



American Finance Association

Can Capital Income Taxes Survive in Open Economies?

Author(s): Roger H. Gordon

Source: *The Journal of Finance*, Vol. 47, No. 3, Papers and Proceedings of the Fifty-Second Annual Meeting of the American Finance Association, New Orleans, Louisiana January 3-5, 1992 (Jul., 1992), pp. 1159-1180

Published by: Blackwell Publishing for the American Finance Association

Stable URL: <http://www.jstor.org/stable/2328981>

Accessed: 25/11/2009 11:48

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/action/showPublisher?publisherCode=black>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



Blackwell Publishing and American Finance Association are collaborating with JSTOR to digitize, preserve and extend access to *The Journal of Finance*.

<http://www.jstor.org>

Can Capital Income Taxes Survive in Open Economies?

ROGER H. GORDON*

ABSTRACT

Optimal-tax theory forecasts that small open economies should not tax capital income. Yet, countries do tax capital income. Why the inconsistency? This paper shows that use of the double-taxation convention, whereby governments credit taxes paid abroad against domestic taxes, helps explain this inconsistency. In particular, capital income will be taxed if a dominant capital exporter acts as a Stackelberg leader when setting its tax policy. Due to the convention, other countries will then tax capital imports, making it attractive for the dominant capital exporter to tax capital income. Without a dominant capital exporter, however, the model still forecasts no capital-income taxes.

CAN TAXATION OF CAPITAL income survive the increasing integration of world capital markets? A number of recent papers suggest not. Diamond and 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. This is because production would occur efficiently under an optimal tax system, 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 income earned on 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 and 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.

Yet virtually all countries do in fact tax the capital income earned by corporations and individuals located within their borders. How can the theoretical forecast of no capital income taxation be reconciled with this simple observation? It is difficult to use existing models with any confidence to analyze the implications of changes in capital income tax rates if these same models forecast that countries should never tax capital income.

* University of Michigan, Ann Arbor. This paper was written while I was visiting the Ministry of Finance in Lisbon. The Ministry takes no responsibility for the contents of the paper. I would like to thank Vitor Gaspar, Michelle White, Hans-Werner Sinn, and participants at seminars at Columbia, C.O.R.E., Harvard, the University of Pennsylvania, and the University of Wisconsin, for comments on an earlier draft.

This paper begins by discussing briefly a number of simple explanations for the pervasive existence of capital income taxes. The above theory assumes, for example, that countries are small and open. If countries are not that small or that open, will the theory forecast use of capital income taxes? Yes, but not likely of the form or level seen in practice. For example, if countries are large relative to the world capital market, then they should take advantage of this market power by restricting their net lending or borrowing. Yet this implies opposite *signs* for the tax rates in capital-importing vs. capital-exporting countries. Similarly, the existence of pure profits could, in principle, justify pure-profits taxes, but only to the extent that profitable firms cannot easily move to another country. If countries artificially close their borders to capital flows, then capital-income taxes become feasible, but few countries have imposed capital controls and even their tax structures do not conform to the theoretical forecasts.

One common feature of the tax structure in many countries ignored in the standard optimal-tax analysis, however, is the double-taxation convention for foreign-source capital income, which prevents double taxation 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. In this paper, I show that no Nash equilibrium set of tax rates exists, given these conventions, but that there is an interesting Stackelberg equilibrium with positive capital income taxes when a large capital exporter acts as the Stackelberg leader. If the capital exporter adopts the double-taxation convention, capital-importing countries have an incentive to tax capital imports at the income tax rate used in the capital-exporting country. Since multinationals receive a full credit against their domestic taxes for taxes paid abroad on foreign-source income, these tax payments cost the firms nothing and do not discourage investment, yet still collect tax revenue. The capital-exporting country, by adopting this convention, can then set the capital-income tax rate world-wide when it sets its own tax rate. By inducing capital-importing countries to adopt a source-based capital-income tax at the same rate it uses, through use of the double-taxation convention, the capital-exporting country eliminates the incentive its residents would otherwise face to evade domestic taxes by investing entirely abroad. Without the double-taxation convention, this threat of evasion undermines any substantial taxation of capital income. If a capital-importer attempts to act as the Stackelberg leader, however, capital-exporting countries would not adopt the double-taxation convention, and capital income would not be taxed in equilibrium.

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. a capital importer and no one country a dominant capital exporter. The explanation proposed in this paper for the past survival of capital income taxes therefore would not explain the future survival of these taxes. Whether alternative mechanisms will be found to enable capital-income taxes to survive in the future is an open question.

The organization of this paper is as follows: In Section I, I show briefly the equilibrium tax structure that would arise without use of the double-taxation convention. Various possible explanations for the survival of capital income taxes, without the double-taxation convention, are discussed and dismissed. Sections II and III explore the equilibrium established with 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 countries grant them a 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.

I. Equilibrium without the Double-Taxation Convention

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.

A. Optimal Tax Argument for No Capital Taxes

As already noted, Diamond and Mirrlees (1971) showed that a small, open economy should not tax capital income at source. If capital is mobile internationally without cost, then the net-of-tax return to domestic investment cannot be lowered, since otherwise investors would transfer their funds elsewhere and continue to earn the going rate of return. Similarly, output prices cannot go up in response to the tax, due to competition from abroad. If firms are to continue to break even, in spite of the tax, the prices of immobile factors, presumably labor and land, must fall by enough to compensate for the tax payments. But if these other inputs end up paying the tax anyway; it is better to tax them directly—taxing capital income at source, unlike taxing these immobile factors directly, distorts the decision to invest at home vs. abroad, and may distort the composition of goods produced.¹ As long as direct taxation of immobile factors is feasible, direct taxation dominates a tax on capital income at source. This is true regardless of the policies chosen in other countries.²

¹ See, for example, Lovely (1989) or Sinn (1990).

² 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.

