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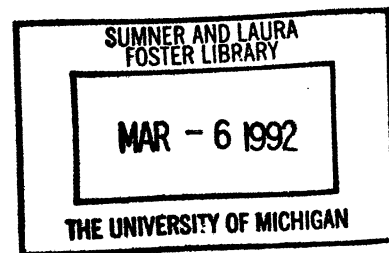
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## Can Capital Income Taxes Survive in an Open Economies?

by

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August 1990



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#### **ABSTRACT**

Recent theoretical work has argued that a small open economy should use residence-based but not source-based taxes on capital income. Given the ease with which residents can evade domestic taxes on foreign earnings from capital, however, a residence-based tax may not be administratively feasible, leaving no taxes on capital income.

The objective of this paper is to explore possible reasons why capital-income taxes have survived in the past, in spite of the above pressures. Any bilateral approach, such as sharing of information among governments or direct coordination of tax rates, suffers from the problem that the coalition of countries is itself a small open economy, so subject to the same pressures. Capital controls, preventing capital outflows, may well be a sensible policy response and were in fact used by a number of countries. Such controls have many drawbacks, however, and a number of countries are now abandoning them.

The final hypothesis explored is that the tax-crediting conventions, used to prevent the double taxation of international capital flows, served also to coordinate tax rates. The paper shows that while no Nash equilibrium in tax rates exists, given these tax-crediting conventions, a Stackelberg equilibrium does exist if there is either a dominant capital exporter or a dominant capital importer, in spite of the ease of tax evasion. While the U.S., as the dominant capital exporter during much of the postwar period, may well have served as this Stackelberg leader, world capital markets are now more complicated. These tax-crediting conventions may no longer be sufficient to sustain capital-income taxation.

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Can taxation of capital income survive the increasing integration of world capital markets? A number of recent papers suggest not. Diamond-Mirrlees(1971), for example, showed that a small open economy would not choose to tax the income generated by the physical capital located within the country — under an optimal tax system, production would occur efficiently, which requires that domestic investments earn the rate of return available on the world capital market. In principle, a country might still attempt to tax the income from the savings of its residents. However in practice, income from savings invested outside the country is virtually impossible for a government to monitor. Individuals therefore can evade tax on such savings with very little risk. As Razin-Sadka(1989) show, such capital flight in theory eliminates any possibility of a tax on savings — investors will simply transfer their funds abroad to avoid taxation.

In the past, perhaps enough countries were sufficiently closed, due to the costs of transferring both goods and information across borders, that these pressures were relatively manageable. When pressures were high enough, a number of countries (including several in Europe) introduced capital controls, preventing residents from investing abroad, in order to preserve this tax base.<sup>1</sup> But the European Community has agreed to eliminate these controls in the near future, as they create an artificial barrier to economic integration within the Community. Will the increasing openness of the E.C., and of the world economy more generally, in fact lead to an erosion of capital income taxation, as the theory predicts?

As shown in Gordon(1983), even though any one country acting in isolation may not choose to tax capital income, all countries acting together could well gain by jointly taxing capital income. Any one country's attempt to increase its tax on capital income should benefit other countries, if only by increasing the size of their tax base. These externalities imply that the equilibrium outcome without coordination would result in rates which

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<sup>1</sup> This paper was written while I was visiting at the Ministry of Finance in Lisbon. The Ministry takes no responsibility for the contents of the paper. I would like to thank Vitor Gaspar for comments on an earlier draft.

are likely to be lower than would be chosen with coordination. What mechanisms are available to enable countries to coordinate their tax policies? One mechanism would be explicit treaties setting tax rates in all countries, which in principle could achieve any desired outcome. But most countries would be loathe to give up their internal discretion over the design of this important element of their tax structure. It is also not clear that every country would gain by signing such a treaty. If participation were voluntary, would the agreement be undermined if any one country chose not to participate?

Another mechanism would involve governments sharing information with each other about the capital income of foreign residents, enabling these governments to enforce a tax on the world-wide income of their residents. Such an agreement could easily be undermined, however, by any one country, e.g. Switzerland, choosing not to participate.

In this paper, I show that existing conventions in many countries for the taxation of foreign-source capital income, which prevent the double taxation of this income by having the home country grant residents a tax credit towards their domestic income taxes for any capital income taxes already paid to the host country, may well help coordinate capital tax policies among countries. In particular, I show that under this convention capital income taxes will end up being used by small open economies, in spite of the previous results. The specific outcome depends on a variety of detailed assumptions, and only in extreme cases would be equivalent to full coordination. However, the outcome may be close enough to explain the prevalence of this convention and the absence of further coordination.

The organization of this paper is as follows: In section I, I show briefly the equilibrium tax structure that would arise without any form of coordination among countries, showing in particular the role of capital controls. Sections II and III then explore the equilibrium under the above type of double-taxation convention. In section II, all international capital flows take the form of direct investment by multinationals; while multinationals owe tax to both the home and the host countries, their home country grants them a tax credit for any taxes already paid to the host government. In section III, international capital flows occur only through portfolio investments by individuals; while earnings abroad are subject to withholding taxes, these tax payments are again credited against any income taxes owed to the home government. Section IV then examines the implications of these results for the process of tax coordination.

## 1. Equilibrium without coordination

I begin by examining briefly the equilibrium pattern of capital income taxation that would arise without the double-taxation convention if each country maximizes a standard social welfare function, taking as given the policies chosen by other countries. This is the setting of many of the past papers on capital income taxation.

### *Source-based taxes*

As already noted, Diamond-Mirrlees(1971) showed that a small open economy should not tax capital income at source. If capital is mobile internationally without cost, then any attempt to do so simply lowers the return to immobile factors — if the return to capital were lowered, investors would transfer their funds elsewhere and continue to earn the going rate of return. But taxing capital income at source, unlike taxing the immobile factors directly, distorts the decision to invest at home or abroad, and may distort the composition of goods produced.<sup>2</sup> As a result, taxing the immobile factors directly dominates, so no source-based capital income tax should exist in small open economies, regardless of the policies chosen in other countries.<sup>3</sup>

To what degree does this result change if the assumptions are relaxed? Diamond-Mirrlees(1971) assumed, for example, that all goods entering individual utility functions, except for the numeraire good, were subject to tax. Yet Gordon(1986) shows the same result assuming only that the immobile factors are subject to tax. What about pure profits? In a closed economy setting, a pure-profits tax is nondistorting, so all pure profits would be taxed away before any distorting taxes are used. But, if the profits are not tied to any one geographic location, then a profits tax would simply induce profitable firms to move elsewhere. Only profits tied to a particular location, e.g. profits from the exploitation of natural resources, can be taxed.

