)xx^*FF^* - (1-\text{MRS}^*)(t-px)k^*x^*F^*\frac{\partial F}{\partial\lambda^*}\\ - (1-\text{MRS})(t^*-p^*x^*)kxF\frac{\partial F^*}{\partial\lambda}\\ + [(t-px)(t^*-p^*x^*) - t_{NR}t^*_{NR}]\frac{\partial F}{\partial\lambda^*}\frac{\partial F^*}{\partial\lambda} > 0\end{aligned} \tag{B3}$$

Inequality (B3) holds as MRS < 1 and MRS* < 1, $\frac{\partial F}{\partial\lambda^*} \leq 0$ and $\frac{\partial F^*}{\partial\lambda} \leq 0$, and $t - px > t^*_{NR}$ and $t^* - p^*x^* > t_{NR}$.

C. Adding a Cost of Providing Information

We can examine this case by introducing a cost $\zeta(\lambda, F^*)$ of providing information for the home country; $\zeta_\lambda \geq 0$, $\zeta_{F^*} \geq 0$, $\zeta_{\lambda\lambda} \geq 0$, $\zeta_{F^*F^*} \geq 0$. Similarly, the foreign country has a cost $\zeta^*(\lambda^*, F)$ with the same assumptions. We define $\zeta' = \zeta_\lambda + \zeta_{F^*}\frac{\partial F^*}{\partial\lambda}$ as the marginal cost of transmitting information. Inequality (B3) becomes:

$$\begin{aligned}&(1-\text{MRS})(1-\text{MRS}^*)xx^*FF^* - (1-\text{MRS}^*)(t-px)k^*x^*F^*\frac{\partial F}{\partial\lambda^*}\\ &\quad - (1-\text{MRS})(t^*-p^*x^*)kxF\frac{\partial F^*}{\partial\lambda} + [(t-px)(t^*-p^*x^*) - t_{NR}t^*_{NR}]\frac{\partial F}{\partial\lambda^*}\frac{\partial F^*}{\partial\lambda}\\ &\quad + \zeta'^*t_{NR}\frac{\partial F^*}{\partial\lambda} + \zeta' t^*_N\frac{\partial F}{\partial\lambda^*} > 0\end{aligned} \tag{C1}$$

This inequality may not hold now due to the negative terms $\zeta'^*t_{NR}\frac{\partial F^*}{\partial\lambda}$ and $\zeta' t^*_{NR}\frac{\partial F}{\partial\lambda^*}$.

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Notes

1. See Rigby (1991). Hines and Willard (1992) provide an interesting empirical analysis of these treaties.
2. See, for example, Beams (1992), Beith (1992), Guttentag (1980), International Fiscal Association (1990) or OECD (1994) for a description.
3. There exist other basis for mutual assistance. For example, Scandinavian and European countries have multilateral agreements (Nordic Mutual Assistance Treaty and EC Directive on Mutual Assistance, 77/799/CEE).
4. See, for example, Giovannini (1989), Frenkel, Razin, and Sadka (1991), Mintz and Tulkens (1990), Ghosh (1991), or Gordon (1992).
5. Persson and Tabellini (1992), Bacchetta and Caminal (1992), and Bacchetta and Espinosa (1995) use a similar function in related setups. Niehans (1992) uses a quadratic function. These references contain a justification for such a function. For simplicity, we assume throughout the analysis that $\eta(F)$ is such that the individual's problem has an interior solution with F in (0, 1).
6. For example, multinationals set up foreign subsidiaries for reasons that are independent of the net return on capital in other countries. Alternatively, investors might benefit from diversification in the presence of uncertainty.
7. The degree of monitoring $1 - k$ can be determined by institutional factors or can be decided optimally before the tax variables.
8. The information provided by the foreign government is never redundant.
9. This is the case as the model is highly simplified. By extending the model, for example with a domestic tax on the principal as in Bacchetta and Espinosa (1995), this condition is no longer necessary and nothing substantial is changed in the analysis.
10. Assuming a benevolent government appears to be a natural benchmark in our framework. This would also be justified if the government worries about reelection each period. The presence of heterogeneous individuals (voters) and specific political processes can lead to different objective functions.
11. A natural question is why countries bother to sign a treaty if it is sustainable anyway. In a repeated game we find multiplicity of equilibria and a treaty may be a way of explicit coordination on one of them; implicit coordination may be difficult to achieve specially when countries are asymmetric and the persons in charge of economic policy change periodically. These issues are not specific to international taxation and are found for example in international trade, monetary or environmental agreements.
12. See Abreu (1988).
13. Gordon (1992) analyzes this issue with static games, but in a richer setup.
14. It can be easily shown that the one-shot Nash equilibrium is unique. This is also true in the following sections.
15. See Mintz (1992) for a discussion of these effects.
16. As specified, for example, in paragraph 2 of Article 26 of the 1992 OECD Model Convention on Income and Capital.
17. If the punishment were stronger, for example if the treaty were abandoned altogether, information sharing would be more likely to be sustainable and our results would be strengthened.
18. This implies that $\eta(F)$ cannot be quadratic.
19. See International Fiscal Association (1990). Examining a capital flow equation like (2) in isolation would give us the opposite correlation sign.
20. The fundamental question is, of course, why should countries only consider a treaty with reciprocity when they could benefit from a treaty without reciprocity.

21. See Jensen (1994) for another example where size heterogeneity makes cooperation less sustainable.
22. This assumption, has two consequences. First, gains from deviation in the first period are smaller than in the case where the private sector cannot react immediately and, therefore, a treaty is more easily sustainable. Second, the well-known problem of time inconsistency of capital taxes is eliminated, as the domestic government cannot cheat non-resident investors. This greatly simplifies the analysis.
23. The right-hand side of the inequality is at a minimum at the unconstrained t_{NR}, as g is maximized. When the constraint becomes binding for a low δ, it is impossible to adjust t_{NR} to lower the right-hand side.
24. As a consequence, λ and λ^* take the non-cooperative value of 0 in g^{nc} and c^{nc} and changes in λ or λ^* have no impact on the welfare obtained along the punishment path. Moreover λ takes the value zero in g^d and c is independent of λ, i.e., changes in λ or λ^* do not affect welfare from deviation either.

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