While Diamond and 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. Under their assumptions, this would imply the same tax rate on capital income, regardless of the location of the investment.

Such a tax would be very difficult to enforce, however. In order to enforce a tax on 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 by 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.³ 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 evaded. Investors simply invest entirely through foreign intermediaries, resulting in a "cross-hauling" of financial investments. An individual can still invest in domestic real assets through a foreign financial intermediary, thereby avoiding being identified by domestic tax authorities as the recipient of the income. 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.⁴ Razin and 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 should steadily 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.

³ 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.

⁴ Gordon and Slemrod (1988) in fact found that the U.S. lost revenue in 1983 from its attempt to tax income from savings and investment.

B. Results Under Alternative Assumptions

The above argument assumes that each economy is small and open. In addition the optimal tax framework implicitly makes a variety of other assumptions. Would the model forecast positive capital-income taxes if these assumptions were relaxed?

For example, what if firms have pure profits, contrary to the assumptions in Diamond and Mirrlees (1971)? 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, justifying a cash-flow tax though not the existing types of capital-income taxes. But in an open economy, if the profits are not tied to any one geographical location then a profits tax would simply induce profitable firms to move elsewhere, and should not be used. Only profits tied to a particular location, e.g., profits from the exploitation of natural resources, would be taxable, in which case the profits tax simply turns into a land tax.

The standard optimal-tax framework also ignores effects of government expenditures on firm productivity. 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, so as to preserve productive efficiency, but in proportion to the costs imposed rather than in proportion to capital income.

What if the country is large relative to the world capital market?⁵ If the amount of capital a country imports (exports) affects the interest rate it pays (receives) on this capital, then it has an 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. Therefore, if this were the explanation for nonzero capital-income taxes, the sign of these taxes should differ between capital-importing and capital-exporting countries. This means that the U.S. should have changed the signs of its tax rates between the 1960s and the 1980s, and should now have taxes of opposite signs from those used in Japan. It is therefore difficult to rationalize existing tax structures using this approach. Gordon and Varian (1989) note that countries may have market power in the international equities market, due to the unique risk characteristics of capital income in each country. The optimal response would be to restrict sales of domestic equity to foreigners. One way to do this would be to impose a corporate income tax, and then offer a compensating subsidy to domestic individuals' purchases of domestic equity. The implied Nash

⁵ This case has been studied in a variety of other papers, including Hamada (1966), Feldstein and Hartman (1979), and Gordon and Varian (1989).

equilibrium corporate tax rates are much lower than observed tax rates, however, and we do not observe the compensating subsidies.

What if countries are not completely open? Feldstein and Horioka (1980) noted, for example, that net capital flows among countries are surprisingly small, suggesting limited capital mobility, while Adler and Dumas (1983) noted a puzzling lack of international portfolio diversification. Perhaps this lack of net and gross capital flows can be used to rationalize observed tax structures.⁶ If this is the explanation for positive capital-income taxes, however, then whatever factors limit gross and net capital flows—presumably asymmetric information—ought to be a key element in any model analyzing the positive and normative implications of capital-income taxes. Otherwise, the models imply that the optimal policy is no capital-income taxes. Analyzing tax policy would not only be much more difficult than it already is if asymmetric information must be added to any model, but asymmetric information would add many new considerations to optimal tax policy.⁷ The objective of this paper is not to dismiss this potentially fruitful line of research but to try to find an explanation for capital-income tax without introducing major new complications to models of capital-income taxes.

Even if we assume no real factors inhibiting capital flows among countries, governments may choose to introduce artificial barriers to capital flows.⁸ Assume, for example, that governments can monitor the income from foreign investments made by domestic corporations, through requiring audits by certified public accountants, even though they cannot monitor the income from foreign investments made by individual investors. Assume in addition that the government can identify the ultimate owners of all shares in domestic corporations.⁹ Then each government can achieve the same outcome that they could without any evasion by imposing capital controls which prevent domestic residents, but not domestic corporations, from investing abroad. Given these capital controls, a residence-based tax on capital income can be achieved through a tax on the world-wide capital income earned on

⁶ My own preliminary work suggests otherwise. For example, the reluctance of foreign investors to buy domestic capital likely arises in part from their fear that they may be overpaying for domestic capital, due to the fact that they have poorer information about this capital than do the domestic sellers. But when domestic owners sometimes succeed at overcharging for this capital, the country gains on average from extra foreign investment, justifying a subsidy to capital imports, contrary to observed tax policy. Similarly, even if most individuals invest at home, if a country's net supply of capital is large enough to justify some capital exports, then the country should take as given the *ex ante* return available on the world capital market, again suggesting no source-based taxes.

⁷ See, e.g., Greenwald and Stiglitz (1986).

⁸ Razin and Sadka (1990) also noted the theoretical appeal of capital controls as a device to enable governments to tax capital income.

⁹ Doing so may not be easy. Domestic firms, for example, can set up off-shore affiliates which invest at home. The government would need to trace through the ownership structure of these foreign affiliates to know that they are domestically owned.

each domestic resident's shares in domestic corporations, and no tax on income accruing to foreign owners of shares in domestic corporations. Administratively, this tax can consist of any combination of personal income taxes and corporate taxes.¹⁰ The tax base in this case would be domestically owned world-wide capital income. This results in a residence-based capital-income tax and no source-based tax, as the theory shows to be optimal.¹¹ No coordination of tax policy among countries is needed to achieve this outcome.

While Italy, France, and a few other countries have imposed capital controls in the past, their tax systems did not at all correspond to these forecasts. For example, France exempted the foreign earnings of domestic corporations, but taxed the domestic earnings of corporations regardless of who owned the shares. Italy and France have recently abandoned capital controls in the face of the agreement within the European Economic Community (EEC) to eliminate any policies preventing or discouraging individuals from changing their country of residence. In any case, most countries have not used capital controls, yet still maintain corporate and personal taxes on capital income. Apparently, these countries have found an acceptable alternative mechanism which is at least as attractive as capital controls, to support capital-income taxes in equilibrium.

