CES Working Paper Series

TAX EVASION AND THE OPTIMAL TAX TREATMENT OF FOREIGN-SOURCE INCOME

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Working Paper No. 125

1997

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We have benefited from comments by Steven Sheffrin and other participants in the 52nd Congress of the International Institute of Public Finance (Tel Aviv, August 1996), and by seminar participants at Rice University and the University of Texas at Austin (November 1996).

CES Working Paper No. 125
January 1997

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Abstract

This paper models a capital-exporting country that encounters difficulties in taxing foreign-source income, due to tax evasion problems. The paper compares the country's optimal effective tax rates on the income from capital invested at home and abroad (including penalties levied on detected tax evaders). It is found that tax evasion abroad does not provide a justification for a relatively low effective rate on foreign-source income. Under a variety of circumstances, foreign-source income should actually be taxed at a relatively high effective rate, regardless of the severity of tax evasion problems abroad. However, tax evasion abroad does tend to reduce the optimal taxation of capital income both at home and abroad. Thus the paper demonstrates how capital mobility effectively makes the optimal tax on capital income at home dependent on tax evasion problems abroad. The paper also investigates the role of constraints on capital exports as a substitute for high effective tax rates on foreign-source income.

Keywords: Capital exports, export quotas, foreign-source income, tax evasion, capital taxation.

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1. Introduction

The superiority of residence-based capital taxes over source-based capital taxes is now well-known. Under a residence-based tax, all of a resident's income from savings is taxed at the same rate, regardless of where it is earned. As a result, savings are distorted but not the decision about where to invest. In contrast, a source-based tax is levied on only the capital income earned within the home country's borders. This discourages investment at home relative to abroad, but the overall level of domestic savings is unaffected if capital is freely mobile and the return available abroad is unaffected by domestic tax policy (the "small country," or "price-taker," assumption). Given these distortions, a government would not tax capital on either a source or residence basis if lump-sum taxes were available. Thus, the superiority of residence-based taxation must be based on a model in which lump-sum taxation is absent or restricted. Gordon (1986) proves that residence-based taxation dominates source-based taxation, even when the only other available tax instrument for financing public expenditures is a distortionary tax on labor income. One way to understand this result is to observe that a government should avoid taxing items that are in infinitely elastic supply, and such is the case for investment, which earns a return that is determined on world capital markets and therefore exogenous from a small country's viewpoint.[1]

Gordon's result seems to be of limited significance, however, because a country's ability to tax foreign-source income is typically quite limited. Noncompliance appears to be widespread, and legal tax avoidance schemes are readily available.[2] Given these difficulties, some studies simply assume that source-based taxation must be used to finance public expenditures, and investigate the resulting implications.[3] However, the absence of residence-based taxation raises the issue of whether there should be any use of source-based taxation. In fact, Bucovetsky and Wilson (1991) demonstrate that if the only alternative to source-based taxation is a distortionary tax on labor income, then the country will take full advantage of this alternative and not impose any tax on capital.[4] It therefore appears to be important to investigate the intermediate ground, where taxing foreign-source income is difficult but not impossible. By doing so, we can ensure that at least some taxation of capital income is desirable, and then we can ask whether this taxation tends to be closer to a source-based system or a residence-based system.

This paper finds that the optimal tax system diverges quite dramatically from a source-based system. For a capital-exporting country facing tax evasion abroad, we find that foreign-source capital income should be taxed at a higher effective rate than domestic capital income. In this sense, the optimal tax system seems closer to a residence-based system than to a source-based system.[5] The essential factor behind these results is capital mobility. Because of capital mobility, tax evasion problems abroad get translated into lower optimal tax rates abroad and at home. In fact, both tax rates go to zero as the severity of tax evasion rises to the point where taxing capital abroad becomes impossible; i.e., the Bucovetsky-Wilson result of no source-based taxation is reached as a limiting case of the model.

The intuition for how tax evasion should affect the optimal tax rate on a commodity cuts both ways. On the one hand, governments may want to set the tax rate relatively high in an effort to prevent evasion from eroding the effective tax rate. But doing so may induce firms or individuals to engage in a considerable amount of socially-wasteful evasion activities, suggesting that tax rates should be set quite low. A significant accomplishment of Cremer and Gahvari's (1993) analysis of optimal commodity taxation in the presence of tax evasion is that they are able to formally model such tradeoffs in a way that produces useful insights into how these tradeoffs are resolved.[6] As a special case, they consider how tax evasion modifies the inverse elasticity rule, which is central to textbook demonstrations of the importance of price elasticities for the design of an optimal tax system. Comparing two goods with the same price elasticity, they conclude that "the expected tax rate in the... market which is subject to tax evasion will be less than in the market without tax evasion " (p. 271). This "expected rate" (which corresponds to our "effective rate") is based on tax avoidance activities, detection probabilities, and penalty rates. We show that similar results fall out of our model when the country's capital exports are restricted: tax evasion problems abroad reduce the optimal taxation of foreign-source income relative to domestic income. However, linking home and foreign capital markets via capital mobility destroys this result. Thus, one theme of our paper is that in an open economy, the intuition that tax rates should be set relatively low where tax evasion is high is of limited value.

The following section presents the basic model, and Section 3 then compares the optimal tax rates on capital income at home and abroad. Section 4 considers a number of extensions and alternative specifications of the model, arguing that the case for relatively large tax rates on foreign-source income does extend beyond the specific assumptions of our main model. The use of constraints on capital exports is then considered in Section 5. Along with showing that these constraints greatly alter the implications of tax evasion for the taxation of foreign-source income, we demonstrate that the desirability of such constraints depends on tax evasion costs abroad being "larger" than the deadweight loss created by taxing capital income at home. Section 6 concludes.