If firms benefit from the existence of public services, would they be taxed under an optimal tax system? If the services are pure public goods, then the benefits from providing them to the firm accrue, as before, to immobile factors located in the country, not to the firm's capital-owners. As before, it would be better to tax these immobile factors directly rather than distort capital-allocation decisions. Only if a firm's use of the services

imposes marginal costs should it be charged for these costs, in order to preserve productive efficiency, but in proportion to the costs imposed rather than in proportion to capital income.

If the country is large relative to the world capital market, then some intervention would be called for. As shown in Gordon–Varian(1989), the specific policy response would depend critically on where it has market power. For example, if the amount of capital it imports (exports) affects the interest rate it pays on this capital, then it has the incentive to reduce net imports (exports) of capital in order to move the interest rate in a favorable direction. This implies that the *sign* of any tax on capital investment should depend on the direction of net capital flows. It is therefore difficult to rationalize existing tax structures based on each country's desire to make use of this type of market power.<sup>4</sup>

#### *Residence-based taxes*

While Diamond–Mirrlees(1971) argued that source-based capital income taxes should not be used, they did assume that income generated by all factor supplies was subject to tax, including in this case capital income. In general, capital income could come from assets invested anywhere in the world.<sup>5</sup>

Such a tax would be very difficult to enforce, however. In order to effectively tax any source of income, a government must be able to monitor directly each individual's income from this source. If its only information comes from the individual's tax return, then the individual faces little risk in failing to report such income sources. In principle, any domestic source of income can be monitored, if the government grants itself the enforcement power. The U.S., for example, requires all firms and financial intermediaries to report to U.S. tax authorities the earnings they pay out to each U.S. resident.<sup>6</sup> A country cannot require foreign firms and foreign financial intermediaries to make such reports, however. Even if it could detect when capital reenters the country, and tax it then, such a tax could be avoided simply by leaving funds abroad.

Yet if taxes can be evaded without risk on funds invested through foreign firms and foreign financial intermediaries, then all capital income taxes can be so avoided. Investors simply invest entirely through foreign entities, resulting in a "cross-hauling" of financial

investments. An individual can still invest in domestic real assets as long as he does so through a foreign financial intermediary in order to avoid detection by domestic tax authorities. If interest payments are deductible for tax purposes, then investors can do yet better by borrowing at home, deducting the resulting interest payments from their taxable income, and investing all the funds abroad. If everyone behaves in this way, then no revenue can be collected from an attempt to tax capital income, and revenue may even be lost due to interest deductions.<sup>7</sup> Razin–Sadka(1989) then argued that the optimal tax on capital income is no tax at all.

At this point in time, perhaps only the largest savers are sophisticated enough to avoid taxes in this way. But then any tax on income from savings is paid only by smaller savers, making the tax much less equitable. In any case, individuals will quickly become more sophisticated, helped by foreign financial intermediaries seeking extra business. Therefore, even if a capital-income tax would currently collect revenue, and from wealthy enough people to appear equitable, this cannot last for long. The tax base should continue to erode, creating pressure to eliminate the tax entirely.

#### *Role of capital controls*

One response countries have chosen, given these pressures, is to impose capital controls which prevent domestic residents from evading domestic capital income taxes by investing abroad. Under certain assumptions, the outcome will be the same as would occur without tax evasion.

Consider, for example, a simple economy with one representative individual who lives for two periods. In the first period, he starts with assets  $A$ , which he either consumes then or saves. Denote first-period consumption by  $C_1$  and savings by  $S$ , where  $S = A - C_1$ . During the second period, he works, supplying an amount of labor  $L$ , and consumes an amount  $C$  equal to his labor income plus the return from his savings, net of any taxes. Denote the net-of-tax wage rate he receives by  $w^*$  and the net-of-tax interest rate by  $r^*$ , so that  $C = w^*L + r^*S$ .

Domestic production in the second period equals  $f(K, L)$ , where  $K$  is supplied either through domestic savings or through international borrowing at the interest rate  $r$ . This

output, the stock of savings,  $S$ , plus net receipts from foreign investments (minus net payments to foreign creditors), are used for domestic consumption plus government services,  $G$ . The economy's resource constraint in the second period is therefore

$$S + f(K, L) + r(S - K) = C + G, \quad (1)$$

where  $L$ ,  $S$ , and  $C$  are each functions solely of  $A$ ,  $r^*$ , and  $w^*$ . The resulting utility of the representative individual is  $W = U(r^*, w^*, A) + V(G)$ . The objective of the government is assumed to be to maximize  $W$  subject to the resource constraint (1).

If individuals can evade capital income taxes by investing abroad and the government does not use capital controls, then  $r^*$  cannot be below  $r$ . Since the government cannot collect revenue from a residence-based capital income tax, by the previous arguments it will rely entirely on labor income taxes to finance  $G$ , choosing  $w^*$  to maximize  $W$  subject to equation (1). Through use of capital controls, however, it should be able to do better.

Consider first the case of a capital-importing country. If the government prevents domestic residents from investing abroad, then it can tax their income from savings without constraint. Given capital imports, it can independently choose  $K$  through its choice of a corporate tax rate. Then it would choose  $w^*$ ,  $r^*$ , and  $K$  to maximize  $W$  subject to equation (1). Differentiating with respect to  $K$  immediately shows that  $f' = r$ , implying an efficient allocation of capital internationally, so no use of corporate taxes. Since the government's choice problem is formally identical to what it would face without tax evasion, the optimal values of  $w^*$  and  $r^*$  are identical to the values chosen if the government could in fact measure any foreign earnings.