The candidate for the alternative mechanism that I examine in this paper is the use of double-taxation conventions. Under these conventions, a country taxes domestic individuals and corporations on their world-wide income, but allows these taxpayers to claim as credits towards their domestic taxes certain taxes they have already paid abroad on any foreign-source income. Corporations are allowed to claim as credits any foreign corporate income taxes or withholding taxes, and individual investors can claim credits for any withholding taxes. In each case, these credits are used to reduce or even eliminate any domestic taxes on foreign-source income, but cannot be used to reduce taxes due on domestic-source income.

The prevalence of this double-taxation convention is difficult to explain in the above framework. Optimal-tax theory suggests that capital-income taxes in open economies should consist only of residence-based taxes. Yet under a residence-based tax, a country would tax domestic residents on their world-wide income, net of any foreign taxes, thereby allowing a deduction, but not a credit, for foreign taxes,¹² and would not tax the domestic earnings of foreign investors. The hypothesis being explored below is that these conventions have

¹⁰ 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 noncorporate investments.

¹¹ If individuals can evade the capital controls through expenditure of enough time or resources, then the optimal tax rates become more complicated.

¹² This deductibility, rather than crediting, of foreign tax payments has long been advocated. See, e.g., Richman (1963). Feldstein and Hartman (1979) also demonstrated the desirability of deductibility for a small capital exporter.

arisen to enable use of capital income taxes in equilibrium, whereas capital-income taxes would be used little if at all without this convention.¹³

In exploring the equilibrium under the double-taxation convention, I examine first the equilibrium use of corporate-income taxes in Section II, then examine personal taxes on capital income in Section III.

II. Equilibrium Corporate-Income Taxes Given Double-Taxation Conventions

In order to explain the use of capital-income taxes in equilibrium given use of double-taxation conventions, I must make several restrictive assumptions. First, assume that governments can monitor the foreign earnings of domestic corporations, even though they cannot monitor the foreign earnings of individual investors. Otherwise, only source-based taxes would be feasible, and prior results show that they would not be used.

Second, assume that each country adopts the double-taxation convention and taxes foreign-source income at accrual rather than at realization. I will not attempt to explain the taxation of income from foreign subsidiaries at realization rather than accrual, though I discuss below whether or not governments have an incentive to adopt the double-taxation convention.

Third, for simplicity, assume that all investment is equity financed. The tax system modeled here approximates the existing tax treatment of income from equity. Income earned on debt-financed investment, in contrast, is not subject to corporate income taxes. The model in Section III describes the equilibrium under a tax system approximating the existing tax treatment of income from debt.

Fourth, assume for now that individuals cannot or at least do not invest abroad directly, so that all foreign investments is done through corporations. Without this assumption, no taxes can ever be collected at home on foreign-source income. If foreign-source income of domestic corporations were subject to further taxes at home, then individuals rather than corporations would invest abroad to avoid these surtaxes. If no taxes on foreign-source income are ever collected at home, then only source-taxes are feasible, and these would not be used. Given the counterfactual nature of this assumption, I will return to it below.

Fifth, assume that no *positive* residence-based taxes can be imposed on domestic residents, either through the corporate tax or the personal income tax. Given the previous assumptions, if a residence-based tax were available

¹³ Hamada (1966) also tried to explain the prevalence of these conventions, by noting that the crediting arrangement would lead to an efficient world-wide allocation of capital, unlike use of deductions for foreign taxes. The crediting scheme could in principle be set up so that both countries shared in the efficiency gains. In his setup, however, the role of capital-income taxes was to take advantage of market power in the world capital market. Small open economies would not have such market power, eliminating the need for agreements restricting a country's exploitation of this market power. In any case, residence-based taxes also lead to an efficient allocation of capital.

it would be the only tax used on capital income. I return below to reexamine what happens when this assumption is relaxed. For now, the only positive taxes on capital income a country can use are taxes on the world-wide capital income earned by residents, subject to the double-taxation convention, or taxes on domestic-source capital income. I will assume, however, that a subsidy tied to an individual's income from equity, e.g., a dividend-credit scheme, is feasible and that an individual has the incentive to report income in order to obtain a subsidy.

Sixth, assume that taxes on the one immobile factor in the model, labor, are feasible. This assumption is essential to the optimal-tax argument which forecasts no source-based capital-income taxes. In a paper exploring some of the same issues, Bond and Samuelson (1988) did not allow for labor taxes. But if no alternative taxes are available, then capital income taxes would be used even by small open economies, eliminating the puzzle.¹⁴

Finally, assume initially that there are many identical capital-importing countries, and many identical capital-exporting countries. I will examine first the Nash equilibrium in corporate tax rates, so that each country chooses its tax rate taking as given the rates chosen by other countries.

In the model, each country consists of 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 $S = A - C_1$.¹⁵ 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 $C = w^*L + (1 + r^*)S$.

Domestic production in the second period equals $f(K_m, L_m)$ in a capital-importing country and equals $g(K_x, L_x)$ in a capital-exporting country. Domestic savings in a capital-exporting country is either invested at home, giving K_x , or is invested abroad. Income to capital is taxed at rate t_x in the capital-exporting countries and at rate t_m in the capital-importing countries. As a result, capital invested abroad in a capital-importing country pays tax there at rate t_m , then pays a surtax at home equal to $\max(t_x - t_m, 0)$, yielding a net tax rate equal to $\max(t_x, t_m)$. In equilibrium, investment occurs so that

$$g_K(1 - t_x) = f_K(1 - \max(t_x, t_m)). \quad (1)$$

In each country, domestic 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 . Capital-exporting countries take home $f_K(1 - t_m)$ per unit of capital invested abroad, and

¹⁴ They also find no Nash equilibrium set of tax rates, though the arguments are somewhat different due to the lack of alternative taxes.