2. The Model

We consider a world economy consisting of a capital-exporting "home country" and the rest of the world. The home country is inhabited by a representative consumer who divides an exogenous endowment, I, between current consumption and savings.[7] The economy lasts for two periods, so savings are used to help pay for second-period consumption. These savings are allocated between investment at home and capital exports, denoted K and B, respectively. In the second period, domestic firms produce output by combining their capital with labor provided by the consumer, and capital exports earn an exogenous return, R. We initially ignore taxes levied by foreign governments but then show how our analysis extends to include their presence.

We model tax evasion as occurring at the firm level. The representative consumer purchases shares in a large number of domestic firms, which then decide how to divide the consumer's savings between investments at home and abroad. By holding a fully diversified portfolio, the consumer avoids the potential risks associated with tax evasion by firms. Specifically, some firms are caught evading taxes and others are not, but the consumer earns an (almost) certain income on the diversified portfolio. While the assumption of tax evasion by firms motivates the absence of risk aversion, our framework can be interpreted more generally as one where risk aversion is not a factor, either because expenditures on evasion activities yield certain outcomes or because taxpayers are risk neutral.[8] This concentration on the risk-neutral case eliminates considerations involving the optimal taxation of risky assets as a possible explanation for high tax rates on foreign-source income. Section 4 shows how our results extend to the case where risk-averse investors also directly evade taxes on portfolio investments abroad.

We next describe the consumer's behavior, and then we turn to firm behavior and the government's welfare maximization problem.

2.1 The Consumer's Problem. The consumer maximizes utility subject to a lifetime budget constraint, requiring that the present value of consumption equal the present value of income:

(P.1) $$\max_{c^1, c^2, L} u(c^1, c^2, L)$$

$$\text{s.t.} \quad c^1 + q^{-1}c^2 = I + q^{-1}\omega L, \tag{1}$$

where c^i is consumption in period i (i = 1,2), L is the labor supply, I is an initial endowment of income, q is one plus the after-tax return on savings (as specified below), and ω is the net wage rate. The consumer's utility may also depend on public goods, but they will be treated as fixed throughout the analysis (perhaps at their optimal levels), so we may suppress them as separate arguments in the utility function.

It will be algebraically convenient to rewrite (1) in terms of future values:

$$qc^1 + c^2 - \omega L = qI = M, \tag{2}$$

where M is the future value of lump-sum income. With this notation, the solution to the consumer's problem yields an indirect utility function, $v(q, \omega, M)$, consumption functions, $c^i(q, \omega, M)$ for period i, and a labor supply function, $L(q, \omega, M)$.

2.2 The Firm's Problem

The home country contains a large but fixed number of competitive firms. Each of these firms obtains funds from the representative consumer for investment at home and abroad, and uses a constant-returns-to-scale production technology to produce a single output at home from labor and capital. We depict the aggregate behavior of firms by positing a representative firm with a production function, F(K, L), relating the country's total output to the total amount of capital and labor employed there. This firm then chooses K, L, and B to maximize profits.

To motivate the existence of a tax evasion problem in this model, the before-tax return on investment abroad, R, may be regarded as the expected value of a random variable that is i.i.d. across the individual firms. Firms observe this variable after committing to their investment plans, but tax evasion is possible because the government never directly observes these values. Similarly, although firms must possess ex ante identical production technologies (since only the most efficient firms can survive in a competitive equilibrium), we may allow for random ex post differences due to technological uncertainty. Assuming no uncertainty at the aggregate level, F(K, L) represents both expected and actual output. With the representative consumer holding a fully diversified portfolio, the appropriate objective for individual firms is to maximize expected profits, and this implies the maximization of aggregate profits for the economy.

Since constant returns to scale prevail in domestic production, the equilibrium capital-labor ratio is the solution to the problem of maximizing domestic profits per unit of labor:

$$\text{(P.2)} \qquad \max_{k} \; F(k, 1) - rk - w$$

where r and w are the before-tax returns on capital and labor in the home country. This problem defines k as a decreasing function of r: $k = k(r)$; $k'(r) < 0$. The total amount of domestic capital is then

$$K = k(r)L(q, \omega, M), \tag{3}$$

and the requirement that equilibrium profits equal zero defines the following "factor-price frontier:"

$$w(r) = F(k(r), 1) - rk(r); \qquad dw/dr = - k(r). \tag{4}$$

The home government levies taxes on the income from labor and capital, and it uses the revenue to finance the exogenous level of public expenditures. We shall allow for tax evasion on capital income earned both at home and abroad, but the case where evasion occurs only abroad will be highlighted, since this case captures the idea that tax evasion on foreign-source income is especially widespread.[9] In section 4, we also allow taxes on labor income to be evaded.