What if the country is a net capital-exporter? Assume that capital controls can be designed so that only  $p$  percent of each resident's savings can be invested abroad, but that income earned on these foreign investments continues to evade tax. In this case,  $r^*$  equals a weighted average of the rate of return  $r$  earned on savings abroad, and the net-of-tax return on domestic savings, with weights  $p$  and  $(1 - p)$ . The government can choose  $r^*$  freely given  $p$ , at least over a certain range, through changing the tax rate on domestic capital income. As before, it would design its policies so as to maximize  $W$  subject to resource constraint (1), where  $K = (1 - p)S$ . Differentiating with respect to  $p$ , again

shows that  $f' = r$ . The choice problem for  $r^*$  and  $w^*$  is the same as before, implying that the chosen values would again equal those chosen without tax evasion.

This conclusions would quickly be weakened when any number of complications are added to the story. Uncertainty, for example, would create a desire for international diversification which would be prevented by capital controls. If governments can monitor the income from foreign investments made by domestic corporations, however, even though individuals can evade taxes on their foreign portfolio holdings, then an alternative set of controls is available which does not prevent international diversification. In particular, the government can forbid individuals from investing abroad directly, but allow domestic corporations to do so without restriction. Given that the resulting foreign income can be monitored for tax purposes, the optimal tax structure would simply be a tax on the world-wide capital income earned on each domestic resident's shares in domestic corporations, and no tax on foreign shares in domestic corporations. This results in a residence-based capital income tax and no source-based tax, as the theory shows to be optimal. No coordination of tax policy among countries is needed to achieve this outcome. The residence-based tax can consist of any combination of personal income taxes and corporate taxes, where in each case the tax base would be the domestically owned world-wide capital income of the individual or firm.<sup>8</sup>

This policy not only allows international diversification of the portfolio holdings of domestic residents through foreign investments by domestic corporations, but also permits the market rather than the government to determine the allocation of domestic savings between investments at home vs. abroad. Allowing corporate capital flows also enables firms to take advantage of potential synergy gains from mergers with foreign corporations, facilitating the transfer of technology and other information across countries.

But even this form of capital controls is unlikely to remain an attractive mechanism to preserve capital income taxes. Any government's control over capital flows is limited — borders are porous, and increasingly so. If individuals expend resources to evade controls, this use of resources is an additional cost of controls. In spite of the fact that several of the countries in the European Community have used capital controls in the past, the Community has agreed to eliminate them as part of its economic integration plans. Presumably, the same pressures elsewhere will undermine reliance on capital controls.

Capital controls, even where they have been used, cannot explain the pattern of capital income taxes that exist, since, the tax structure implied by the above discussion differs substantially from existing tax structures. In theory, domestic operations of foreign-owned corporations would not be taxed, but foreign operations of domestically-owned corporations would be taxed on an accrual basis. However, existing corporate taxes apply equally to all domestic operations, regardless of ownership. Many countries also tax the foreign earnings of domestic corporations, but normally allow firms a credit for foreign corporate taxes already paid on this income (up to the amount of domestic taxes due). In the next section, I derive the equilibrium tax structure that should result given these crediting provisions. Under the above assumptions, this tax structure will be less attractive than the one just described. However, I also find that when individuals can in fact invest abroad directly, and thereby can evade domestic taxes, then the outcome with these crediting provisions may indeed look more attractive.

## 2. Equilibrium corporate income taxes under existing double taxation convention

In examining the equilibrium choices of capital income taxes under existing conventions, I make several simplifying assumptions. First, I assume that the home country taxes the foreign earnings of domestic corporations at accrual rather than at repatriation.<sup>9</sup> Second, I assume that governments cannot levy personal income taxes on the net-of-corporate-tax equity income that individuals receive, though they can grant rebates as is done with dividend credit schemes.<sup>10</sup> This forces countries to raise their corporate tax rate in order to tax capital income more heavily. Finally, for simplicity I assume that there are many identical capital-importing countries, and many identical capital-exporting countries.

Let us examine first the Nash equilibrium in corporate tax rates.<sup>11</sup> Let  $t_x$  represent the tax rate chosen by capital exporters, and let  $t_m$  be the rate chosen by capital importers. In equilibrium, each country must find its choice optimal taking as given the rate chosen by other countries.

I examine first the situation of the capital-importing countries. Since each country is small relative to the world capital market, it takes as given the required rate of return on capital imports. Given the double-taxation convention, owners of this capital pay a tax

rate equal to  $\max(t_x, t_m)$ . What they receive net of tax must at least equal  $r$ , the assumed going rate of return. If  $f_K$  represents the domestic marginal product of capital in these countries, then capital is imported until

$$f_K[1 - \max(t_x, t_m)] = r. \quad (2)$$

Denote the amount of capital imports by  $I$ , where  $K = S + I$ . What the country must pay for capital imports then equals  $[f_K(1 - t_m)]I$ , which by equation (2) equals  $\{\max[r, r(1 - t_m)/(1 - t_x)]\}I$ .

The choice problem of the government is then to maximize  $U(r^*, w^*) + V(G)$  subject to the resource constraint

$$S + f(K, L) = C + G + \{\max[r, r(1 - t_m)/(1 - t_x)]\}I. \quad (3)$$

Since personal income taxes on equity must be nonpositive, there is the further constraint that  $r^* \geq f_K(1 - t_m)$ . In order to understand the nature of the solution, consider first a marginal change in  $t_m$  when  $t_m < t_x$ . By equation (2), a marginal increase in  $t_m$  does not change  $K$ . For a given  $r^*$ , this increase therefore is a clear gain, since it raises more revenue from the fixed capital imports. Since  $r^*$  need not be changed, taking into account any effects on  $r^*$  only strengthens this conclusion. Therefore,  $t_m \geq t_x$ . What if  $t_m$  were increased above  $t_x$ ? Now equation (2) implies that  $f_K(1 - t_m)$  is fixed. The feasible values of  $r^*$  therefore do not change, but  $I$  falls. A fall in  $I$ , however, causes a drop in welfare since  $f_K > r$ . Therefore, at the optimum  $t_m = t_x$ .

Let us now examine the tax rates chosen by the capital-exporting countries. These countries take  $t_m$  as given. Assume in analyzing this case that no corporate tax rebates are granted under the personal income tax — raising the corporate tax but then rebating the increase accomplishes nothing since only domestically owned corporations are subject to the corporate tax. If the domestic production function is  $g(K, L)$ , capital is then exported until

$$g_K(1 - t_x) = f_K[1 - \max(t_x, t_m)], \quad (2a)$$

where a small capital-exporting country takes  $f_K$  as given. If capital exports equal  $E$ , so that  $S = K + E$ , then total receipts from these capital exports equal  $f_K(1 - t_m)E$ . The

government therefore chooses its policies so as to maximize  $U(r^*, w^*) + V(G)$  subject to

$$g(K, L) + f_K(1 - t_m)E = C + G, \quad (3a)$$

where  $r^* = g_K(1 - t_x)$ .

