INTERNATIONAL CAPITAL TAX EVASION AND THE FOREIGN TAX CREDIT PUZZLE

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ABSTRACT

This paper examines the role of international tax evasion for the choice of an optimal foreign tax credit by a capital exporting region. Since a foreign tax credit raises the opportunity cost of concealing foreign source income, it can be employed to discourage evasion activity. The existence of international tax evasion possibilities could thus help rationalize a choice of tax credit in excess of a deduction-equivalent credit level. Our analysis shows that, under certain conditions, the presence of international tax evasion can indeed result in a higher optimal foreign tax credit for a capital exporting country, but the conditions for this result to hold are quite restrictive. We find that: (i) although an increase in the foreign tax credit unambiguously reduces evasion activity per unit of exported capital, it also encourages exports, and may thus result in higher total evasion costs; (ii) the presence of evasion reduces the "compounding" effect of the double taxation of foreign source income, thereby reducing the need for a foreign tax credit; (iii) by making residence based taxes distortionary, the presence of international tax evasion raises the marginal cost of the public funds that are obtained through domestic taxes, and hence raises the social cost of a foreign tax credit.

KEYWORDS: Optimal Taxation, Tax Evasion. JEL CLASSIFICATION: H21, H26.

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1 Introduction

Literature on the international taxation of capital has been at pains trying to explain why the majority of capital exporters are observed to choose a foreign tax credit system over a deduction system when taxing internationally mobile capital (Bond (1991)). Under a deduction system, a capital exporter taxes the worldwide income of their residents, but allows foreign taxes paid to be deducted from taxable income, while under a tax credit system, the exporter offers double-taxation relief by allowing residents to credit foreign tax payments against domestic tax liabilities. A long established result in the literature is that a deduction is preferable to a full tax credit from the point of view of a capital exporter (Musgrave (1969)), even though a full tax credit is superior to a deduction on global efficiency grounds (Hamada (1966)). One method of implementing a deduction system is to employ a partial foreign tax credit, where only a fraction of foreign taxes can be claimed, this fraction being equal to the foreign taxes paid times the domestic rate of residence taxation (i.e., equal to the domestic tax savings associated with a deduction).

Recent literature on tax competition in the presence of international trade (Kanbur and Keen (1993), Mintz and Tulkens (1986)) has stressed the essentially non-cooperative nature of the interaction between sovereign jurisdictions. With reference to the choice of a foreign tax credit in the presence of international capital flows, Bond and Samuelson (1989), and Gordon (1991) have concluded that a tax credit system is generally not sustainable as a non-cooperative outcome. This theoretical prediction is in stark contrast to what we actually observe in real-world tax systems: many countries grant double taxation relief for fractions of foreign taxes in excess of the domestic tax value of a deduction, thereby adopting a foreign tax credit policy that is closer to a full foreign tax credit system.[1] The standard tax

[1]Some countries offer double-taxation relief by giving limited foreign tax credits, where the credit cannot exceed domestic tax liabilities. Countries that have adopted this measure include the U.S., Japan, U.K., Denmark, Portugal and Spain. Italy offers a refund on excess credits, which constitutes a full foreign tax credit, while other countries such as Germany and Ireland offer a choice between using a deduction or a limited credit (Frenkel, Razin, and Sadka (1991)).

competition framework thus appears to be ill-equipped to provide a solution to this foreign tax credit "puzzle".

Even if we assume that cooperation between countries is possible, it may not be possible to rationalize the choice of a tax credit in excess of the deduction equivalent credit as the outcome of a cooperative game, unless side payments are feasible. This is because no mutual gains can arise from a full double-taxation treaty between a pure capital exporter and a pure capital importer. If cross-hauling in capital flows takes place between two countries, there could be reciprocal gains which could justify a cooperative double-taxation treaty involving the adoption of the source principle of taxation (which would require reciprocity). But this observation still fails to explain the stylized fact that large foreign tax credits are granted in situations where capital flows are largely unidirectional.[2]

In this study we explore the idea that foreign tax credits might be used by a capital exporter to counter the effects of international tax evasion. Although earlier writers have noted that tax credits may play this role (Bracewell-Milnes (1980)), no full formal analysis of this mechanism has been offered so far.[3] Slemrod (1990) notes that existing analyses of tax competition generally assume that there is no tax resistance or tax evasion, even though recent evidence seems to indicate that evasion on internationally mobile capital is widespread. As noted by Slemrod, evasion is a means of reducing the effective tax rate faced by the exporter of capital. This realization is in fact the key to our analysis. The

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[2]For example Japan recently allowed unilateral foreign tax credits to be claimed by second-tier subsidiaries of Japanese parent companies, which may also claim limited foreign tax credits (with a three-year carry forward of excess credits)(Magnin and Rautalahti (1993), and Anderson (1991)).

[3]Gordon (1991) and Bruce (1992) both incorporated evasion in their analysis. Gordon addressed the issue of whether or not capital income taxes can survive in an open economy by examining the choice between a full credit (limited to domestic tax liabilities) and a deduction. He showed that a credit system is generally not sustainable, but did not examine the optimal choice of a foreign tax credit. Bruce explored the foreign tax credit puzzle and showed that in a tax competition game, a Stackelberg leader may find it optimal to offer a limited tax credit when capital exporters have a discrete costless evasion choice; but in his model a small capital exporting region will have no incentive to offer such a credit.

foreign tax credit acts as a fiscal instrument that reduces the effective tax rate on exported capital. At the same time, it represents a private cost for the exporter of capital who chooses to evade, since, by concealing foreign source income, an exporter must forego the associated tax credit. Hence, by raising the opportunity cost of concealment, a foreign tax credit can discourage international tax evasion, thus lowering the social cost associated with evasion activities. This role of foreign tax credits could help explain why so many countries unilaterally choose tax credit rates in excess of the domestic rate of residence based taxation.