¹⁵ Values of variables in a capital-exporting (capital-importing) country are denoted by a subscript x (m). In discussion applying equally to both types of countries, as here, subscripts are omitted.

capital-importing countries pay this same amount per unit of capital they import. The economy's resource constraint in the second period in a capital-exporting country is therefore

$$S_x + g(K_x, L_x) + (S_x - K_x)f_K(1 - t_m) = C_x + G_x, \quad (2)$$

where L_x , S_x , and C_x are each functions solely of A_x , r^* , w^* . The resulting utility of the representative individual is $W = U(r^*, w^*, A_x, G_x)$. Analogous expressions apply in the capital-importing countries.

The objective of each government is assumed to be to maximize W subject to the resource constraint (2) and the capital-market equilibrium condition (1). In doing so, it chooses w^* through its tax rate on labor income, chooses a corporate-income tax rate, chooses a subsidy rate on individual income from corporate equity through its choice of r^* , and chooses G . By constraint, $r^* \geq g_K(1 - t_x)$ in capital-exporting countries, with the analogous constraint in capital-importing countries.

I examine first the choices made by a capital-importing country. Since each country is small relative to the world capital market, it takes as given the required rate of return on capital imports, $g_K(1 - t_x)$. What the country must pay for capital imports then equals $(K_m - S_m)f_K(1 - t_m)$, which by equation (1) equals $(K_m - S_m)g_K(1 - \min(t_m, t_x))$.

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

$$S_m + f(K_m, L_m) = C_m + G_m + (K_m - S_m)g_K(1 - \min(t_m, t_x)), \quad (3)$$

and the further constraint that $r^* \geq f_K(1 - t_m)$. Let λ represents the Lagrangian on the budget constraint, and γ the Lagrangian on the constraint on r^* . Consider first a marginal change in t_m when $t_m < t_x$. By equation (1), a marginal increase in t_m does not change K , so that $\partial U / \partial t_m = \lambda(K_m - S_m)g_K + \gamma f_K$. Utility rises as t_m increases, as long as $t_m < t_x$, for two reasons. First, more taxes are collected on capital imports which are fully credited by the government in the capital-exporting country, so these extra taxes do not affect K_m . Second, the tax increase allows the government if it chooses, to increase its tax rate on individual savings by lowering r^* . Therefore, $t_m \geq t_x$.

What if t_m were increased above t_x ? Now equation (1) implies that $f_K(1 - t_m)$ is fixed. The feasible values of r^* therefore do not change, but K_m falls. The resulting change in utility is $\partial U / \partial t_m = \lambda t_m f_K(\partial K / \partial t_m) < 0$. The fall in K_m causes a drop in welfare since f_K is greater than the cost of extra capital imports, $f_K(1 - t_m)$. Therefore, at the optimum $t_m = t_x$.

Let us now examine the tax rates chosen by a capital-exporting country.¹⁶ The government chooses its policies so as to maximize $U(r^*, w^*, A_x, G_x)$ subject to equation (2), taking as given the value of $f_K(1 - t_m)$.

¹⁶ Assume in analyzing this case that no corporate tax rebates are granted under the personal income tax, so that $r^* = g_K(1 - t_x)$. Raising the corporate tax but then rebating the increase accomplishes nothing since only domestically owned corporations are subject to the corporate tax.

If $t_x < t_m$, what is the effect on welfare of a marginal increase in t_x ? Equation (1) shows that the value of r^* does not change, but that domestic investment falls. The resulting change in utility is $\partial U / \partial t_x = t_x g_K (\partial K / \partial t_x)$. Welfare falls as K_x falls since $g_K > f_K(1 - t_m) = g_K(1 - t_x)$.

If $t_x \geq t_m$, what is the effect on welfare of a marginal increase in t_x ? Equation (1) now implies that domestic investment does not change, but that r^* falls. Locally, at least, this tax change is equivalent to a change in a residence-based tax rate on capital income. Using equation (2) and the individual's budget constraint, it follows that

$$\frac{\partial U}{\partial t_x} = \left(\frac{\partial r^*}{\partial t_x} \right) \left\{ S_x(\alpha - \lambda) + \lambda \left[(g_L - w^*) \frac{\partial L_x}{\partial r^*} + f_K(t_x - t_m) \frac{\partial S_x}{\partial r^*} \right] \right\}. \quad (4)$$

Here, α represents the marginal utility of second period income, coming from use of Roy's identity $\partial U / \partial r^* = \alpha S_x$. This expression is just the standard type of first-order condition for a change in an excise-tax rate. The first term implies that utility rises (as long as $\lambda > \alpha$) due to the transfer of revenue from individuals to the government, resulting from the drop in r^* . The extra terms describe the efficiency loss caused by any resulting changes in individual behavior. Individuals are indifferent, at the margin to these changes so that the only welfare impact arises from effects on government revenue, which are measured by these last two terms. Here, $g_L - w^*$ simply measures the tax collected per unit of work effort, while $f_K(t_x - t_m)$ is the surtax collected on extra investment abroad—any extra savings go entirely abroad.

This first-order condition differs only slightly from that which would arise with a residence-based tax on capital income. First, while a tax increase collects revenue from savings invested anywhere in the world in both cases, any resulting drop in savings causes a smaller revenue loss here than occurs with a residence-based tax due to the crediting arrangements. In addition, for any set of tax rates, government revenue is less here, again due to the crediting arrangements. For both reasons, the optimal value of t_x should be higher here. Assuming this optimal value is above t_m , then utility increases initially as t_x rises above t_m , until some locally optimal value denoted t^* .

These effects of changes in t_x on welfare are portrayed graphically in Figure 1. The figure shows that the optimal value of t_x will be either zero or some value t^* , where $t^* > t_m$; 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 $t_m = t_x$.¹⁷

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

¹⁷ There is an implicit assumption here that the capital-exporting countries would want to have a positive residence-based tax on capital income, if it were feasible. If not, then there would be an equilibrium with nonpositive tax rates.