If  $t_x < t_m$ , what is the effect on welfare of a marginal increase in  $t_x$ ? Equation (2a) shows that the value of  $r^*$  does not change, but that domestic investment falls. Equation (3a) then implies, given  $r^*$ , that a fall in  $K$  causes welfare to fall since  $g_K > f_K(1 - t_m)$ . Therefore, welfare falls as  $t_x$  rises as long as  $t_x < t_m$ .

If  $t_x \geq t_m$ , what is the effect on welfare of a marginal increase? Equation (2a) now implies that domestic investment does not change, but that  $r^*$  falls. This increased tax rate on income from savings, both foreign and domestic, may well cause welfare to increase, at least initially. Eventually as  $t_x$  increases, welfare should reach a local maximum.

The effects of changes in  $t_x$  on welfare is portrayed graphically in Figure 1. The figure implies that the optimal value of  $t_x$  will be either zero or  $t^*$ ; it can never be  $t_m$ . But this implies that there is no Nash equilibrium set of tax rates in pure strategies, since capital importing countries always set  $t_m = t_x$ .

Historically, changes in corporate tax rates have occurred roughly simultaneously among the major industrialized countries, most recently around 1986. Given this pattern, it seems of interest to examine a Stackelberg equilibrium as well. The U.S. may plausibly have played such a role in the world market, or Germany such a role within the E.C. In theory, the Stackelberg leader could be either a capital exporter or a capital importer. I explore both cases.

Consider first a large exporter acting as the leader. For simplicity, assume that this country is the only capital exporter.<sup>12</sup> When the leader increases  $t_x$ , it realizes that the capital importing countries will raise their own tax rates accordingly, maintaining the equality  $t_m = t_x$ . From the investor's perspective, it is as if the country were using a residence-based tax. The government, however, cedes the tax revenue on capital exports to the other governments. Losing this tax revenue reduces the gain from raising capital-income tax rates, so the optimal rate should be below that chosen under a true residence-based tax. But the tax could still be used.

How does the story change if the leader is a large capital importer? In response to any choice of  $t_m$ , what do the capital exporting countries do? As noted above, their optimal tax rate is either zero or the  $t^*$  seen in Figure 1. Changing  $t_m$  therefore causes a change in policy elsewhere only if  $t^*$  were the optimal rate and  $t^*$  changes, or if these countries switch between one locally optimal policy and the other.

It is easy to show that raising  $t_m$  raises  $t^*$ . From the perspective of the government in an exporting country, the cost of raising  $t_x$  is in large part the revenue loss that occurs due to the resulting fall in domestic savings. Since extra savings all go abroad, this revenue loss is  $(t_x - t_m)f_K(\partial S/\partial t_x)$ . If  $t_m$  were higher, this term becomes less important, and the locally optimal  $t_x$  would be higher.

How would a rise in  $t_m$  affect which locally optimal policy is chosen? Raising  $t_m$  lowers the utility of the capital exporting country due to the drop in the rate of return,  $f_K(1 - t_m)$ , earned on capital exports. The size of the drop in utility depends on the size of capital exports. When  $t_x$  is zero,  $g_K = f_K(1 - t_m)$ , whereas  $g_K = f_K$  when  $t_x = t^*$ , suggesting that capital exports are larger at  $t^*$ . However, total domestic savings should be smaller when  $t_x$  is higher. Assuming the latter effect is less important, utility at  $t^*$  drops more when  $t_m$  is raised, implying that eventually the capital exporting country would shift to  $t_x = 0$  as  $t_m$  is raised.

Given these responses, what value of  $t_m$  would the capital importing country choose? It would certainly choose a rate so that the exporting countries set  $t_x$  equal to  $t^*$ , rather than to zero. When  $t_m$  is increased, more revenue is obtained from existing imports, but the amount of imported capital falls due to the fall in world-wide savings. Either this drop is in itself large enough to put an upper bound on  $t_m$ , or else  $t_m$  is raised just to the point where a further increase causes capital-exporting countries to drop  $t_x$  from  $t^*$  to zero.

What can be said about the welfare generated in capital-exporting and capital-importing countries in these equilibria? When the capital-exporter is the leader, all countries are better off than they would be with no taxes on capital income. However, capital importers would gain from a yet higher rate, since they get to keep the extra tax revenue on their capital imports, implying that there would be gains from further tax coordination.

When the capital-importing country is the leader, the outcome is less clear. Certainly,

the capital-importer is better off than with no capital income taxes, but the capital exporter is likely to be worse off. Note, for example, that utility at  $t_x = 0$  is lower when taxes are imposed by the capital-importing country. Yet if the capital importing country raises its tax rate until  $t_x$  is about to drop to zero, then the capital exporters receive the same utility in equilibrium as they would if  $t_x = 0$ , implying that the capital-exporting countries are worse off.

Do these equilibria have any advantages over the previous equilibrium, in which only corporations, not individuals, could invest abroad and governments taxed only the income earned by their own residents? Capital-exporting countries are worse off, since they give up the tax revenue on their capital exports. Even if capital-importing countries are better off, direct transfers from the capital-exporting countries would provide a Pareto superior approach to aid these countries.

The key advantage of this equilibrium over the previous one is that it need not be undermined by individuals being able to invest abroad without detection. In the previous case, if individuals could invest abroad, they would invest all their funds abroad in order to avoid taxes imposed on the world-wide income of domestic corporations. A small host country for these investments would not choose to tax them, implying that all capital-income taxes would disappear if portfolio flows could not be prevented.

The Stackelberg equilibrium in which the capital exporter is the leader is not directly vulnerable to individual portfolio flows, even if these flows cannot be detected. From the perspective of the capital exporter, all capital exports generate  $f_K(1 - t_m)$  in revenue, none of which is paid in domestic taxes, regardless of whether corporations or individuals undertake the investment. Individual investors earn the same net return both at home and abroad. In a capital-importing country, residents earn at least as high a net return at home as abroad, doing equally well only when  $r^* = f_K(1 - t_m)$ . In the latter case, the government earns the same tax revenue regardless of where residents invest, since it taxes all domestic capital and the domestic capital stock is set based on the equilibrium condition  $f_K = g_K$ , where a small economy takes  $g_K$  as given.