Tax evasion at home and abroad is modeled in the same way, using a "reduced-form" model that captures the essential features of tax evasion for our study. A fully-specified evasion model that has these features is presented in the Appendix. To begin, let T denote the tax rate on foreign-source income. The after-tax return on this income would then be $R(1 - T)$ in the absence of tax evasion. However, the firm is able to spend real resources to lower the "effective" tax rate to some level T^e less than the T. This effective rate may be interpreted as the expectation of a random tax rate, conditional on the audit policies and the penalties levied on the evaded income that is detected. The rate T will sometimes be referred to as the "statutory rate," to distinguish it from T^e. But our interpretation of T is that it would be the effective tax rate if their were no tax evasion. The penalties and activities undertaken to detect tax evasion (including their costs) are treated as fixed throughout the analysis, allowing us to concentrate on the suboptimization problem of choosing the tax rates that maximize the representative consumer's welfare.[10] The effective tax rate is assumed to be increasing in T but decreasing in the resources, G, spent on evading taxes per dollar of income (see the Appendix for the derivation of such a function):

$$T^e = T^e(T, G); \qquad \partial T^e/\partial T > 0; \qquad \partial T^e/\partial G < 0. \tag{5}$$

The after-tax return on foreign-source income, calculated net of evasion costs, is $R(1 - G)(1 - T^e)$, and the firm's objective is clearly to maximize $(1 - G)(1 - T^e)$. Note our assumption that evasion costs are tax deductible in the calculation of taxable income. The basic idea here is that real resources are used to evade taxes (e.g., accountants, lawyers, less efficient production techniques), and the government is unable to distinguish between these resources and those used in productive activities. This assumption simplifies the exposition, because differences in the ad valorem rates, T^e and t^e, have the same sign as differences in the unit rates, T^eR and t^er, implying that we do not have to distinguish between the two types of rates in the statement of our results. But the implications of our results for unit tax rates and, hence, investment incentives, would continue to hold if evasion costs were not treated as tax deductible.

Since T represents a parameter for the firm's tax evasion problem, the solution is a function of T: $G = G(T)$. There is a strong presumption that a rise in T should increase G, since the expected taxes saved from failing to report another dollar of income should rise with T. The model in the Appendix has this property, but we will not need to restrict our analysis to it. It is important, however, that evasion activities in this model exhibit a certain type of "constant-returns" on evasion activities. Specifically, the effective-tax-rate function, $T^e(T, G)$, does not include capital exports B as an argument. Alternatives our discussed in Section 4.

Tax policy and evasion at home are represented by lower case letters. Thus, $t^e = t^e(t, g)$, and the resulting evasion-cost function is $g = g(t)$. Some of our main results will depend on the assumption that $\partial g/\partial t \geq 0$, which again seems reasonable.

The competitive firms divide their investments between home and abroad to the point where the after-tax returns on capital are equalized in both locations, taking into account evasion costs:

$$R(1 - G)(1 - T^e) = r(1 - g)(1 - t^e). \qquad (6)$$

Throughout this paper, (6) is referred to as the "arbitrage condition."

Finally, observe that the arbitrage condition determines an equilibrium relation between the before-tax return at home, r, and the tax rates T and t:

$$r = r(T, t); \qquad \partial r/\partial T < 0; \qquad \partial r/\partial t > 0; \qquad (7)$$

where the derivatives follow from assumption (5) and the corresponding assumption for the taxation of domestic capital income.[11]

2.3 The Government's Problem

The government's problem consists of choosing taxes to maximize the value of the indirect utility function, $v(q, \omega, M)$, subject to a government budget constraint. To formally state the problem, consider first the determination of q. Under free capital mobility, the after-tax return on investment abroad, $R(1 - G)(1 - T^e)$, may serve as the marginal return on the representative consumer's savings. Hence, this return determines the price of second-period consumption in the representative consumer's utility-maximization problem:

$$q^{-1} = \frac{1}{1 + R(1 - G)(1 - T^e)} \tag{8}$$

Under the small country assumption, the country faces a fixed R, determined on the world capital market. Since G and T^e are functions of T, (9) defines q as a function of T alone: $q = q(T)$.

For the government budget constraint, we require that taxes be sufficient to finance the government's required expenditures, denoted E:

$$E \leq [(w(r) - \omega) + t^e r(1 - g)k(r)]L(q, \omega, M) + T^e R(1 - G)B. \tag{9}$$

Capital exports satisfy

$$B = I - c^1(q, \omega, M) - k(r)L(q, \omega, M), \tag{10}$$

which enables us to rewrite (9) as follows:

$$E \leq \{[w(r) - \omega] + [t^e r(1 - g) - T^e R(1 - G)]k(r)\}L(q, \omega, M) + T^e R(1 - G)[I - c^1(q, \omega, M)]. \tag{11}$$

After substituting from arbitrage condition (6) to rewrite (11), we have the final form of the maximization problem:

(P.3) $$\max_{\omega, t, T} \; v(q, \omega, M)$$

$$\text{s. t.} \quad E \leq \{[w(r) - \omega] + [r(1\text{-}g) - R(1 - G)]k(r)\}L(q, \omega, M) + T^e R(1 - G)[I - c^1(q, \omega, M)], \tag{12}$$

where $r = r(T, t)$ and $q = q(T)$, as defined above. For convenience, we are using the after-tax wage as a control variable, in place of the tax rate on labor.[12]

In the absence of tax evasion, the optimal T may be negative in some cases, depending on the properties of the savings and labor supply functions. But at zero or negative tax rates, tax evasion is not a problem. To concentrate on the impact of tax evasion on relative tax rates, we shall assume in the text that it is optimal to collect some taxes on savings, and then we address this issue in our concluding remarks.

3. The Optimal Tax System

We now prove and discuss the main proposition of this paper:

Proposition 1. If tax evasion occurs only abroad, then $T^e = t$ and, therefore, $T > t$. If taxes on domestic capital income are also evaded, with $g > 0$ and $\partial g/\partial t \geq 0$, then $T^e > t^e$.