We examine this conjecture by first modelling the national income maximization choice of foreign tax credit for a small capital exporter who has no public goods requirement. Our analysis does bear out that, in the presence of international tax evasion, the optimal foreign tax credit rate can exceed the domestic rate of residence based taxation; but we find that this result does not hold generally. The reason for this ambiguity is twofold: first, although an increase in the foreign tax credit unambiguously reduces evasion activity per unit of exported capital, it also encourages exports, and may thus result in higher total evasion costs. Consequently, for a higher tax credit to be effective as an instrument for reducing the deadweight loss associated with evasion, it is necessary that there be negative net savings in evasion costs resulting from an increase in the tax credit rate. The second reason for the ambiguity of our results stems from the fact that the presence of evasion reduces the "compounding" effect of the double taxation of foreign source capital, and thus, *ceteris paribus*, reduces the need for a foreign tax credit.

If we examine the problem of the design of a foreign tax credit jointly with the problem of choosing an optimal residence tax rate, in a situation where tax revenues are required to finance public good provision, further trade-offs are involved. Specifically, the loss in net tax revenues generated by higher foreign tax credits must be compensated by higher domestic tax rates. The presence of evasion makes residence based taxes distortionary, raising the marginal cost of the public funds obtained through domestic taxes; as a result, the marginal social cost of a foreign tax credit will also be higher. Thus, *ceteris paribus*, international tax evasion will result in lower foreign tax credit rates.

The plan of the chapter is as follows. In Section 2 we lay down the basic elements of our model structure, and examine optimal tax design in the absence of international tax evasion. Section 3 introduces evasion into the model and discusses its implications for the effects of changes in tax parameters, while Section 4 examines the optimal tax design problem for the government. Section 5 summarizes our main results and present our conclusions.

2 The no-evasion case

This section lays down the structure of the tax design problem for a capital exporter in the absence of tax evasion, formalizing the standard results of the literature on the optimal design of a foreign tax credit. This will provide the groundwork for building a model with international tax evasion, which we present in the next section. We begin by describing the equilibrium structure of our model and the optimization problem for the exporting region, and then move on to the analysis of the design of an optimal foreign tax credit system. The basic structure of our model is analogous to Zodrow and Mieszkowski's (1986), which in turn is an adaptation of the Ricardo-Viner international trade model.

Here and in the following sections, we will maintain the assumption that the capital exporting country is a small open economy; this simplifies our analysis but still enables us to capture the essence of the exporter's problem. Moving to a more general framework of strategic interaction between a capital exporting country and a capital importer adds further dimensions to the problem, which we will briefly address in our conclusions.

Consider a small capital exporting region, and assume that it is endowed with two factors of production: capital, which is perfectly mobile internationally and available in quantity K, and an immobile factor (e.g., labour) which is available in fixed quantity. A single commodity is produced in quantity Y using the mobile factor through a production technology which exhibits decreasing returns-to-scale (reflecting the presence of the immobile factor). This is represented as:

$$Y = F(K - X) \tag{1}$$

where $(K - X)$ is the total amount of capital employed in the region, i.e., the capital

endowment net of exports, X. F is assumed to be increasing and concave, and, in order to ensure that output is positive, we also assume that the Inada conditions ($F'(0) = \infty$ and $F'(\infty) = 0$) are satisfied. Producers in the exporting region demand capital up to the point where the marginal revenue product of capital is equal to ρ, the marginal gross-of-tax return to capital in the exporting region. Normalizing the price of output to be unity, we have:

$$F'(K - X) = \rho \tag{2}$$

The capital exporting country levies a residence-based capital income tax that does not discriminate between the domestic and foreign source income earned by residents. This specification is equivalent to one where there are no credits, but the exporting region is able to levy both residence-based capital taxes and source-based capital taxes, thus discriminating between capital left at home and capital employed abroad.[4] The *ad valorem* rate of residence-based taxation is t_D. Capital exports earn a gross-of-tax return equal to r; if the foreign source tax rate is t_F, then the net-of-tax return to capital exports is $(1 - t_D - t_F)r$. The exporter of capital may also choose to grant a foreign tax credit for a fraction a of foreign tax payments. We can define

$$t_X = t_D + (1 - a)t_F \tag{3}$$

as the *statutory* rate of tax payable on the income earned by exported capital. Likewise, the statutory rate of tax on the income earned by domestic capital is simply equal to t_D.

The representative consumer maximizes disposable income, which can be expressed as $C = N + (1 - t_D)\rho(K - X) + (1 - t_X)rX$, where N represents rents. The terms N and ρ are both taken as given by the price-taking exporter. It can be shown that the resident of the exporting region exports capital up to the point where the marginal net-of-tax return

[4]See Mintz and Tulkens (1993) for more on this issue of multiplicity of instruments and equivalence between a mix of residence-based and source-based taxes with a foreign tax credit in combination with a residence-based tax.

to exports is equal to the marginal net-of-tax return to leaving capital employed at home, i.e.,

$$(1 - t_D)\rho = (1 - t_X)r \tag{4}$$

Notice that, when $t_F > 0$ and $a \in [0, 1]$, we must have $r \geq \rho$ for an interior solution. The reason for this is that r must be sufficient to more than compensate exports for the double-taxation that they are subject to in the presence of any positive foreign source tax rate. In this case the residence-based tax is distortionary because the tax credit is offered on the gross-of-tax return to exports.