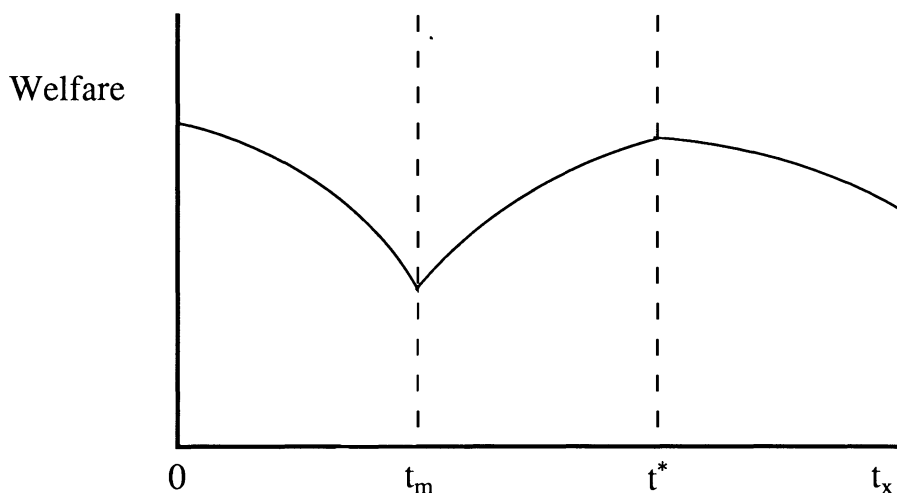


Figure 1. Choice of t_x in capital-exporting countries.

equilibrium as well.¹⁸ The U.S. may plausibly have played the role of Stackelberg leader in the world market, or Germany such a role within the E.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.¹⁹ When the leader increases t_x , it realizes that the capital importing countries will raise their own tax rates accordingly, maintaining the equality $t_m = t_x$. Formally, the welfare impact of a tax increase is

$$\frac{\partial U}{\partial t_x} = \left(\frac{\partial r^*}{\partial t_x} \right) \left\{ \alpha S_x - \lambda K_x + \lambda \left[(g_L + w^*) \frac{\partial L_x}{\partial r^*} + t_x g_K \frac{\partial K_x}{\partial r^*} \right] \right\}. \quad (4a)$$

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

¹⁸ Feldstein and Hartman (1979) also examined a Stackelberg equilibrium with a large capital exporter as the Stackelberg leader. In their model, capital taxes were used to exploit market power in the world capital market, and crediting arrangements were not used. Small countries in their setting would therefore not use capital-income taxes.

¹⁹ 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 $t_x > t_m$.

capital exports to the other governments, so that the extra revenue is proportional to K_x , while the individuals pay extra tax on the larger base S_x , reducing the attractiveness of the tax relative to a true residence-based tax. With a true residence-based tax, there would also be a welfare loss arising from a drop in savings, since the tax drives the value of savings above its opportunity cost. Here, however, the government collects taxes on domestic capital rather than savings, so changes in savings/investment behavior matter only to the extent that domestic capital is affected. In a small open economy, it would not be affected at all. On net, the chosen tax rate may be higher or lower than the optimal residence-based tax rate. The main conclusion, however, is that the tax can survive in equilibrium.

How does the story change if the leader is a large capital importer, with all other countries small exporters? 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. In addition, the loss in revenue creates pressure to raise tax rates.

How would a rise in t_m affect which locally optimal policy is chosen? When $t_m = 0$, capital-exporting countries would set $t_x = t^*$; in this case t_x is precisely a residence-based tax. 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 than utility at $t_x = 0$ does, 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.²⁰ 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

²⁰ When t_m rises to the point where t_x falls from t^* to 0, welfare in the capital-importing country falls due to the resulting capital outflow—the marginal product of capital is f_K but its marginal cost is only $f_K(1 - t_m)$. Further increases in t_m lead to a further fall in welfare by the arguments used in the discussion of the Nash equilibrium.

point where a further increase causes capital-exporting countries to drop t_x from t^* to zero.

So far we have *assumed* that countries adopt the double-taxation convention. But would each country have the incentive to do so, given other countries' behavior? Consider first the situation in which there is one capital importer who acts as the leader. In this equilibrium, a capital exporter would certainly choose to maintain the double-taxation convention, if the alternative is source-based taxes. Utility under the zero optimal source-based tax rate is the same as the utility above when $t_x = 0$. But the country chose instead to set $t_x = t^*$. If capital-exporting countries as a group could eliminate the double-taxation convention, however, and thereby induce the capital importer to eliminate its corporate tax, they very likely would. To see this note, that utility, holding $t_x = 0$, is lowered 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 as a group than with source-based taxes.

What happens when there is one capital exporter who acts as the Stackelberg leader? The capital exporter is certainly made better off by adopting the double taxation convention. Under the alternative of source-based taxes, there would be no capital-income taxation; with it, no taxation is feasible (simply set $t_x = 0$), yielding the same welfare, but the country chooses a positive tax rate so it ends up better off. Capital-importing countries do not need to adopt the double-taxation convention in the above equilibrium, so the equilibrium is sustainable even if their welfare falls. The effect of a marginal increase in t_x on welfare in a capital-importing country is expressed formally by

$$\frac{\partial U}{\partial t_x} = \lambda \left(t_m f_K \frac{\partial K_m}{\partial t_x} - (K_m - S_m) \frac{\partial r^*}{\partial t_x} \right) - \gamma \frac{\partial r^*}{\partial t_x}. \quad (5)$$

Here, the second term captures the fact that the country pays a lower price, net of domestic taxes, for capital imports as t_x goes up, given the equal rise in t_m , while the last term measures the potential gain from being able to raise capital-income taxes on residents. The first term, however, measures the cost of any fall in the domestic capital stock. Due to the tax increase, world-wide savings should fall, causing K_m to fall as well. Therefore, if world-wide savings are not too elastic, welfare in the capital-importing countries rises.