Proof. Since t does not appear in the government's objective function, the first-order condition for t is obtained by differentiating the government budget constraint, given by (12):

$$[r(1 - g) - R(1 - G)]k'(r)\frac{dr}{dt} L - \frac{d(rg)}{dt} K = 0, \qquad (13)$$

where use is made of the derivative, $w'(r) = -k$, to cancel terms. We have previously observed that $\partial r/\partial t > 0$ and $k'(r) < 0$ Using these inequalities, we conclude from (13) that $R(1 - G) = r(1 - g)$ in the absence of tax evasion at home, and $R(1 - G) > r(1 - g)$ if $g > 0$ and $\partial g/\partial t \geq 0$. The arbitrage condition then confirms the claims about T^e and t^e in the proposition. Since tax evasion lowers T^e below T, we will always have $T > t$ if there is tax evasion abroad but not at home. Q.E.D.

Equation (13) provides the basic intuition behind Prop. 1. Suppose that we start with a tax system under which $T^e = t^e$. If we now lower t, there will be a movement of capital from abroad to home, but this movement will have no first-order efficiency effects, i.e., the first term in (13) equals zero. If, however, firms respond to the lower t by choosing to incur lower evasion costs at home, then there is a first-order welfare gain. Hence it is optimal to reduce t. As t is reduced, t^e falls below T^e, causing $r(1 - g)$ to fall below $R(1 - G)$. In other words, capital exports become inefficiently small. The optimal t is found where a marginal reduction in t produces a benefit in the form of a lower g that just offsets the efficiency loss from the further reduction in capital exports.

When tax evasion exists both at home and abroad, the difference between the statutory tax rates cannot be signed in general, since we do not know the relative magnitudes by which they differ from the corresponding effective tax rates. However, if we continue to interpret the model as one in which tax evasion abroad is the more important problem, then T will again exceed t.

In either case, there is no cost function for foreign evasion that will induce the government to impose a higher effective tax rate on capital income at home than abroad. In this sense, the optimal taxation of capital can never be said to "approximate" source-based taxation by taxing foreign-source income relatively lightly, even when tax evasion abroad is a serious property.

It may seem puzzling that T^e cannot lie below t^e regardless of the severity of tax evasion abroad, since a severe tax evasion problem will limit the maximum attainable value of T^e. The puzzle is resolved by observing that the proposition only tells us about the value of T^e relative to t^e, not the absolute value of T^e. As tax evasion abroad become more severe, we can expect the optimal tax on capital income at home to fall. In other words, tax evasion abroad is translated via capital mobility into low tax rates on capital income at home, even if evasion at home is not a problem. In the limit, the taxation of capital income at home disappears as taxing capital income abroad becomes impossible. This brings us back to the Bucovetsky-Wilson result: if only source-based taxes are available, then they should not be used.

Additional insight into the influence of foreign tax evasion on domestic tax rates is obtained by examining the first-order conditions for T and the tax on labor income, which are derived in the Appendix:

$$\frac{\lambda - \delta}{\lambda} - \frac{B}{I - c^1}(1 - G)^{-1}\frac{dG/dT}{\partial T^e/\partial T} = \frac{\beta(-c^1 s_\omega) + T^e R(-c^1 s_Q)}{I - c^1}; \qquad (14)$$

$$\frac{\lambda - \delta}{\lambda} = \frac{\beta L^s_\omega + T^e R L^s_q}{L}; \tag{15}$$

where the superscript "s" denotes a compensated demand derivative; λ is the social marginal value of government revenue; and

$$\beta = [w(r) - \omega] - [t^e r(1-g) - T^e R(1-G)]w'(r); \tag{16}$$

$$\delta = v_M + \lambda[t^e r(-c^1_M) + \beta L_M]. \tag{17}$$

In words, β is a "tax wedge" on labor income (as explained below), and δ is the "social marginal utility of income," defined by Diamond (1975) to include the value of the additional tax payments collected when the consumer receives another dollar of income. Conditions (14) and (15) differ in two distinct ways from the Ramsey Rule, which in this case would require that the tax system reduce the demand for labor and savings by approximately the same percentages, where the approximation is conducted by holding producer prices, utilities, and the (compensated) demand derivative fixed. First, the tax wedge, β, no longer equals the unit tax on labor. Instead, it equals this tax plus the first-order wage reduction resulting from the difference in tax rates on capital income at home and abroad, $-w'(r)[t^e r(1-g) - T^e R(1-G)]$. In contrast to the Ramsey Rule, then, producer prices should no longer be held fixed in the calculation of the (approximate) percentage changes in labor and savings. The second difference is the presence of the tax evasion term in (14). This term, $(1-G)^{-1}[(dG/dT)/\partial T^e/\partial T)]$, which measures the marginal increase in evasion costs from an increase in the <u>effective</u> tax rate, can be viewed as reflecting the severity of the tax evasion problem abroad.[13] The presence of this marginal evasion cost in (14) implies that the percentage reduction in savings should be less than the percentage reduction in the labor supply, suggesting that tax evasion abroad reduces the relative tax burden on savings. If we assume zero cross elasticities, then (14) and (15) become variants of the familiar inverse elasticity rule:

$$\frac{\frac{\lambda - \delta}{\lambda} + \frac{B}{I - c^1}(1 - G)^{-1}\frac{dG/dT}{\partial T^e/\partial T}}{\varepsilon^S} = \frac{T^e R}{q}; \tag{18}$$

$$\frac{\frac{\lambda - \delta}{\lambda}}{\varepsilon^L} = \frac{\beta}{\omega}; \qquad (19)$$

where ε^S and ε^L are the savings and labor supply elasticities. Now foreign tax evasion is seen more clearly to reduce the taxation of savings relative to labor, and for the difference in capital taxes identified by Prop. 1, this lower savings tax consists of lower taxes on capital income at home and abroad.