To analyze the optimal tax design problem, we first focus on a situation where the domestic residence tax rate is given and there are no public goods. In this scenario, we will assume that all tax revenues are returned to the domestic consumer in lump-sum fashion. Then, national income for the capital exporting region is

$$I = Y + (1 - t_F)rX \tag{5}$$

In the absence of a foreign tax credit, residence based taxation generates a "compounding effect" which discourages exports. A tax credit can reduce this effect, and, with $a = t_D$, this compounding effect is fully eliminated and any residence based taxes become lump-sum, even though foreign source income is still subject to taxation in the importing region. The income maximizing choice of tax credit for the tax authority in the exporting region is thus $a^* = t_D$: the optimal foreign tax credit rate is exactly equal to the rate of the domestic residence-based tax, a choice which is equivalent to using a deduction system. In contrast, the choice of a that maximizes global income is $a = 1$.[5] Thus, a deductions policy

[5]Overall world income in this model is simply $Y + rX + Z$ where Z is the national product of the rest-of-the world, which is fixed (owing to our small open economy assumption). Maximizing this by choice of a yields $a^* = 1$. For this choice of a, the compounding effect of residence based taxes the double-taxation of foreign source income is fully eliminated. If a limited credit system were implemented then the optimal choice would be $a = 1 \; \forall \; t_D \geq t_F$, and $a = t_D/t_F > t_D \; \forall \; t_D < t_F$. To see this, notice that the statutory tax rate on exports with a limited tax credit is one where a is chosen to satisfy $(1 - \text{MAX}[t_d, t_f]) = (1 - t_X)$. Solving this yields a limited credit system.

is unambiguously preferred to a full credit policy solely on national income maximization grounds.

To endogenize the choice of a residence tax rate, and examine it jointly with the problem of choosing a foreign tax credit, we must introduce public good provision into the analysis. We assume that the representative consumer's utility depends both upon private and public goods consumption; these are denoted respectively by I and G. We represent preferences by means of a utility function, $U(I, G)$, which is assumed to be well-behaved and concave so that $U_I > 0$, $U_G > 0$, $U_{II} < 0$ and $U_{GG} < 0$, where subscripts denote partial derivatives. We also assume that the marginal rate of transformation between private consumption goods and public consumption goods is unity, i.e., one unit of output can be used interchangeably for private and public goods consumption. The representative consumer's disposable income is simply rents accruing to the fixed factor net of domestic tax payments, whereas public goods provision is equal to the revenues from residence based taxation on domestic and foreign source income net of foreign tax credits:

$$I = Y - t_D F'(K - X)(K - X) + (1 - t_X)rX \tag{6}$$

$$G = t_D F'(K - X)(K - X) + (t_D - at_F)rX \tag{7}$$

The exporting region's problem consists of choosing a pair (t_D^*, a^*) that maximizes utility for the representative consumer, subject to the equilibrium condition for the international capital market. Solving this problem, we obtain the following first order conditions:

$$U_G \frac{\partial G}{\partial a} + U_I \frac{\partial I}{\partial a} = 0 \tag{8}$$

$$U_G \frac{\partial G}{\partial t_D} + U_I \frac{\partial I}{\partial t_D} = 0 \tag{9}$$

It is easy to verify that the optimal foreign tax credit rate is $a^* = t_D$, since for this choice, both equations yield $U_G/U_I = 1$. From this, we can also conclude that the choice of the level of public goods provision in the exporting country will be undistorted once the "compounding" effects of the double-taxation of capital are eliminated. Thus, in a standard tax competition framework, the problem of choosing an optimal tax rate is separable from the issue of the choice of a foreign tax credit rate: independently of the level of domestic taxation, an exporter will choose a partial tax credit system that is equivalent to a pure

deduction. Under this scheme the residence-based tax is non-distortionary and its rate can be freely chosen so as to provide the nationally optimal level of public goods.

3 International tax evasion and capital export choices

To model international tax evasion, we posit that there exist differential evasion possibilities for taxes payable on capital income. Typically, evasion at home will be relatively more difficult to perpetrate than evasion of residence-based taxes on foreign source income, owing to the imperfect sharing of information between the tax authorities of the importing and exporting regions. Available evidence seems to suggest that this is in fact the case.[6]

We will examine an extreme form of differential in domestic and foreign tax evasion possibilities, by assuming that the only form of evasion available is evasion of residence-based taxes on foreign source income. This is modelled as a costly proportional abatement, E $(0 \leq E \leq 1)$ of the tax base X. Evasion costs are represented by a convex increasing function of E. If we denote by $C(E)$ evasion costs per unit of exports, then total evasion costs are $XC(E)$. We also assume that the function C satisfies the following properties: $C'(0) = 0,\ C(0) = 0,\ C(1) = \infty$.

The introduction of international tax evasion possibilities causes the *effective* rate of tax on exported capital to differ from the statutory rate of tax on exported capital as defined above. In the absence of a foreign tax credit, this effective rate would be

$$t_X = (1 - E)t_D + t_F \tag{10}$$

If we assume that the foreign tax rate is known to the capital exporting region, when foreign source income is concealed from the tax authority, the exporter of capital also foregoes the applicable foreign tax credit. In this situation the effective tax rate on capital that is

[6]Even when countries enter into bilateral information sharing agreements *vis-a-vis* reciprocal double-taxation agreements, the effectiveness of the agreement is typically hampered by lack of cooperation between the countries involved (Beyer (1993)).

exported may be defined as

$$t_X = (1 - E)(t_D - at_F) + t_F \tag{11}$$

Since no evasion takes place on income that is earned by domestically owned capital, the applicable effective tax rate will be the same as the statutory tax rate, t_D.