The key complication, however, is that with unrestricted individual portfolio flows, the incentives of the government in a capital-importing country change. With respect to

capital imports generated by portfolio flows, the tax  $t_m$  is simply a source-based tax, so has an optimal value of zero. Capital-income taxes can still survive, however, if the capital-exporting country gives its residents a suitably large dividend credit for dividends received from domestic corporations, which discourages portfolio investments abroad. If a capital-importing country now eliminates its capital income tax, in order to attract the optimal amount of portfolio investment, it pays  $g_K(1 - t_m + d)$  per unit of imported capital, where  $d$  is the dividend credit received by investors in the capital-exporting country, and imports capital until  $f_K = g_K(1 - t_m + d)$ . If instead it maintains its capital income tax, it pays  $g_K(1 - t_x)$  per unit of imported capital, and imports capital until  $f_K = g_K$ . When  $t_m = 0$ , it pays more per unit of imported capital, but gets to import more capital. If  $d$  equals zero, the country clearly does better by setting  $t_m = 0$ . When  $d$  is high enough, however, it will prefer to set  $t_m = t_x$ . The use of dividend credits results in an even larger transfer of revenue to the capital-importing country, relative to the case of a residence-based tax system, implying yet lower net tax rates on capital income in equilibrium.

Capital income taxes may still survive in the Stackelberg equilibrium, even with individual portfolio flows, and produce a higher utility for all countries than occurs without capital-income taxes. The equilibrium results in a variety of pressures, however. For example, the capital-exporting country finds the marginal product of capital invested at home to be higher than that earned on capital exports, net of foreign taxes. One possible response, noted by Findlay(1986), would be to introduce subsidies for domestic but not foreign investment.<sup>13</sup> Similarly, in a capital-importing country, the cost per unit of imported capital is less than the marginal product of this capital. As a result it has the incentive to subsidize further capital imports, as long as these subsidies are not credited against the foreign corporation's domestic taxes.

This equilibrium can also be improved on through further tax coordination. For example, if the capital-importing countries transferred back to the capital-exporting countries the revenue that they collect on imported capital, as proposed in Giovannini-Hines(1990), then the outcome is exactly equivalent to that which occurs with residence-based taxes. A move in this direction would be a Pareto improvement if the capital-importing countries were allowed to keep their current revenue from the taxation of capital imports but must



transfer back to the capital-exporting country any changes in this revenue resulting from the agreement. The capital-exporting country is then simply making a lump-sum transfer to the capital-importing countries, which does not change the conditions determining its optimal tax rates.

### 3. Equilibrium withholding tax rates under existing double-taxation conventions

The above Stackelberg equilibrium is not the only approach that might be taken to facilitate capital income taxation. Capital-exporting countries might set up double-taxation conventions to deal with the taxation of foreign portfolio income earned by domestic residents. Such conventions, specifying crediting schemes for foreign taxes paid on income from financial assets held abroad, do in fact exist. Typically, each government taxes its residents on their world-wide portfolio income, but grants a credit towards domestic tax liabilities for any foreign taxes (referred to below simply as withholding taxes) already paid on this income. The credit cannot exceed the domestic taxes that would be due on this foreign income, however. This section examines the equilibrium that results, given this convention.

In this setting, each country is trying to tax the capital income of its own residents, and to tax any income from domestic financial securities accruing to foreigners. (No corporate taxes are used.) Let  $s_x$  ( $s_m$ ) denote the tax rates imposed on the world-wide capital income of domestic residents in capital-exporting (capital-importing) countries, and let  $n_x$  ( $n_m$ ) denote the withholding tax rate imposed on earnings of imported capital.

The analysis of this problem differs from that in the previous section because the home government remains unable to monitor the foreign capital income of domestic residents, even though it can monitor the income of domestic corporations. Individuals will therefore report their foreign earnings to their home government only if they gain by doing so. Yet existing conventions do not allow any rebate from the home government in response to large foreign tax payments, only a forgiveness of any additional domestic taxes. Therefore, domestic investors never have an incentive to report foreign earnings, implying that any foreign tax collected on their earnings is simply a source-based tax. As seen earlier, a small open economy would not use a source-based tax.

In order for the treaty to change behavior, domestic investors must have some incentive to report their foreign earnings. Assume, therefore, that in order to evade domestic taxes on foreign earnings, individuals must spend resources of  $c$  per unit of capital exports; there is no such cost without evasion.<sup>14</sup> If the foreign financial security has a pretax rate of return of  $r$ , then investors in a capital-importing country receive a net return of  $r(1 - n_m) - c$  if they evade taxes, and  $r[1 - \max(n_m, s_x)]$  if they do not.

As before, there is no Nash equilibrium in pure strategies. The key elements of the argument closely parallel those used in the previous section, and are not repeated. Let us turn instead to examine the outcome when a capital exporter acts as the Stackelberg leader.

To do this, it is necessary to examine first how capital-importing countries respond to any set of policies chosen by the capital-exporting country. Given  $n_x$  and  $s_x$ , what policies would a capital-importing country choose? Given its policies, foreign investors must be able to earn the going rate of return,  $r$ , net of tax. If they report their earnings, they receive a rate of return  $f_K[1 - \max(s_x, n_m)]$ , whereas if they evade domestic taxes, they instead receive  $f_K(1 - n_m) - c$ . They choose whichever is more attractive, so that

$$\max\{f_K[1 - \max(s_x, n_m)], f_K(1 - n_m) - c\} = r. \quad (4)$$

Similarly, when residents of the country save, they can either invest at home, earning  $f_K(1 - s_m)$ , or they can invest abroad,<sup>15</sup> where their return would be  $\max\{g_K[1 - \max(s_m, n_x)], g_K(1 - n_x) - c\}$ . They do whichever pays more, so that

$$r^* = \max\{f_K(1 - s_m), \max\{g_K[1 - \max(s_m, n_x)], g_K(1 - n_x) - c\}\}. \quad (5)$$

The government then chooses the two tax rates so as to maximize  $U(r^*, w^*)$  subject to the resource constraint

$$S + f(K, L) = f_K(1 - n_m)I + C + G, \quad (6)$$

where  $K = S + I$ .<sup>16</sup>

Consider first its choice of  $n_m$ . If  $n_m < s_x - c/f_K$ , then foreign investors evade their domestic taxes, so that  $f_K = (r + c)/(1 - n_m)$ , implying a cost per unit of imported

capital of  $r + c$ . Holding  $r^*$  constant, increasing  $n_m$  leaves unchanged the cost per unit of imported capital, but causes a fall in  $I$ , which is a welfare loss. Welfare therefore falls as  $n_m$  increases in this range.