4. Extensions

We now extend the model in a number of directions. Taken as a whole, these extensions provide further support for relatively high taxes on foreign-source income.

4.A Labor Taxation

The previous section has described how evasion problems abroad translate into lower taxes on capital income at home. This section uncovers the opposite phenomenon: evasion in one market leads to relatively high tax rates in another market. In particular, we show that the evasion of taxes on labor income tends to raise the expected tax rate on capital income at home relative to abroad. However, this finding does not appear to be sufficient to reverse Prop. 1 under reasonable assumptions about the relative importance of this new source of evasion.

We stay within our existing framework by modeling the evasion of taxes on labor income in the same way as before, including the risk-neutrality of the consumer with respect to any risks associated with tax evasion. Thus the government's optimization problem is amended in only two ways to account for this new source of tax evasion. First, the unit tax rate on labor income in the government budget constraint becomes $b^e w(r)$, where b^e is the effective ad valorem tax rate on labor income. Second, the after-tax wage rate, ω, is now given by

$$\omega^e = w(r)[1 - b^e - h], \qquad (20)$$

where h is evasion costs per unit of labor income (now assumed not to be tax deductible).[14] The consumer chooses evasion activities that minimize $b^e + h$, and the solution to this problem defines both b^e and h as functions of the "statutory" tax rate on labor income, denoted b.

With these changes, we isolate the impact of the evasion of labor taxation by considering the case where there is no evasion of taxes on domestic capital income:

Proposition 2. Assume that taxes on labor income are evaded, with $h > 0$ and $\partial h/\partial b \geq 0$, but there is no evasion of taxes on domestic capital income. Under the optimal tax system, $T^e < t$.

Proof. At the optimum, any small perturbation in the tax system has a zero first-order impact the Lagrangian for the government's problem. Consider one such perturbation consisting of a rise in t, thereby changing the gross wage $(\partial w/\partial r)(\partial r/\partial t)$, and a reduction in b by an amount, $db/dt < 0$, that keeps the after-tax wage unchanged. As a result, there is no change in the objective function for problem (P.3), but the government budget constraint does change. To see how, note from (20) that the unit tax rate on labor income satisfies, $b^e w(r) = w(r)(1 - h) - \omega^e$. Hence the government budget constraint given by (12) may be rewritten

$$E \leq \{(w(r)(1 - h) - \omega^e) + [r - R(1 - G)]k(r)\}L(q, \omega^e, M) \\ + T^e R(1 - G)[I - c^1(q, \omega^e, M)], \tag{21}$$

where r is again determined by T and t, and we are using our assumption that $g = 0$. For an optimal tax system, our small perturbation must have a zero first-order impact on this constraint, giving us the following condition:

$$[r - R(1 - G)]k'(r)(\frac{\partial r}{\partial t}) - \{w'(r)(\frac{\partial r}{\partial t})h + w(r)(\frac{dh}{db})(\frac{db}{dt})\} = 0, \tag{22}$$

where we again use the equality, $w'(r) = -k$, to cancel terms. We know that $k'(r)(\partial r/\partial t) < 0$, $(dh/db)(db/dt) \leq 0$, and $w'(r)(\partial r/\partial t) < 0$. Thus the expression in the curly brackets is negative, implying that $r - R(1 - G) > 0$. It follows from the arbitrage condition that $t > T^e$. Q.E.D.

Once again, we see how a comparison of evasion activities in different markets provides a poor guide for predicting how tax rates should differ. But now evasion in the labor market can lead to a relatively low tax rate on domestic capital income. The basic explanation is that a rise in t now lowers evasion costs in two ways. First, it reduces the amount of labor income that is subject to tax evasion by causing w(r) to fall. Second, the fall in b need to maintain a constant after-tax wage causes evasion activities to fall (i.e., h rises). These two effects are represented by the terms in the curly brackets in (22). At the optimum, it is worthwhile to obtain these reduced evasion costs by raising t above T^e, although this causes capital exports to be inefficiently large.

In a model with evasion of taxes on both domestic capital income and labor income, it remains true that the relative rates of taxation on domestic and foreign-source capital income are independent of the severity of the tax evasion problem abroad. However, these relative rates cannot be signed without knowledge of the relative severity of these two forms of evasion. Perhaps the most empirically relevant assumption is that opportunities to evade taxes on capital income are more widespread, so that the forces that raise T^e above t^e dominate. In fact, it is possible to show that this difference in taxes must prevail if we make the empirically reasonable assumption that labor income is effectively taxed more than domestic capital income (i.e., $b^e > t^e$), and we represent the greater importance of capital tax evasion by the following assumptions at the optimum: $g > h$, $dg/dt > dh/db$, and $\partial t^e/\partial t < \partial b^e/\partial b$.[15] The first two inequalities say that the total and marginal evasion costs incurred on each unit of income are greater in the capital sector, and the third inequality provides a sense in which more evasion successfully occurs at the margin in the capital sector.