The equilibrium level of evasion and the equilibrium level of exports are obtained from the maximization (by choice of X and E) of the disposable income for the representative consumer, which is $C = N + (1 - t_D)\rho(K - X) + (1 - t_X)rX - C(E)X$, where N denotes rents. Solution to this problem defines the following arbitraging conditions:

$$rX(t_D - at_F) - C'(E)X = 0 \tag{12}$$

$$(1 - t_D)\rho - (1 - t_X)r + C(E) = 0 \tag{13}$$

where $C'(E)$ is the marginal cost of evasion per unit of X.[7]

In order to derive comparative static results for this system of equations, we can note that expression (12) is independent of X. Thus, exploiting the block-recursive nature of the problem allows us to solve for the optimal E and the optimal X separately.

Expression (12) in isolation implicitly defines $E^* = E^*(a, t_D, t_F)$ (for $X > 0$). A necessary condition for this interior solution is that $t_D > at_F \quad \forall a \in [0, 1]$. This condition simply says that at the optimum, the exporter of capital will choose not to evade at all when the value of tax credits that he must give up is larger than his tax savings from evading, a situation that will occur under full credits when the domestic residence-based tax rate is smaller than the foreign source tax rate, and under partial credits when the savings from evasion in terms of domestic residence-based taxes are less than the cost of foregone tax credits that are induced by evasion activity.

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[7]When capital flows are not real but financial flows, this specification of evasion could generate arbitraging possibilities through cross-hauling of financial capital across regions, if both regions levy residence-based taxes. It should be noted, however, that if the rates of source and residence based taxes are chosen endogenously by both regions, then the region which is a net importer of capital will find it optimal to move from a residence-based tax system to a pure source-based tax. Such arbitraging possibilities would thus be eliminated in a tax competition equilibrium.

The equilibrium level of evasion activity can be shown to be increasing in t_D and decreasing in a, i.e.,

$$\frac{\partial E^*}{\partial t_D} = \frac{r}{C''(E^*)} > 0 \tag{14}$$

$$\frac{\partial E^*}{\partial a} = -\frac{rt_F}{C''(E^*)} = -t_F \frac{\partial E^*}{\partial t_D} < 0 \tag{15}$$

This result is as expected: an increase in t_D raises the tax savings to evasion for the exporter, while increasing a results in a higher opportunity cost of evasion.

The presence of international tax evasion also affects the arbitraging condition for capital exports by reducing the effective tax rate on foreign source income. Specifically, it creates a wedge between the effective rate of residence-based taxation levied on foreign source income and that levied on domestic source income. Substituting the implicit function $E^*(a, t_D, t_F)$ into the arbitraging condition for capital exports, obtains:

$$\begin{aligned}&(1-t_D)\rho - (1-t_F)r \\ &\quad +[1-E^*(a,t_D,t_F)]C'[E^*(a,t_D,t_F)] + C[E^*(a,t_D,t_F)] = 0\end{aligned} \tag{16}$$

This condition defines an implicit function $\rho^* = \rho(a, t_D, t_F)$, the interior solution of which is characterized by (i) $\rho^*/r < 1 \ \forall t_F \geq t_D$; and (ii) $\rho^*/r < (1+\theta) \ \exists \theta \in R^{++}$ and $t_F < t_D$. Substituting this in (2), then allows us to obtain an implicit function $X^*(a, t_D, t_F)$.

Examining the comparative statics effects of changes in fiscal parameters on the equilibrium level of exports, we find

$$\frac{\partial X^*}{\partial a} = -\frac{1}{F''(K-X^*)} \frac{(1-E^*)t_F r}{(1-t_D)} > 0 \tag{17}$$

$$\frac{\partial X^*}{\partial t_D} = -\frac{1}{F''(K-X^*)} \frac{[F'(K-X^*)-r]+E^* r}{1-t_D} \gtreqless 0 \tag{18}$$

An increase in the foreign tax credit unambiguously induces capital flight, although this effect is dampened by the presence of evasion. In contrast, an exogenous increase in t_D has an ambiguous effect on exports. From (18) we can see that residence-based taxes are distortionary because of their compounding effect, but they are also distortionary for two additional reasons: (i) they generate wasteful evasion activities, and (ii) they generate capital flight because of the associated tax evasion wedge.

Our preceding discussion has hinted to the potential tradeoffs involved in choosing the correct combination of fiscal instruments for the exporting region. The implications of these results for the exporting region's optimal choice of residence-based tax and foreign tax credit will be explicitly analyzed in the next section.

4 International tax evasion and the optimal foreign tax credit

The results of our analysis so far suggest that the exporting region may be able to employ a foreign tax credit as a means of containing the waste of resources associated with international tax evasion. In this section we will formally examine this conjecture using the framework developed in the preceding section. Following the sequence of arguments used in Section 2, we will begin by examining the problem of the optimal choice of a tax credit rate for a tax planner in isolation from the problem of choosing an optimal tax rate. Subsequently we will look at the problem of a joint choice of tax and tax credit rates.

Given a rate of residence based taxation t_D, the problem facing the exporting region now consists of choosing a tax credit rate a that maximizes national income subject to the equilibrium conditions derived in the previous section. National income, net of evasion costs, is[8]

$$I = Y + (1 - t_F)rX - C(E)X \tag{19}$$

Differentiating expression (19) with respect to a yields the following first-order condition for national income maximization:

$$\frac{\partial I}{\partial a} = \delta \frac{\partial X}{\partial a} - \gamma = 0 \tag{20}$$

where

$$\delta = -[F'(K - X) - r] - rt_F \tag{21}$$

[8]In what follows, X and E will denote equilibrium values (i.e., X^* and E^*).

$$\gamma = C(E)\frac{\partial X}{\partial a} + C'(E)X\frac{\partial E}{\partial a} \tag{22}$$

Notice that $\delta\ \partial X/\partial a$ measures the marginal social benefit of reducing the compounding effect of residence based taxes, net of the marginal social cost of transferring surplus to the importing region, while γ is the marginal social cost (or benefit) associated with the increase (or reduction) in the total cost of evasion that results from an increase in a.