If  $s_x - c/f_K < n_m < s_x$ , then foreign investors no longer evade domestic taxes. Therefore,  $f_K = r/(1 - s_x)$ , and the cost per unit of imported capital is  $r(1 - n_m)/(1 - s_x)$ . Increasing  $n_m$  in this range does not change the amount of capital imported, but reduces the cost of this imported capital, a welfare gain.

Finally, if  $n_m > s_x$ , then  $f_K = r/(1 - n_m)$  and the cost per unit of imported capital is simply  $r$ . Increasing  $n_m$  further is a net welfare loss, since imports decline and  $f_K > r$ .

These results are portrayed graphically in Figure 2. As seen in the Figure, the only possible values of  $n_m$  are 0 and  $s_x$ . Shifting from  $n_m = 0$  to  $n_m = s_x$  causes the cost per unit of imported capital to decline but the amount of imported capital also declines. The welfare comparison is shown graphically in Figure 3. Here, the net profits generated from imported capital when  $n_m = 0$  are measured by the area ABC; when  $n_m = s_x$  the net profits are ADEF. The higher is  $c$  relative to  $s_x$ , the less attractive is setting  $n_m = 0$ .

What about the choice of  $s_m$ ? If the optimal  $n_m = 0$ , then domestic investors can always invest in other capital-importing countries free of tax. Therefore,  $s_m$  is simply a source-based tax, so should not be used.

What is the optimal value of  $s_m$  if  $n_m = s_x$ ? As long as  $s_m < n_x + c/g_K$ , domestic residents do not evade taxes. There may well be an interior optimum for  $s_m$  within this range. Within this range use of  $s_m$  is more attractive than it would be under a residence-based tax system. Normally, the main cost of raising  $s_m$  is the revenue loss from the resulting fall in savings. Yet when imported capital substitutes for domestic savings, this revenue loss is only  $(s_m - n_m)f_K(\partial S/\partial s_m)$  — it is reduced (and may even be negative) because the government collects tax at rate  $n_m$  on the imported capital that replaces foregone savings.

If  $s_m = n_x + c/g_K$ , then any further increase in  $s_m$  causes domestic residents to shift to evading domestic taxes. The country taxes domestic capital income at rate  $s_m = n_x + c/g_K$  when domestic residents own it, but at rate  $n_m = s_x$  when foreign residents own it. When  $s_x > n_x + c/g_K$ , capital flight will be encouraged, and conversely.

Given these results, how should the capital exporting country behave? To begin with, it should not set  $s_x$  so high that capital-importing countries act as tax havens, setting  $n_m = 0$  and  $s_m = 0$ . Better to set  $s_x = n_x = 0$  — capital-importing countries still set  $n_m = s_m = 0$ , but the fixed costs  $c$  required by tax evasion are avoided.

Assume, therefore, that  $s_x$  is small enough to prevent capital flight by domestic residents. Given this, consider the country's choice of  $n_x$ . If  $n_x < s_x - c/g_K$ , then the  $s_m$  would normally be set to encourage capital flight by foreign residents.<sup>17</sup> But being a tax haven is unattractive under these circumstances. The tax rate on inflows of capital is  $n_x$ . This inflow of capital will be offset by an equal amount of domestic savings moving abroad so as to maintain the equilibrium condition (4). This domestic savings had been taxed at rate  $s_x$ , and pays nothing in taxes when invested abroad. This cross-hauling therefore results in a net revenue loss, implying that  $n_x \geq s_x - c/g_K$ .

If  $n_x > s_x - c/g_K$ , however, then there is an incentive to reduce it. Doing so either leaves  $s_m$  unchanged or causes it to fall. But a fall in  $s_m$  should cause foreign savings to rise, leading to less capital exports. Since the net rate of return on capital exports is only  $g_K(1 - s_x)$ , compared with a net return of  $g_K$  at home, a drop in capital exports is a welfare gain. Therefore,  $n_x$  will be set equal to  $s_x - c/g_K$ . One implication is that  $s_m \leq s_x$ .

What about the choice of  $s_x$ ? The optimal value of  $s_x$  will be below the optimal value of a true residence-based tax, if it were feasible, due to three separate effects. First, under the double-taxation convention the capital-importing countries get to keep the tax revenue collected on capital exports, whereas this revenue would be retained by the capital-exporting country under a residence-based tax. Without this revenue, a tax increase is less attractive. Second, when  $s_x$  increases, so do  $n_x$  and  $n_m$ . These increases result in a rise in  $s_m$ , and a fall in foreign savings. Capital exports increase to offset this drop in savings, leading as before to a fall in welfare. Finally,  $s_x$  must remain small enough to prevent capital-importing countries from setting  $n_m = 0$  and becoming tax havens.

The equilibrium under the treaty therefore has the following characteristics. First,  $s_x$  is below the value that would be chosen under a residence-based tax. The equivalent tax rate in the capital importing countries can be no higher:  $s_m \leq s_x$ . Finally,  $n_m = s_x$ , while  $n_x = s_x - c/g_K$ .

There would be a variety of potential gains from further coordination of taxes. As before, if each country returns any revenue it obtains from taxing capital imports to the government of the country where the capital originates, then the outcome is residence-based taxation. More limited types of tax coordination would also be possible. For example, countries could set the withholding tax rates by treaty, then allow decentralized choice of  $s_m$  and  $s_x$ .