4.B Multiple Types of Foreign Investment

We now sketch a model with a second source of foreign tax evasion and use it to demonstrate that our previous results about the taxation of foreign-source income can be extended to this more complicated setting. In particular, assume now that the representative consumers is able to directly purchase a portfolio of foreign assets, which are then taxed at a separate personal rate, T^P. The consumer has the option of evading this tax by under-reporting the earnings on these assets. Using our previous model of tax evasion, let $G^P(T^P)$ denote evasion cost as a function of T^P, and assume that the two types of foreign investments both earn the same return, R. We recognize, however, that the consumer bears the burden of the risks associated with random audits of the foreign portfolio. Letting ψ denote a risk premium associated with the resulting random tax payments, the "arbitrage condition" for the division of foreign investment between portfolio investment and the direct foreign investment of the previous sections becomes:[16]

$$R(1 - G)(1 - T^e) = R(1 - G^P)(1 - T^{Pe}(1 + \psi)). \qquad (23)$$

With this setup, it is now easy to see that the argument behind Proposition 1 remains completely valid. Following that argument, consider a small reduction in the tax rate on domestic income. This draws capital back into the jurisdiction, and we have shown that the resulting first-order welfare effect is zero, as required for an optimum, only if $T^e \geq t^e$, with equality when there is no domestic tax evasion. Note, in particular, that there is no change in the marginal return on savings, which continues to be determined abroad. Adding a second source of foreign-source income does nothing to alter this argument and, hence, is irrelevant for the optimal difference between T^e and t^e.

This additional income source does raise the issue of how the two tax rates on the different foreign incomes should differ. There is no general answer, since the evasion of taxes on portfolio investment means that we are effectively taxing a risky asset, and the optimal levels of such taxes depend on attitudes towards risk. In particular, examples can be presented in which T^{eP} exceeds T^e, again demonstrating that taxes on foreign-source income can be relatively high.[17]

4.C. Different Evasion Technologies

We have worked with a class of models in which the effective tax rate on capital income depends only on the tax rate and evasion costs: $T^e = T^e(T, G)$. A possible alternative would be to assume that T^e depends on the amount of investment abroad: $T^e = T^e(T, G, B)$. In this case, a reduction in the tax rate on capital income at home can have general equilibrium effects on evasion cost G through the resulting reduction in capital exports. Proposition 1 must therefore be modified, but it not clear how we should specify the relation between T^e and B. This issue can

only be resolved by more modeling of the tax evasion process, combined with empirical work.

One direction that this modeling might take would be to drop the constant-returns assumption at the firm level, and model an endogenous determination of the number of domestic firms with operations abroad. One could envision the following process. As the tax rate t is reduced, B declines and there is an accompanying drop in the number of domestic firms operating abroad. Given the budget available for catching tax cheats, more resources can now be devoted to detecting tax evasion in each of these firms. As a result, each firm is induced to lower its G. (In the model presented in the Appendix, for example, G is a declining function of the probability of an audit.) Thus, a reduction in t leads to a reduction in wasteful evasion costs abroad, and this consideration reinforces the tendency for t to fall short of T^e.

This argument follows the previous analysis by treating the determination of tax rates as a suboptimization problem, for which the government's expenditures devoted to detecting tax evaders are exogenous. Thus, our conclusions are meant to hold whether or not these detection activities are optimal. For the model presented in the Appendix, it is straightforward to endogenize the audit probability, but the investigation of models with superior, but more complicated, audit policies in an optimal tax model would be useful.[18] Such extensions raise the issue of time consistency. In particular, if the government finds it optimal to commit to a particular policy, then it normally has an incentive to renege on such commitments when a taxpayer's income and other attributes are observed. See Reinganum and Wilde (1986) for an analysis of the no-commitment case.

One particular issue that is specifically relevant to the evasion of taxes on foreign-source income is the extent to which foreign governments cooperate in collecting such taxes. Our working assumption that it is significantly easier to evade taxes on income earned abroad reflects the belief that such cooperation is difficult to elicit. Indeed, the ability to conduct a successful audit is likely to depend on such cooperation. Bacchetta and Espinosa (1995) investigate a model with endogenous information sharing between governments and show that the sharing of partial information may occur in equilibrium. However, incentives to exchange full information do not exist and, indeed, full information sharing may not be Pareto optimal. They assume that the proportion of foreign income that is evaded depends only on the extent of information-sharing; a home government possesses no other tools to reduce this proportion, such as the audits and penalties considered here. It would be useful to build a model where information sharing and domestic enforcement policies do substitute for each other to some extent.

4.D. Taxes Levied by Foreign Governments

Consider finally taxes levied by foreign governments, and let us allow for the common practice of crediting these taxes against domestic tax liabilities. Small values of T raise no revenue and have no incentive effects, since the burden of the tax is eliminated by the tax credit. Thus the government will raise T beyond this range, and there will be no change in the arbitrage condition given by (6); T^e continues to determine the total tax burden on foreign-source income. However, for each unit of capital invested abroad, the home government only receives $R(1 - G)(T^e - S)$, where S is the foreign tax rate.[19] As a result, the social value of investment abroad is reduced to $R(1- G)(1 - S)$ and efficiency requires that this return equal $r(1 - g)$. In other words, $R(1- G)$ must exceed $r(1 - g)$ to compensate for foreign taxes, and this is only possible in equilibrium if T^e is greater than t^e. For this reason, the only change in Prop. 1 is the replacement of the equality, $T^e = t$, with the inequality, $T^e > t$, for the case where there is no tax evasion at home.

Thus, foreign tax credits appear to reinforce the case for relatively high effective tax rates abroad. On the other hand, the appropriate effective tax rate on a unit of capital from the home country's standpoint is now given by $R(1 - G)(T^e - S)$, and Prop. 1 can be rephrased with this revised definition of an effective tax rate, as can the other results in this paper. Moreover, this is the more relevant concept of an effective tax rate, because it is the difference between this revised rate and the effective unit tax rate on capital at home that determines whether capital exports are inefficiently large or small.

5. Constraints on Capital Exports

The previous analysis suggests a potential justification for constraints on capital exports. Tax evasion problems abroad reduce the optimal taxation of capital income at home, due to the link between domestic and foreign markets created by capital mobility. By constraining capital exports, the home government is able to break this link and raise the tax on capital income at home without causing capital flight.