To gain some intuition on the implications of this first-order condition, let us focus on a simplified problem where evasion costs do not appear in the maximand—e.g, because private evasion costs do not entail any use of resources, but just involve transfers to other domestic consumers. Then, the term γ drops from (20) and the first-order condition for an optimum requires $\delta = 0$. Solving for the optimal a, which we denote as $\tilde{a}$, allows us to state the following Proposition:

Proposition 1: $\tilde{a} < t_D$ when $\gamma = 0$.

Proof: The optimal choice of foreign tax credit is given by

$$\tilde{a} = \frac{t_D}{t_F}\left[1 - \frac{(1-t_F)}{(1-E)}\right] + \frac{C(E)}{rt_F(1-E)} \tag{23}$$

Notice that $\tilde{a} = t_D$ if and only if $C(E)/E = C'(E)$, i.e., the average cost of evasion must be equal to the marginal cost of evasion. Our specification of evasion costs ensures that $C(E)/E < C'(E)$, and hence $\tilde{a} < t_D$.

In contrast, the foreign tax credit rate that yields a deductions system in the presence of evasion is equal to t_D. Thus, if the exporting region failed to take evasion costs into account, the presence of international tax evasion would cause the optimal tax credit rate to be *less* than the deduction-equivalent rate. The reason for this result is that evasion reduces the compounding effect of residence based taxation, thereby serving the same role as a foreign tax credit. The presence of evasion thus takes pressure off the tax credit and results in a choice of foreign tax credit that is smaller than the one that yields a deduction. To put it another way, the evasion-related "wedge" amplifies the capital flight effect of a

given foreign tax credit, which, when evasion costs are ignored, results in a lower optimal tax credit rate.

If, however, the costs of evasion are taken into account by the planner, a choice of $a = \tilde{a}$ does not cause the left-hand side of (20) to vanish. When $a = \tilde{a}$, we have $\delta = 0$, and the sign of the left-hand side of (20) becomes opposite to the sign of γ. If $\gamma < 0$, then it will be necessary for δ to decrease from zero for (20) to be satisfied. Since $\partial\delta/\partial a < 0$, we can conclude that, in this case, $a^* > \tilde{a}$. And if γ is large enough in absolute value, a^* could be larger than t_D. On the other hand, if γ is positive, we must conclude that $a^* < \tilde{a}$. Thus, a^* can exceed t_D only if $\gamma < 0$.

What is the meaning of the condition $\gamma < 0$? Expression (22) represents the marginal change in the total cost of evasion from a change in the foreign tax credit rate. This total effect can be decomposed as follows: on the one hand, an increase in a constrains evasion choices and thus results in a reduction of the total cost of evasion; on the other hand, an increase in a results in higher evasion costs due to the fact that exports are increasing in a. Examining (22) we can actually see that γ includes two terms: a negative term, which reflects the decrease in evasion activity per unit of exports associated with an increase in a, and a positive term, which reflects an increase in capital exports. The sign of the total change will depend upon which effect is stronger, which in turn will depend upon the characteristics of evasion costs and production technologies.

We can now formulate the following proposition:

Proposition 2: A necessary condition for $a^* > t_D$ is that, at an optimum,

$$\gamma < \frac{rt_F(1-E)(\tilde{a}-t_D)}{(1-t_D)} \frac{\partial X}{\partial a^*} \tag{24}$$

Proof: We can solve condition (20) for a to obtain

$$a^* = \frac{t_D}{t_F}\left[1 - \frac{(1-t_F)}{(1-E)}\right] + \frac{C(E)}{rt_F(1-E)} - \frac{\gamma(1-t_D)}{rt_F(1-E)\partial X/\partial a^*} \tag{25}$$

Now employing condition (23) allows us to rewrite this as

$$a^* = \tilde{a} - \frac{\gamma(1-t_D)}{rt_F(1-E)\partial X/\partial a^*} \tag{26}$$

from which Proposition 2 follows.

Our analysis thus confirms that international tax evasion *can* cause the optimal tax credit to exceed the deduction-equivalent rate for a capital exporter, but the conditions under which this result holds are quite restrictive even in this simple model. Since the expression on the right-hand side of (24) is negative, condition (24) requires that not only the impact of a change in a on total evasion costs be negative, but also that these savings in evasion costs be sufficiently large in absolute value to dominate the impact that evasion has on the compounding effect of residence based taxes.

We will now move on to examine the more general problem of choosing a tax credit rate jointly with a residence tax rate, by introducing endogenous public goods provision into our analysis. Here, private national income is the sum of domestic rents (net of domestic tax payments) and foreign source income (net of "effective" taxes), minus total evasion costs, while public expenditure equals tax revenues. We can write income and revenue as follows:

$$I = Y - t_D F'(K - X)(K - X) + (1 - t_X)rX - C(E)X \tag{27}$$

$$G = t_D F'(K - X)(K - X) + (1 - E)(t_D - at_F)rX \tag{28}$$

As in the no-evasion case, the exporter's problem consists of choosing a combination of t_D and a that maximizes utility for the representative consumer, subject to the equilibrium conditions (12) and (13), and subject to conditions (27) and (28). And, as before, the first-order conditions for an optimum are

$$U_G \frac{\partial G}{\partial a} + U_I \frac{\partial I}{\partial a} = 0 \tag{29}$$

$$U_G \frac{\partial G}{\partial t_D} + U_I \frac{\partial I}{\partial t_D} = 0 \tag{30}$$

We can solve expression (29) for the marginal rate of substitution between private and public goods as

$$\frac{U_G}{U_I} = \frac{\alpha}{\alpha - [\delta \partial X/\partial a - \gamma]} \tag{31}$$

where δ and γ are as previously defined and α represents the increase in income caused by an increases in a, which in turn is simply the direct addition to income net of the reduction in rents caused by capital flight effects, i.e.,

$$\alpha \equiv \frac{\partial I}{\partial a} = rt_F X(1-E) + F''(K-X)t_D \frac{\partial X}{\partial a} \tag{32}$$

Notice that since $U_G > 0$ and $U_I > 0$, an interior solution to this problem requires that a be chosen so that (i) $\alpha > 0$ and (ii) $\alpha - [\delta \partial X/\partial a - \kappa] > 0$. These conditions simply ensure that national income rises with the foreign tax credit and government revenue declines.