The tax parameters in any such Stackelberg equilibrium depend critically on the value of the parameter  $c$ , which measures the cost of evading domestic taxes on foreign-source income. A fall in  $c$  forces a fall in all tax rates — when  $c$  equals zero, so do all capital-income tax rates. Yet the value of  $c$  itself results from decisions made by governments in both capital-exporting and capital-importing countries. If one country, e.g. Switzerland, created a mechanism to lower  $c$  for investments channeled through this country, then all foreign investment any place in the world would be channeled through this country unless capital-income taxes were reduced by enough world-wide to compensate for this fall in  $c$ . A diversity of values of  $c$  across investors would lead to more complicated equilibria, in which governments potentially concede that investors with low values of  $c$  would evade taxes, while still attempting to tax those with higher values of  $c$ .

Capital-exporting countries would have the incentive to invest resources in enforcement in order to raise the value of  $c$ . Such expenditures result in an increase in tax rates, potentially benefiting all countries. As a result, there would be potential gains from the coordination of tax enforcement. The value of  $c$  could be increased, for example, by agreements to share information among national tax authorities. Such agreements may not be very effective, however, unless they are universal.

A group of countries seeking to coordinate tax enforcement measures can prevent a tax haven from undermining this agreement through a variety of mechanisms. For example, this group of countries can specify a withholding tax at a rate at least equal to  $s_x$  on any payments made to the tax haven. Such a tax does not discourage capital from being invested in the tax haven, but does prevent the evasion of taxes on real investments made within the group of countries. Such a withholding tax does require coordination, since each country in isolation has no incentive to impose it. Alternatively, the group of countries can

agree to impose capital controls preventing capital flows to any tax haven. Certainly, at the margin this would be attractive, since the net return in equilibrium to real investments in the tax haven is below the marginal product of capital within the group of countries. The optimal controls would prevent capital flows unless the net return from investments in the tax haven were at least equal to the marginal product of capital at home.<sup>18</sup>

The types of tax coordination that occur through the double-taxation conventions dealing with corporate taxes and with withholding taxes, described in the last two sections, are really complementary. Coordination of corporate taxes alone is insufficient, given that corporate bonds would provide a tax haven. Similarly, coordination of taxation of dividends and interest income in itself is insufficient, given that corporate retentions would serve as a tax haven. I do not try to analyze explicitly the equilibrium in the combined case, however.

#### 4. Further coordination of capital income taxes

If countries could coordinate their tax policies fully, allowing lump-sum payments between countries to compensate for any lost transfers, what would be the outcome? Razin-Sadka(1989) show under the same types of assumptions used above that the outcome is simply residence-based taxes. These taxes generate externalities only to the degree to which a tax change results in a change in the market interest rate.<sup>19</sup> Yet a small open economy has no ability to affect the market interest rate.

Are there mechanisms other than those discussed above to achieve the same result as occurs with full coordination? Cooperative game theory suggests that a mutually beneficial set of policies might be supported through implicit threats which are exercised whenever a country violates an agreement. Alternatively, an explicit treaty might be signed specifying all tax rates. Yet, in both cases, the entire tax structure must be specified, either implicitly or explicitly. Given the enormous complexity of capital income tax law in any developed country, this hardly seems like a realistic option. In any case, most countries would be loathe to cede their sovereignty in determining the characteristics of their capital-income tax structure.

Coordination of tax policies is hampered by the fact that explicit negotiations inevitably take place among two or at best a few countries. Important discussions are currently going

on, for example, among the twelve members of the E.C. But in the previous analysis, the equilibrium policies would remain unchanged if twelve small countries unite (for purposes of policy-making) into one "country," assuming it still remains small relative to the world capital market. In theory, then, there should not be important gains from coordination within any small group.<sup>20</sup>

The survival of capital-income taxation to date, in spite of the substantial openness of most developed economies, may well be due to the types of double-taxation conventions used by many countries. However, as seen above, the equilibrium tax structure with these conventions can be rather delicate. There is an appealing Stackelberg equilibrium tax structure if there is a dominant capital exporter that acts as the Stackelberg leader. During much of the postwar period, the U.S. was the dominant capital exporter and may well have served as the Stackelberg leader with regard to capital-income-tax policy. World capital markets are now much more complex, however, with the U.S. now a capital importer and no one country a dominant capital exporter. Whether these double-taxation conventions will continue to be sufficient to allow capital-income taxation to survive in this more complex environment, or whether alternative mechanisms of coordination will be found, is an open question.

## FOOTNOTES

1. Such controls could be a rational response of an optimizing government to the difficulties faced in taxing capital income, as argued by Razin-Sadka(1990). See below for further discussion.

2. See, for example, Lovely(1989) or Sinn(1990).

3. Eliminating capital income taxes at source may make taxation of labor income much more difficult, however, since labor income taxes could be avoided simply by reclassifying the income flow as capital income. This would be particularly easy for self-employed entrepreneurs. Consumption taxes would not suffer from this problem, however, and in theory have the same incidence.

4. Gordon-Varian(1989) show, however, that when the risk generated by the capital in each country is unique, then countries have market power in the international equities market. Their optimal response could well involve imposing source-based capital income taxes.

5. As noted, for example, in Slemrod(1988), if countries differ in the relative tax rates they impose on income from different types of assets, then arbitrage possibilities arise which in general could lead to negative taxable income in all countries. Investors simply invest in assets which are taxed relatively favorably in their country and "go short" in assets which are taxed relatively unfavorably. This arbitrage pressure should force the equalization across countries of the relative tax treatment of different types of assets.

6. Many European governments, however, attempt to preserve the secrecy of individual bank accounts and individual stock-holdings. Unless foreign and domestic holders can be distinguished, even a tax on the aggregate income from these sources becomes simply a source-based tax, so should not be used.

7. Gordon-Slemrod(1988) in fact found that the U.S. lost revenue in 1983 from its attempt to tax income from savings and investment.

8. Due to the difficulty of taxing capital gains on corporate equity at accrual, corporate taxes are defended as a means of preventing the tax structure from favoring corporate over non-corporate investments.

9. In the latter case, Hartman(1985) showed that the outcome effectively involves source-based taxes; previous results immediately imply that source-based taxes will not be used. See Auerbach(1988), however, for a proposed scheme for imposing a tax at repatriation which duplicates the incentives of an accrual-based tax.