This section partially confirms this intuition. The appropriate response to severe tax evasion problems abroad is export constraints (if they are feasible), coupled by relatively low effective tax rates on foreign-source income as a means of reducing the wasteful evasion activities. However, if the deadweight losses associated with the taxation of capital at home are sufficiently large relative to evasion costs abroad, then export constraints will not be desirable. Thus, our analysis qualifies Razin and Sadka's (1991) finding that export constraints are always desirable when foreign-source income cannot be taxed. In some cases, the appropriate cure for tax evasion abroad is relatively high tax rates on foreign-source income, not export constraints and little or no taxation.

To represent relatively severe tax evasion problems abroad, let us return to the case in which there is no tax evasion at home. This assumption enables us to immediately rule out the desirability of constraining allowable investment at home so that investors are forced to accept a lower expected return abroad, calculated net of evasion costs. If $R(1 - G)(1 - T^e)$ were less than $r(1 - t)$, then the marginal price of future consumption (q^{-1} in the consumer's budget constraint) would be determined by the net return abroad. Hence a marginal rise in t would then represent a lump-sum tax, and the government could improve welfare by increasing this tax while reducing the taxes that do distort.

Thus we amend the arbitrage condition to account for the possibility of export constraints by allowing either

$$R(1 - G)(1 - T^e) = r(1 - t) \quad \text{or} \quad R(1 - G)(1 - T^e) > r(1 - t). \tag{24}$$

In either case, the marginal investment earns $r(1 - t)$, and this return determines q:

$$q = 1 + r(1-t). \tag{25}$$

The lump-sum income in the consumer's budget constraint also changes. In particular, it now consists not only of the future value of the endowment, qI, but also quota rents in the case of a binding constraint on capital exports:[20]

$$M = qI + [R(1 - G)(1 - T^e) - r(1-t)]B, \tag{26}$$

or, by (25),

$$M = qI + [R(1 - G)(1 - T^e) - (q - 1)]B. \tag{27}$$

For the government's control variables, we now use q, r, ω, T, and B. The variables q and r determine t via equality (25), and ω and w(r) determine the tax rate on labor income. There is also an additional constraint in the government's problem, requiring that B equal the difference between domestic savings and investment. By substituting 1 + r - q for tr in the government budget constraint given by (11), we may state the problem as follows:

(P.4) $\max_{q,\, r,\, \omega,\, T,\, B} \quad v(q, \omega, M)$

$$\text{s. t.} \quad E \leq \{[w(r) - \omega] + [1 + r - q - T^eR(1 - G)]k(r)\}L(q, \omega, M) + T^eR(1 - G)[I - c^1(q, \omega, M)]; \tag{28}$$

$$B = I - c^1(q, \omega, M) - k(r)L(q, \omega, M). \tag{29}$$

Using this setup, we now prove --

<u>Proposition 3</u>. Assume that tax evasion exists only abroad, and dG/dT > 0 for all positive T. If capital exports can be constrained, this constraint binds at the optimum if and only if $t > T^e$ at the optimum.

<u>Proof</u>. The "if" part follows immediately from Prop. 1, and the Appendix proves the "only if" part. Q.E.D.

Thus a binding export constraint necessarily eliminates the equality between t and T^e that exists under perfect capital mobility (see Prop. 1). To investigate when in fact $t > T^e$ is optimal, the Appendix derives the following first-order conditions for q, ω, and T:

$$q: \quad \frac{\lambda - \delta}{\lambda} = \frac{\beta(-c^1 s_\omega) + T^e R(-c^1 s_q)}{K}; \tag{30}$$

$$\omega: \quad \frac{\lambda - \delta}{\lambda} = \frac{\beta L^s_\omega + T^e R L^s_q}{L}; \tag{31}$$

$$T: \quad \frac{\lambda - \delta}{\lambda} = (1 - G)^{-1} \frac{dG/dT}{\partial T^e/\partial T} \tag{32}$$

Foreign tax evasion no longer directly enters the conditions for the optimal domestic tax rates, now given by (30) and (31); the lack of capital mobility has broken this link. As a result, the imposition of the tax system should now reduce savings and labor supply by the same percentages (approximately). But this percentage depends on foreign tax evasion through condition (32). Low marginal evasion costs, measured by low values of $(1 - G)^{-1}[(dG/dT)/(dT^e/dT)]$, will cause T^e to exceed t under the tax system that satisfies (30)-(32), implying that constraints on capital exports are not desirable.[21] On the other hand, high marginal evasion costs will lead to a relatively low T^e, making export constraints desirable.

To conclude, we find that capital mobility must be eliminated to obtain a case that corresponds to the Cremer-Gahvari insight that tax evasion leads to relatively low optimal tax rates: If evasion costs are sufficiently high at the margin, then capital exports should be constrained and T^e should then be set below t. How high these evasion costs must be will depend on the savings elasticity, which is a major determinant of the optimal value of t. In the special case of zero cross elasticities, (30) and (31) reduce to the inverse elasticity rule, and a sufficiently high savings elasticity will eliminate the desirability of constraints on capital exports. Finally, even if export constraints are found to be desirable in this model, it must be recognized that they are difficult to enforce in practice.

6. Concluding Remarks

We have shown that with unfettered capital mobility, foreign tax evasion does not lower the effective rate at which foreign-source income should be taxed relative to domestic capital income. Instead, severe evasion problems abroad are translated into lower capital taxes both at home and abroad. In fact, Proposition 1 shows that foreign-source income should be taxed at the higher effective rate when there is tax evasion at home.