Countries would therefore *choose* to use the double-taxation convention, if the alternative is source-based taxes. But are these results robust to any further relaxation of the initial assumptions? If capital exporting countries, for example, were able to tax the world-wide income earned by domestic corporations, net of any foreign taxes paid, they would choose to do so instead of adopting the double taxation convention—this alternative is simply a residence-based tax. Capital-importers would then want to tax the earnings

just of domestically-owned firms, exempting foreign-owned firms. If residence-based taxes are allowed, they will be chosen.

If individuals can invest abroad directly, the results also break down. Whenever the tax rate in the capital-importing countries is below that in the capital-exporting countries, corporate investors based in the capital-exporting country face a surtax at home whereas individual investors, who evade domestic taxes, do not. The model then forecasts that all capital exports should be done by individual investors rather than by corporations. As a result, only source-based taxes are feasible, and should not be used.

One way to rescue the previous results when the capital exporter is the Stackelberg leader, while still relaxing both of these assumptions, is to assume that individuals investing abroad face higher costs than corporations do, so earn a lower return pretax. Assume, for example, that they earn only $f_K(1 - t_m) - c$ abroad, whereas a corporate investor earns $f_K(1 - \max(t_x, t_m))$. Each has an opportunity cost of $g_K(1 - t_x)$. Consider first the incentives faced by a capital-importing country, given that the capital exporter has adopted the double taxation convention. There are now two locally optimal tax rates, $t_m = 0$ and $t_m = t_x$. Which is better? If the capital importer sets $t_m = 0$, it pays $g_K(1 - t_x) + c$ per unit of imported capital, and imports capital until $f_K = g_K(1 - t_x) + c$. If instead it sets $t_m = t_x$, it pays only $g_K(1 - t_x)$ per unit of imported capital, and imports capital until $f_K = g_K$. In sum, when $t_m = 0$, it pays more per unit of imported capital, but gets to import more capital.

This trade-off is portrayed graphically in Figure 2. Here, the net income earned by the capital-importing country on its capital imports is measured by the area ADEF when $t_m = t_x$, and by the area ABC when $t_m = 0$. Their

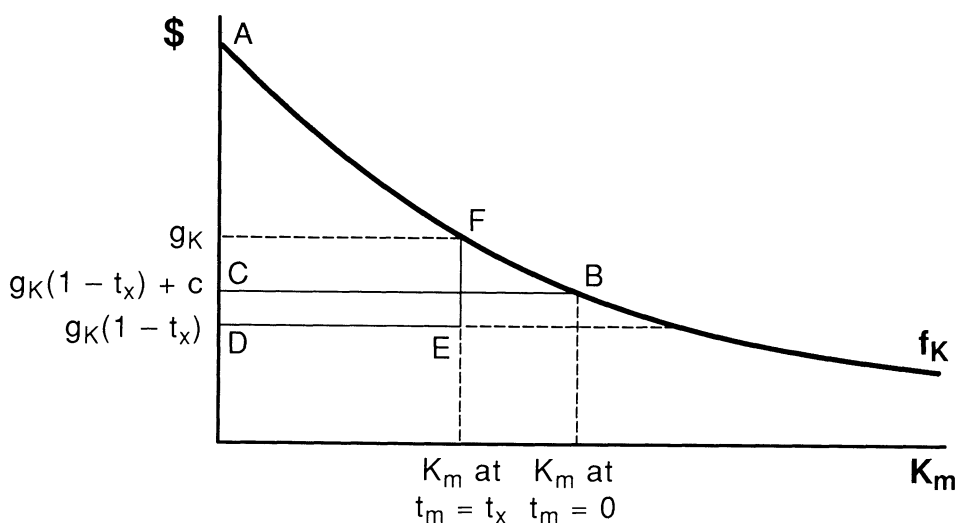


Figure 2. Choice of t_m in capital-importing countries.

relative size depends on the size of c relative to the size of t_x . If c equals zero, the country clearly does better by setting $t_m = 0$. When c is high enough, however, it will prefer to set $t_m = t_x$.²¹

But would the capital-exporting country choose to use the double-taxation convention rather than impose a corporate tax on the world-wide capital income of domestic firms? If the capital-exporting country imposes a corporate-income tax on the world-wide income earned by residents, it knows that capital-importing countries would not choose to tax capital imports. Individuals would evade taxes by investing abroad whenever $f_K - c$ exceeded their net-of-tax income from investing abroad through corporate direct investment, $f_K(1 - t_x)$. The maximum residence-based tax rate that forestalls evasion is therefore such that $t_x f_K = c$ —at any higher tax rate, individuals rather than corporations would invest abroad and evade all taxes. In contrast, the tax rate when the double taxation convention is used can be much higher, as can be seen from Figure 2; in the Figure, $t_x f_K$ is measured by the distance EF, whereas the maximum value of $t_x f_K$ under a residence-based tax, which equal c , is measured by the distance CD. The maximum feasible tax rate, given the double-taxation convention, occurs at the point where area ABC just equals area ADEF. The gain from being able to use a higher tax rate under the double taxation convention must be traded off with losing the tax revenue on capital exports. It can easily be the case that use of the double taxation convention dominates use of a residence-based corporate tax.

The same is not the case, however, when there is one capital importer who acts as the Stackelberg leader. Now, if a capital exporter imposes a residence-based tax, taking as given the tax rate in the capital-importing country, the maximum rate is such that $t_x f_K(1 - t_m) = c$. If instead, it uses the double taxation convention, again taking t_m as given, the maximum rate is such that $(t_x - t_m)f_K = c$. In both cases, the revenue collected on a unit of capital exports is c , and capital is allocated so that $g_K(1 - t_x) = f_K(1 - t_m) - c$, implying the same value of r^* . The only difference is that the maximum tax rate is lower under a residence-based tax, implying more investment at home. Since the net return on investment at home is higher than that on investment abroad, welfare is higher under the residence-based tax.