10. In many E.C. countries, bank secrecy laws prevent the government from independently monitoring the equity income of each individual. As a result, individuals would likely report such income only if doing so is advantageous. They will therefore report it to receive a rebate, but not to pay further taxes. Even in the U.S., personal taxes on equity income can in theory be avoided if profits are not paid out as dividends and shares are held until death, thereby avoiding capital-gains taxes.

11. For a related discussion, see Bond-Samuelson(1988). Many details differ in their paper, though they also find no Nash equilibrium.

12. Allowing for other exporters, who continue to behave according to the above rules, leads to heterogeneous policies among exporters, which induces heterogeneous policies among importers as well. The formal analysis of this case is more complicated, but the basic insights remain the same. The market power of the single exporter does not in itself have much effects on the story. In the Nash case, allowing the exporter to have market power only accentuated the problem. To make use of this power, the exporter would want to restrict exports. Inspection shows that, as a result, raising  $t_x$  becomes even less attractive when  $t_x < t_m$ , and more attractive when  $t_x > t_m$ .

13. In the U.S., for example, the investment tax credit and accelerated depreciation were available only for capital located in the U.S.

14. For example, buying foreign securities through domestic financial intermediaries is very easy, but can in principle be monitored by the domestic tax authorities. Using a foreign financial intermediary may assure evasion of domestic taxes, but is much less convenient.

15. For simplicity, I assume that they would invest in the capital exporting country. This assumption will be supported, given the later results.

16. If domestic residents invest abroad, then there is an additional term in equation 6.

17. The above results showed that there was a local gain from raising  $s_m$  above  $n_x + c/g_K$  in this case, but not necessarily that this was the global optimum.

18. Unlike investments at home, investments in the tax haven do not result in any tax revenue, so are less attractive everything else equal.

19. This discussion ignores the implications of labor mobility. If individuals whose capital income is taxed relatively heavily can simply move without cost to a country where tax rates are lower, then tax competition between countries would drive capital income tax rates to zero. Additional factors, such as mobility costs or costs of providing services to new residents, would then be needed to allow capital income taxes to survive in equilibrium.

20. There may still be potential gains from sharing information about individuals' capital income among these governments, if evasion had been easier within the group than outside the group. Also, coordinating the definitions of taxable income among the member countries eliminates the need for firms to keep multiple "books."

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Figure 1  
Choice of  $t_x$  in Capital-Exporting Countries

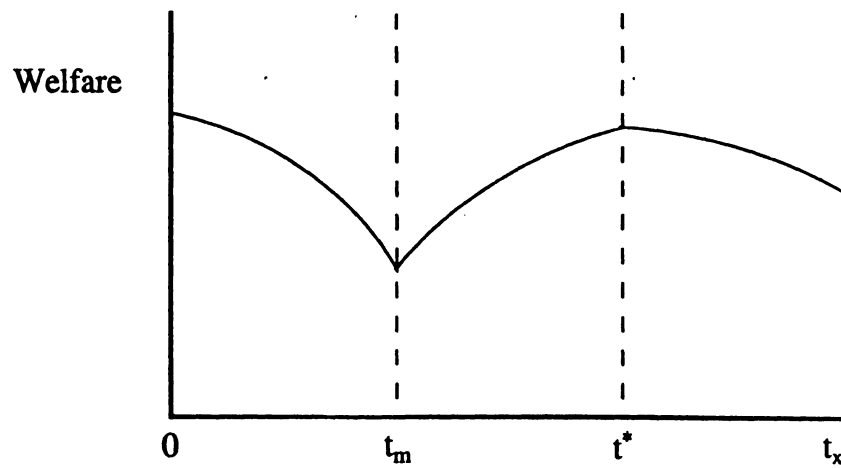


Figure 2  
Choice of  $n_m$  in Capital-Importing Countries

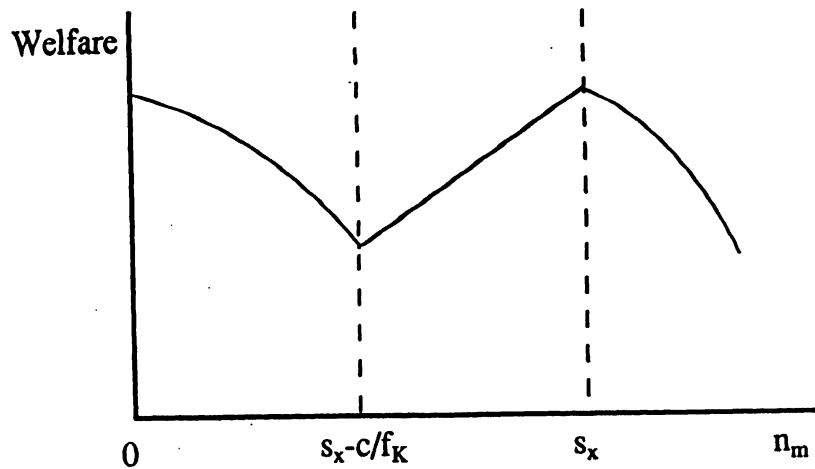
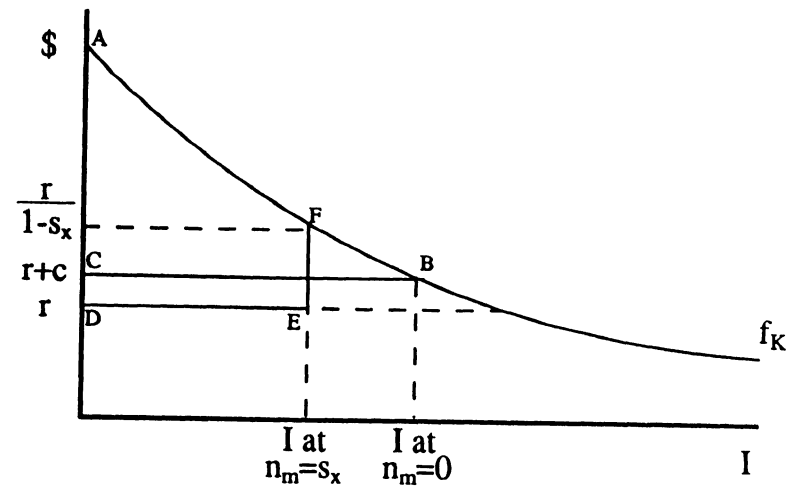


Figure 3  
Choice of  $n_m$  in Capital-Exporting Countries







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