Condition (30) can also be solved for the marginal rate of substitution between private and public goods to obtain

$$\frac{U_G}{U_I} = \frac{\beta}{\beta - [\delta \partial X/\partial t_D - \partial(C(E)X)/\partial t_D]} \tag{33}$$

where β is the marginal decrease in national income that results from a marginal increase in t_D, i.e.,

$$\beta \equiv \frac{\partial I}{\partial t_D} = -F'(K-X)(K-X) - rX(1-E) + F''(K-X)t_D(K-X)\frac{\partial X}{\partial t_D} \tag{34}$$

Notice that the necessary conditions for an interior solution are that $\beta < 0$ and $\beta - [\delta \partial X/\partial t_D - \partial(C(E)X)/\partial t_D] < 0$. These conditions simply ensure that government revenue increases in t_D and national income declines in t_D.

Combining expressions (31) and (33), and employing conditions (15)-(18), we obtain (after some manipulation) the following overall marginal condition for an interior solution (a^*, t_D^*):

$$\left(\delta \frac{\partial X}{\partial a} - \gamma\right) + \frac{1}{1-t_D}\left[\gamma\, t_D + \frac{\alpha C(E)}{(K-X)F''(K-X)}\right] = 0 \tag{35}$$

where δ and γ are as previously defined.

Note that the first-order conditions for an interior solution imply that, at an optimum, the marginal cost of public funds, $[(\partial I/\partial t_D)/(\partial G/\partial t_D)]$, must be equal to the ratio $[(\partial I/\partial a)/(\partial G/\partial a)]$, since these expressions must both equal $[-U_G/U_I]$. It can be shown that $(\partial G/\partial a) = \alpha - (\delta\, \partial X/\partial a - \gamma)$: thus, a necessary condition for the marginal cost of public funds to be greater than unity at the optimum is that $(\delta\, \partial X/\partial a^* - \gamma) > 0$. In this situation, there will be underprovision of public goods.

We can now state the following proposition:

Proposition 3: In the presence of endogenous public good provision, a necessary condition for $a^* > t_D^*$ is

$$\gamma < \frac{rt_F(1-E)(\tilde{a}-t_D^*)}{(1-t_D^*)}\frac{\partial X}{\partial a^*} + \frac{\alpha C(E)}{(1-t_D^*)(K-X)F''(K-X)} \tag{36}$$

Proof: Simply solve expression (35) for a^*, then set $a^* > t_D^*$ and solve for γ to obtain the above condition.

The only difference between condition (36) and condition (24) (for the no-public good case) is the second term on the right-hand side of (36); since this is negative, we can conclude that the conditions under which the optimal foreign tax credit exceed the deductions equivalent foreign tax credit are even more stringent in the presence of endogenous public good provision. The reason for this finding is that in the presence of a revenue requirement, and in the absence of alternative fiscal instruments, any increase in foreign tax credits must be financed through an increase in residence based taxes. And, when international tax evasion is present, residence based taxes are distortionary: any increase in residence taxes induces capital flight and encourages evasion activity. Consequently, the presence of evasion raises the marginal cost of the public funds that are obtained through residence based taxes, and hence it raises the marginal social cost of a foreign tax credit.

To verify that residence based taxes are distortionary at an optimum with $a^* > t_D^*$, where $\gamma < 0$, we can note that the second and third terms on the right hand side of condition (35) are unambiguously negative: we can then conclude that an interior solution with $a^* > 0$ and $t_D^* > 0$ requires $(\delta\, \partial X/\partial a^* - \gamma) > 0$, which in turn implies that the marginal cost of public funds will be greater than one. Because of public good financing requirements, the optimal foreign tax credit will thus be lower, *ceteris paribus*, when international tax evasion possibilities are present, and consequently, in order to justify a choice of a above

the residence based tax rate, marginal savings in evasion costs must be higher than in the no-public good case.

To summarize, we have established that when the exporting region aims at maximizing the national income of a representative consumer, it will choose a foreign tax credit rate that is generally not equivalent to a deduction. If the foreign tax credit constrains evasion choices in such a way as to bring about savings in total evasion costs, it is possible for the optimal tax credit to exceed the rate of domestic residence-based taxation. For this to occur, however, these savings in evasion costs must be sufficient to offset the impact that international tax evasion has on capital flight. Furthermore, if residence-based taxes are used to finance public good provision, these savings in evasion costs must also be sufficiently large to offset the positive impact that evasion activity has on the social marginal cost of financing a foreign tax credit.

5 A numerical example

The results of the previous section are perhaps best illustrated by means of a numerical example. Suppose that the production function assumes the following form:

$$F(K-X) = \alpha(K-X)^{\beta} \tag{37}$$

Notice that this functional form satisfies the conditions $F'(0) = \infty$ and $F'(\infty) = 0$. For the evasion cost function we specify the form

$$C(E) = \psi\left(\frac{E}{1-E}\right)^2 \tag{38}$$

which satisfies the conditions $C'(0) = 0,\ C(0) = 0,\ C(1) = \infty$. For the endogenous public good provision case, we assume Cobb-Douglas substitution possibilities between private and public goods:

$$U(I,G) = I^{1-\omega}G^{\omega} \tag{39}$$

Parameter values are specified as follows: $\alpha = 0.1,\ \beta = 0.25,\ \psi = 0.2,\ \omega \in (0,1),\ r = 0.1,\ t_F = 0.25$.