Therefore, of the two equilibria discussed above, only the one with a single exporter acting as Stackelberg leader is sustainable when countries have the option to impose a residence-based corporate income tax and when individuals can invest abroad directly, subject to some fixed cost. This story of a single capital exporter that acts as a Stackelberg leader does seem suggestive of the early post-war behavior of tax policy. The U.S. was the major capital exporter

²¹ Heterogeneity in c across investors can lead to more complicated stories. If c varies continuously across investors, for example, then there is a Miller-type equilibrium in which enough capital-importing countries become tax havens so that the marginal capital-importing country is indifferent to being a tax haven or setting $t_m = t_x$. The capital-exporting country would have to concede that investors with low values of c would evade taxes through portfolio investments, while still attempting to tax those with higher values of c .

during this period, and most other large countries were either capital importers or cut off from international capital markets due to capital controls. The U.S. did use the double taxation convention, and most other countries adopted tax laws roughly similar to the U.S. law, as forecast by the above model. In recent years, however, the U.S. has become a capital importer, and a number of other countries have become large capital exporters. Therefore, if the above story explains why corporate income taxes existed until the 1980s, it no longer does so. Unless an alternative mechanism is found to facilitate the survival of capital-income taxes, the theory again forecasts no taxation of capital income.

Of course, the above story can be generalized to handle more complicated strategic interactions among countries, to derive mechanisms that might be used to enable capital-income taxes to survive in the current environment. Cooperative game theory, for example, suggests that a set of policies mutually beneficial to a group of countries might be supported through threats which are exercised whenever a country violates an implicit agreement. Such stories seem strained in this setting, however, and I do not pursue them. To begin with, the entire structure of capital taxes must be specified in such an agreement. Given the enormous complexity of capital income tax law in any developed country, this hardly seems like a realistic option. In any case, I know of no examples of countries successfully intervening to try to change capital-income-tax policy elsewhere.²² Whether there is an alternative model which allows capital income taxes to survive under current conditions, based on plausibly realistic behavior, is an open question. Without it, the forecast continues to be that capital-income taxes should disappear.

The extra cost, c , that individuals must pay to invest abroad plays a critical role in the above analysis. The higher it is, the more flexibility governments have in taxing capital income. What determines the size of c ? In some cases, firms will acquire synergy gains from operating jointly with particular foreign firms, giving them an advantage over other investors when investing in these firms. To the extent that firms acquire control over foreign operations, they can more easily monitor the continuing performance of these foreign firms, relative to passive investors. Firms also have more of an incentive to acquire information about foreign firms to the extent that the scale of their investment abroad is larger, enabling them to earn a higher rate of return on their investments. They may also acquire valuable information about foreign firms as a byproduct of their normal operations, whereas individual investors would need to expend resources to acquire the same information. Of course, financial intermediaries may also be able to justify substantial expenditures on gathering information. They face the problem, however, that individual investors have some difficulty judging which intermediaries are informed, reducing their payoff to becoming informed.

²² Germany recently tried to get Luxembourg, and the European Community more broadly, to adopt a common withholding tax on interest income, to no avail.

III. Equilibrium Withholding Tax Rates Given Double-Taxation Conventions

What if countries can impose positive personal taxes on capital income? For capital-importing countries in the above model, this simply eliminates the constraint that $r^* > f_K(1 - t_m)$, without otherwise changing the equilibrium. The capital-exporting country, would again prefer to replace its corporate tax with a personal tax on world-wide income as long as its residents cannot invest abroad directly and thereby evade the tax. As above, the threat of individuals rather than corporations investing abroad, and evading all taxes, can well cause the Stackelberg leader to prefer to use corporate taxes along with the double-taxation convention.

Can the same type of crediting arrangements, however, be used to facilitate the use of personal as well as corporate taxes? Countries do in fact often allow credits against domestic personal taxes on world-wide capital income for any withholding taxes but not corporate taxes paid abroad, where the credit cannot exceed the domestic taxes that would be due on this foreign-source income. This section examines the equilibrium personal tax rates that result given this convention.

Use of personal taxes with the double-taxation convention favors individual over corporate investment abroad. With both types of investment, corporate and withholding taxes are paid abroad. With individual investment, domestic personal taxes on this income are either avoided or reduced by the credit for withholding taxes. With corporate investment abroad, some corporate surtax may be due at home, personal taxes cannot be avoided, and there is no credit against personal taxes to offset withholding taxes. All these factors discourage corporate relative to individual investment abroad. I therefore assume here that all capital flows take the tax-favored form, and ignore any costs individuals face in investing abroad. In addition, for simplicity, corporate taxes are dropped from the analysis, so that domestic as well as foreign investments are taxed only at the personal level.

In this setting, each country can tax the world-wide capital income of its own residents, and tax any income from domestic financial securities accruing to foreigners. 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. In the previous section, the home government could monitor the foreign capital income of domestic corporations, but here it is assumed unable to monitor the foreign capital income of domestic residents. 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, only a forgiveness of any additional domestic taxes. Therefore, domestic investors never have an incentive to report foreign earnings. The tax in the capital-exporting country is therefore simply a source-based tax, and would

not be used. Similarly, the capital-importing country would not choose to tax capital imports.