Given the surprising nature of these results, we have subjected them to considerable scrutiny by extending the basic model in a number of different directions. They seem to hold up rather well, but we caution that many issues remain to be explored. We have only briefly touched on uncertainty, and we have ignored the game-theoretic considerations that arise when capital movements occur between a small number of countries, and when markets are imperfectly competitive.[22] However, our analysis suggests that arguments against taxing foreign-source income simply because it is "too hard to tax" are far less self-evident than one might believe.

On the other hand, this paper raises questions about the desirability of any taxation of capital income. We have assumed such taxation is desirable throughout the analysis, in order to concentrate on how tax rates should differ between home and abroad. According to Prop. 1, if any taxation of capital is desirable, then the tax system should include a tax on foreign-source income. Thus we must ask whether the net benefits of taxing capital are positive, once the necessary administrative, compliance, and evasion costs associated with a tax on foreign-source income are taken into account. It is important to realize that the answer could be "yes" even in cases when these costs exceed the revenue collected from this tax, given the additional role of the tax in discouraging capital flight. However, at the current revenue yields for taxes levied on both domestic and foreign-source capital income by countries like the U.S., it is unclear that these costs are worth incurring.[23] With regard to the ongoing policy debates over the relative merits of consumption taxation and income taxation, the open-economy considerations presented in the present paper strengthen the case for a consumption tax.

Appendix

A Model of Tax Evasion

By amending Cremer and Gahvari's (1993) model of optimal commodity taxation with tax evasion, we shall obtain a model with the essential properties of the "reduced-form" model presented in the text. They assume that a firm evades taxes by reporting only a proportion of the sales of the good it produces. The tax administration makes a costless "cursory examination" of these sales, and this examination reveals the actual sales unless the firm spends resources to conceal sales. The cost of this concealment is a convex function of the proportion of sales that are concealed. The tax administration also audits firms at random. These costly audits reveal actual sales.

For our analysis, under-reporting of capital income is the problem. Consider the evasion of taxes on foreign-source income. (Domestic tax evasion is modeled in the same way). The cost of concealing each dollar of taxable income is a function of the fraction of taxable income that goes unreported: $H(A)$, where A denotes this fraction and we assume that $H(0) = H'(0) = 0$ and, for $A > 0$, $H'(A) > 0$ and $H''(A) \geq 0$. These properties ensure that there is a solution to a firm's optimal evasion problem, and that this solution involves some evasion at any positive T. The cost of tax evasion per dollar of taxable income is, $G^*(A) = AH(A)$, and the properties of $H(A)$ imply that $G^*(A)$ has positive first and second derivatives.

The firm is audited with probability π, in which case it is caught evading taxes and assessed a penalty that effectively raises its tax rate on unreported income to PT, where $P - 1$ is the penalty rate.[24] The firm's expected tax rate on a dollar of foreign-source income is then

$$T^e = [(1 - A) + A\pi P]T \qquad \text{(A.1)}$$

We assume that $\pi P < 1$, since tax evasion would otherwise increase T^e, thereby eliminating any incentive to evade taxes. By inverting $G^*(A)$ to get $A = A(G)$ and substituting this function into (A.1), we obtain the function $T^e(T, G)$ in the text, with $\partial T^e/\partial T > 0$ and $\partial T^e/\partial G < 0$.

The function G(T) in the text is derived as follows. The firm earns a return of $R(1 - G)(1 - T^e)$ on a unit of investment abroad. Hence it chooses A to maximize this return, and the first-order condition is

$$G^{*\prime}(A)(1 - T^e) = [1 - G^*(A)](1 - \pi P)T. \quad (A.2)$$

Since the left side rises with A and the right side falls with A, this condition uniquely determines A as a function of T. We therefore have $G(T) = G^*(A(T))$, and $T^e(T) = T^e(T, G(T))$. Note in particular that $\partial T^e/\partial T > 0$; and, by the envelope theorem,

$$\frac{d[R(1 - G)(1 - T^e)]}{dT} = - R(1 - G)\frac{\partial T^e}{\partial T} < 0. \quad (A.3)$$

Both of these properties are used in the text.

Derivation of Equations (14) and (15). The Lagrangian for problem (P.3) is

$$L = v(q, \omega, M) + \lambda\{[(w(r) - \omega) + [r(1\text{-}g) - R(1 - G)]k(r)]L(q, \omega, M) + T^eR(1 - G)[I - c^1(q, \omega, M)] - E\}, \quad (A.4)$$

where λ is a Lagrange multiplier. To obtain the first-order condition for T, differentiate this Lagrangian with respect to T, using the relation between M and T given by (25):

$$[v_q + v_M I + \lambda(-T^eRc^1{}_q + \beta L_q)]\frac{d[(1\text{-}G)(1\text{-}T^e)]}{dT} + \lambda(I - c^1)\frac{d[T^e(1\text{-}G)]}{dT} + \lambda K\frac{dG}{dT} = 0, \quad (A.5)$$

where K = kL and

$$\beta = [w(r) - \omega] + [r(1\text{-}g) - R(1 - G)]k(r), \quad (A.6)$$

or, by the arbitrage condition given by (6) and the relation, $k = - w'(r)$,

$$\beta = [w(r) - \omega] - [t^e r(1\text{-}g) - T^eR(1\text{-}G)]w'(r). \quad (A.7)$$

This last expression is (16) in the text.

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[23] Even if the taxation of capital income is abandoned, the opportunities that open borders offer for tax evasion still remain. For a recent analysis, see Gordon and Nielsen (1996).

[24] There would be no substantive change in the analysis if audits revealed actual sales with some probability less than one.

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