Figure (1) depicts the optimal level of foreign tax credit for different values of t_D in the no public goods case. The profile labeled as " a˜ " refers to a scenario where private evasion does not generate any deadweight loss, whereas the " a* " profile refers to the case where evasion activities are socially wasteful. When evasion costs are not taken into account, the presence of evasion tends to raise the optimal level of foreign tax credit above t_D. When evasion costs are accounted for the optimal tax credit becomes smaller: for low values of t_D, the optimal tax credit is above the domestic rate of residence taxes, but as t_D increases the savings in evasion costs associated with a reduction in the foreign tax credit come to dominate the impact that evasion has on the compounding effect of residence based taxes, resulting in optimal tax credit rates which are below the deduction-equivalent rate.

Figure (2) refers to a scenario with endogenous provision of public goods. Here, we exogenously vary ω (the weight for public goods in consumer preferences) and compute optimal rates t_D and the optimal associated tax credit rate. It can be seen that the inclusion of endogenous public goods provision, *ceteris paribus*, tends to lower the optimal level of a.

6 Summary and conclusion

In this study we have examined the role of international tax evasion for the choice of an optimal foreign tax credit by a capital exporter. In the presence of international tax evasion, a foreign tax credit can affect the private opportunity cost of evasion for a capital exporter, and can thus be used by an exporting country to discourage evasion activities. Our analysis has shown that, under certain conditions, the presence of international tax evasion can indeed result in a higher optimal foreign tax credit for a small capital exporting country, but the conditions for this result to hold are quite restrictive. We find that: (i) although an increase in the foreign tax credits unambiguously reduces evasion activity per unit of exported capital, it also encourages exports, and may thus result in higher total evasion costs; (ii) the presence of evasion reduces the "compounding" effect of the double taxation of foreign income, and reduces the need for a foreign tax credit; (iii) by making residence based taxes distortionary, the presence of evasion raises the marginal cost of the public funds obtained through domestic taxes, thereby raising the social cost of a foreign tax credit.