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.²³ If the foreign financial security has a pretax rate of return of f_K , then investors in this security receive a net return of $f_K(1 - n_m) - c$ if they evade taxes, and $f_K[1 - \max(n_m, s_x)]$ 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 by the capital-exporting country. Given n_x and s_x , what policies would a capital-importing country choose? Foreigners will invest in the country only if they earn as much as they do investing at home, where their net return is $g_K(1 - s_x)$. Denote this opportunity cost by r . If foreign investors report their earnings abroad, 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

$$\max\{f_K[1 - \max(s_x, n_m)], f_K(1 - n_m) - c\} = r. \quad (6)$$

Similarly, when residents of the country save, they can either invest at home, earning $f_K(1 - s_m)$, or they can invest abroad,²⁴ 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 the net return to savings, r^* , equals

$$r^* = \max\{f_K(1 - s_m), g_K[1 - \max(s_m, n_x)], g_K(1 - n_x) - c\}. \quad (7)$$

The government then chooses the two tax rates so as to maximize $U(r^*, w^*, A_m, G_m)$ subject to the resource constraint²⁵

$$S_m + f(K_m, L_m) = f_K(1 - n_m)(K_m - S_m) + C_m + G_m. \quad (8)$$

Consider first its choice of n_m . There are two locally optimal tax rates, $n_m = 0$ and $n_m = s_x$. When the tax rate is low enough that evasion occurs, it is a source-based tax so reducing it to zero is attractive. When the rate is high enough to discourage evasion, the double taxation convention makes $n_m = s_x$ the locally optimal rate. As in the previous situation described in Figure 2, if $c = 0$, the optimal policy is $n_m = 0$; if c is high enough relative to s_x , the

²³ 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.

²⁴ For simplicity, I assume that they would invest in the capital exporting country. This assumption will be supported, given the later results.

²⁵ If domestic residents invest abroad, then there is an additional term in equation (6).

optimal policy is instead to set $n_m = s_x$.

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 $(s_m - n_x)g_K < c$, 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.

One complication, however, is that the country may benefit from having its residents invest abroad. When they do invest abroad, their investments at home are replaced by extra foreign investment. Foreigners are paid, on net, a rate of return $f_K(1 - n_m)$, whereas residents earn abroad, on net, a rate of return $g_K(1 - n_x)$. Given that $f_K = g_K$ when $n_m = s_x$, this implies a net income gain for the country as a whole if $s_x > n_x$.²⁶ This is the net gain, however, only if individuals do not need to pay the extra cost of c of investing abroad. If foreign earnings are exempt from personal taxes, then individuals can use domestic intermediaries when investing abroad, thereby avoiding c . They will choose to invest abroad as long as s_m is high enough.

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 $n_m = 0$. Better to set $s_x = 0$ —capital-importing countries still set $n_m = 0$, but the fixed costs c required by tax evasion are avoided.

Assume, therefore, that s_x is small enough so that capital-importing countries set $n_m = s_x$. Given this, consider the country's choice of n_x . If $n_x < s_x$, then capital-importing countries would encourage their residents to invest abroad, free of domestic taxes. But the gains to capital importers from this policy are losses to the capital exporter, so that capital exporters will always want to set $n_x \geq s_x$.

If $n_x > s_x$, 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 .

What about the choice of s_x ? There are several reasons why the optimal value of s_x will differ from the optimal value of a true residence-based tax.

²⁶ This does not necessarily imply that individuals and the government both end up with more income. If it leaves individuals with an r^* below that preferred by the government, savings can be subsidized—subsidies are certainly feasible. If it leaves the government with enough less revenue, however, then welfare may fall from having residents invest abroad, even though income rises.

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. Second, when s_x increases, so do n_x and n_m . These increases can 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.

There would be potential gains from explicit coordination of taxes. 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 .

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 monitor and report the capital income of nonresidents to their home government. But such agreements could easily be undermined by any one country, e.g., Switzerland, choosing not to participate, and thereby attracting financial intermediaries to locate within its borders.

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 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.

REFERENCES

- Adler, Michael and Bernard Dumas, 1983, International portfolio choice and corporation finance: A synthesis, *Journal of Finance* 38, 925-984.
- Bond, Eric W. and Larry Samuelson, 1988, Strategic behavior and the rules for international taxation of capital, Mimeo, February.
- Diamond, Peter and James Mirrlees, 1971, Optimal taxation and public production, I: Production efficiency and II: Tax rules, *American Economic Review* 61, 8-27, 261-278.
- Feldstein, Martin S. and David Hartman, 1979, The optimal taxation of foreign source investment income, *Quarterly Journal of Economics* 93, 613-630.
- and Charles Horioka, 1980, Domestic savings and international capital flows, *The Economic Journal* 90, 1988, 314-329.
- Gordon, Roger H. and Joel Slemrod, 1988, Do we collect any revenue from taxing capital income? *Tax Policy and the Economy* 2, 89-130.
- and Hal R. Varian, 1989, Taxation of asset income in the presence of a world securities market, *Journal of International Economics* 26, 205-226.
- Greenwald, Bruce C. and Joseph E. Stiglitz, 1986, Externalities in economies with imperfect information and incomplete markets, *Quarterly Journal of Economics*, 101, 229-264.
- Hamada, Koichi, 1966, Strategic aspects of taxation on foreign investment income," *Quarterly Journal of Economics* 80, 361-375.
- Lovely, Mary E., 1989, Taxes, trade, and the pattern of world production, Unpublished Ph.D. dissertation, University of Michigan.
- Razin, Assaf and Efraim Sadka, 1990, Capital market integration: Issues of international taxation, Working paper No. 3281, March 1990, National Bureau of Economic Research.
- , 1989, International tax competition and gains from tax harmonization, Working paper No. 3152, October 1989, National Bureau of Economic Research.
- Richman, Peggy B., 1963, *Taxation of Foreign Investment Income* (The Johns Hopkins Press, Baltimore).
- Sinn, Hans-Werner, 1990, Can direct and indirect taxes be added for international comparisons of competitiveness, in H. Siebert, ed: *Reforming Capital Income Taxation*, (J. C. B. Mohr (Paul Siebeck), Tübingen) pp. 47-65.