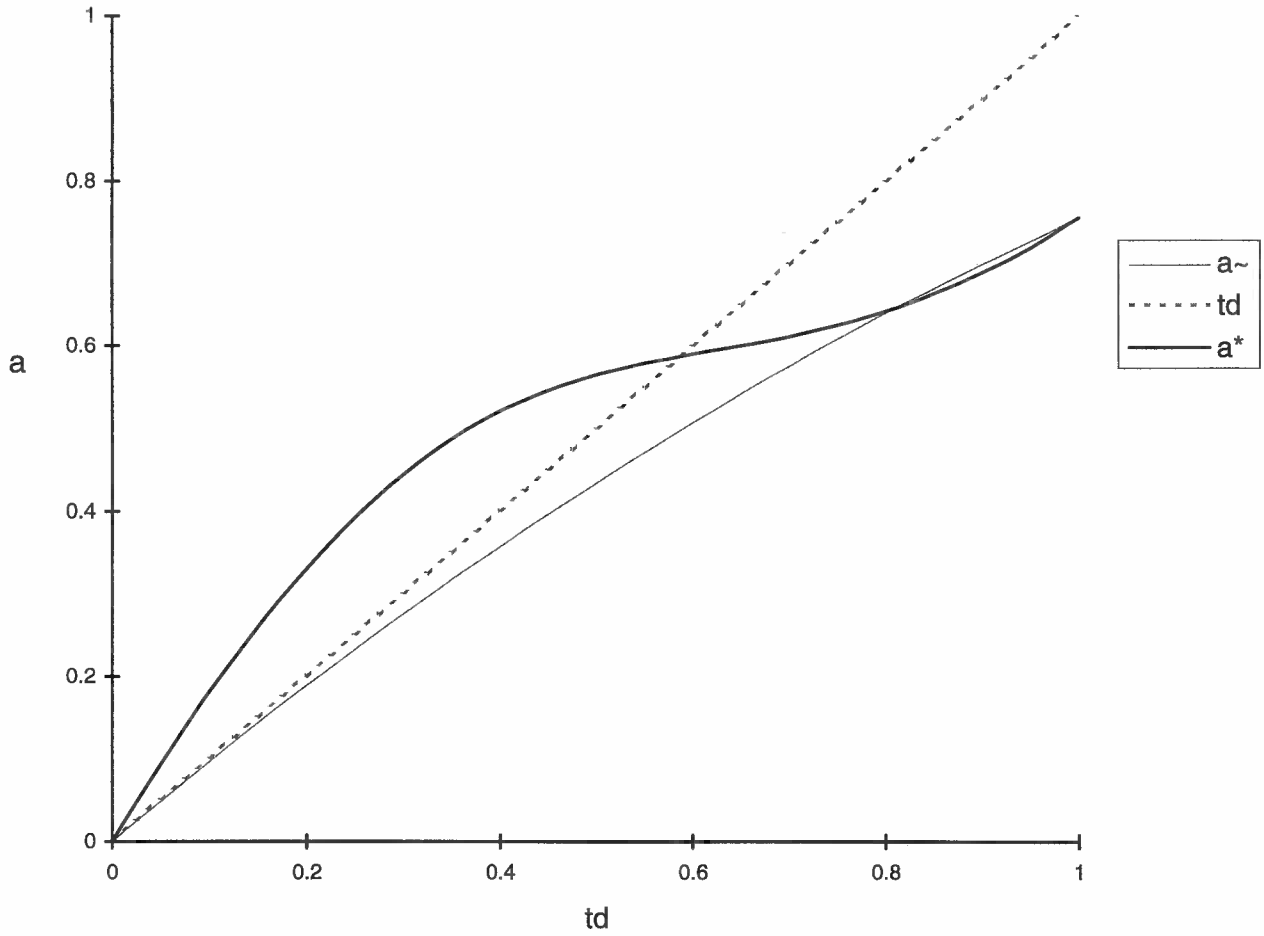

Figure 1: Optimal foreign tax credit – No public goods case

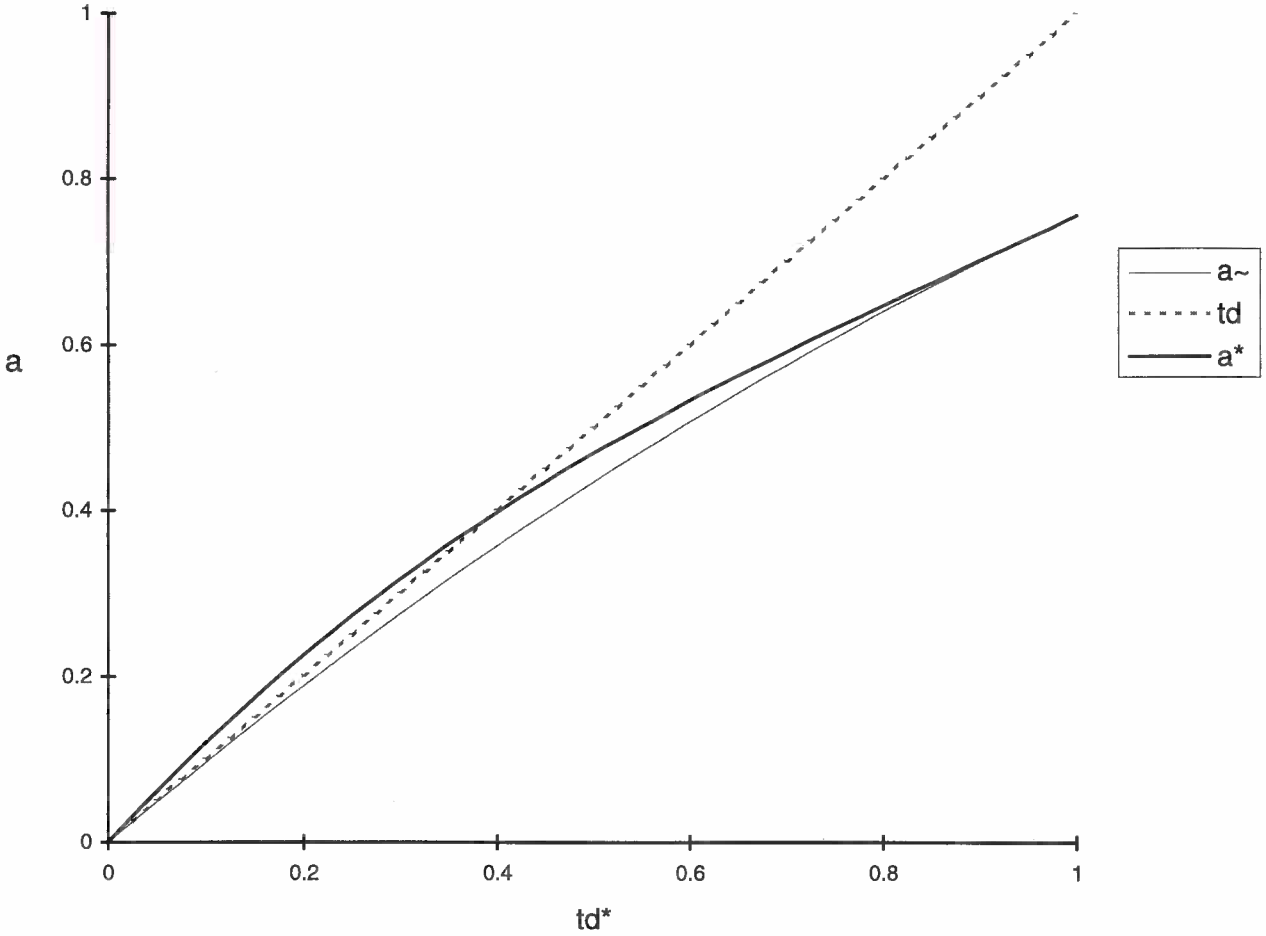

Figure 2: Optimal foreign tax credit – Endogenous public goods provision

Our analysis also suggests that international tax evasion could have important implications for the choice of tax instruments by a capital importing country. International tax evasion, by creating a wedge between the domestic and foreign net-of-tax return to capital, has the effect of lowering the elasticity of capital imports with respect to changes in source tax rates in the importing country, thus enhancing the importing country's ability to capture foreign surplus through taxation, even when the importing country is a small economy. Furthermore, we have shown that the opportunity cost of foregone foreign tax credits depends both upon the foreign tax credit rate and the foreign rate of tax. Thus, importers of capital have the ability to counteract measures taken by the exporter with respect to the foreign tax credit rate. Through these mechanisms, the presence of costly evasion may impact upon the strategic interaction between a capital exporter and a capital importer. The implications of international tax evasion for tax competition should be addressed by further research.

Further research should also examine the role of monitoring choices in this framework. Monitoring activity by a capital importing region has the potential to alter the cost of evasion that foreign firms operating in its jurisdiction face. A capital importer may thus have an incentive to undertake globally suboptimal levels of monitoring in order to create evasion possibilities and thus capture evasion rents. This incentive may persist even when undermonitoring affects evasion decisions by the importing country's residents. Finally, this line of investigation raises the broader question of what the conditions are under which, in a tax competition game, a capital importing country will behave as a tax haven.

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