NBER WORKING PAPERS SERIES

VANISHING TAX ON CAPITAL INCOME IN THE OPEN ECONOMY

Assaf Razin

Efraim Sadka

Working Paper No. 3796

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 1991

This paper is part of NBER's research programs in International Studies and Taxation. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

NBER Working Paper #3796
August 1991

VANISHING TAX ON CAPITAL INCOME IN THE OPEN ECONOMY

ABSTRACT

The increased integration of the world capital market implies that the supply of capital becomes more elastic, and therefore potentially a less efficient base for taxation. In general, the optimal taxation of capital income is subject to two conflicting forces. On the one hand the return on existing capital is a pure rent which is efficient to fully tax away. On the other hand taxing the returns on investment in new capital would retard growth, thus generating inefficiencies. Capturing these considerations, the paper carries out a simple optimal tax analysis for an open economy, which is fully integrated in the world capital markets. The analysis identifies well defined circumstances in which the capital income tax vanishes.

Assaf Razin
Department of Economics
Tel Aviv University
Tel Aviv, 69978
Israel
and NBER

Efraim Sadka
Department of
Economics
Tel Aviv University
Tel Aviv, 69978
Israel

July 1991

Vanishing Tax on Capital Income in the Open Economy

by

Assaf Razin and Efraim Sadka

The increased integration of the world capital markets has strong implications for the taxation of income from capital. In general, if factors become more mobile they are potentially less desirable as a source for government revenue. In fact, in the extreme case, such as the federal system, the ability of individual states to tax capital income is severely constrained, since capital can move freely across state borders.

The paper addresses the issue of the low taxation of capital income for a small open economy, which is completely integrated into the world capital markets. 1/ The main purpose of the paper is to characterize the optimal tax structure for such an economy.

The paper is organized as follows. Section I outlines basic principles of international taxation. Section II sets up the optimum tax problem for a growing open economy. Section III applies the optimum tax model to the situations in which the country cannot enforce the tax on foreign source income, and Section IV provides concluding remarks.

I. Principles of International Taxation

The diverse structures of the national tax systems have important implications for the direction and magnitude of international flows of goods

---

1/ For related analysis see Giovannini (1990), Gordon (1986), Musgrave (1987), and Sinn (1990).

and capital and, consequently, for the world-wide efficiency of resource allocation in the integrated world economy. Although there is probably no country which adheres strictly to a pure principle of international taxation, it seems nevertheless that two polar principles with a wide application can be detected, both in the area of direct taxation and in the area of indirect taxation. The two polar principles of international income taxation are the residence (of taxpayer) principle and the source (of income) principle. According to the residence principle, residents are taxed on their world-wide income uniformly, regardless of the source of income (domestic or foreign), while nonresidents are not taxed on income originating in the country. 1/ According to the source principle all types of income originating in the country are taxed uniformly, regardless of place of residence of the recipients of income. Thus, residents of the country are not taxed on their foreign-source income and nonresidents are taxed equally as residents on income originating in the country.

To highlight the issue of tax arbitrage that arises under the integration of capital markets, consider the familiar two-country model ("home" country and "foreign" country) with perfect capital mobility. Denote interest rates in the home country and in the foreign country by r and r^*, respectively. In general, the home country may have three different effective tax rates applying to capital (interest and dividend) income:

1/ A tax credit is usually given against taxes paid abroad on foreign-source income, so as to achieve an effective tax rate on income from all sources. See Frenkel, Razin and Sadka (1991) for a modern treatise of international taxation.

τ_D - tax rate levied on residents on domestic source income;

τ_A - effective rate of the <u>additional</u> tax levied on residents on foreign-source income (over and above the tax paid in the foreign country);

τ_N - tax levied on income of nonresidents.

Correspondingly, the foreign country levies similar taxes, denoted by τ_D^*, τ_A^* and τ_N^*. 1/

At the equilibrium, the home country residents must be indifferent between investing at home or investing abroad. This must imply that:

$$r(1-\tau_D)=r^*(1-\tau_N^*-\tau_A). \qquad (1)$$

Similarly, at the equilibrium, the residents of the foreign country must be indifferent between investing in their home country (the "foreign country") or investing abroad (the "home" country), so that:

$$r^*(1-\tau_D^*)=r(1-\tau_N-\tau_A^*). \qquad (2)$$

Hence, for the interest rates, r and r^* to be positive (in which case we say that the capital market equilibrium is viable), the two equations (1) and (2), must be linearly dependent. That is,

$$(1-\tau_D)(1-\tau_D^*)=(1-\tau_N-\tau_A^*)(1-\tau_N^*-\tau_A). \qquad (3)$$

1/ We assume that these tax rates apply symmetrically to both interest income and interest expenses.

This constraint, which involves tax rates of the two countries, implies that even though the two countries do not explicitly coordinate their tax systems between them, each one nevertheless must take into account the tax system of the other in designing its own tax system. 1/

It is noteworthy that if both countries adopt one of the two aforementioned polar principles of taxation, residence and source, then condition (3) is fulfilled. To see this, observe that if both countries adopt the residence principle, then

$$\tau_D = \tau_A \ , \ \tau_D^* = \tau_A^* \ , \ \tau_N = \tau_N^* = 0. \tag{4}$$

If both countries adopt the source principles, then

$$\tau_D = \tau_N, \ \tau_{D}^*, = \tau_N^*, \text{ and } \tau_A = \tau_A^* = 0. \tag{5}$$

Evidently, the joint constraint (3) is fulfilled, if either (4) or (5) holds. However, if the two countries do not adopt the same polar principle (or do not adopt either one of the two polar principles), then, in general, condition (3) is not met, and a viable equilibrium may not exist.

1/ The issue of tax arbitrage is not unique to open economies. Tax arbitrage emerges also in closed economies if the relative tax treatment of various assets differ across individuals. In the open economy case tax arbitrage becomes more serious if different types of financing are treated differently. This enables individuals and corporations to arbitrage across different statutory tax rates. Another factor that increases the scope of the tax arbitrage is the interaction between inflation and exchange rates, on the one hand, and differential tax treatments of inflation and exchange rate gains and losses, on the other hand.

The structure of taxation has also important implications for the international allocation of investments and savings. If all countries adopt the residence principle (that is, condition (4) holds), then it follows from either (1) or (2), the rate-of-return arbitrage conditions, that $r = r^*$. That is the pretax rates of return to capital are equated internationally. As the gross return to capital is equal to the marginal product of capital, it follows that the marginal product of capital is equated across countries. Thus, the world (future) output is maximized and world-wide production efficiency prevails. 1/ If, however, the tax rate on capital income is not the same in all countries (i.e., $\tau_D \neq \tau_D^*$) then the after-tax return on capital would vary across countries. As the net return to capital is equal to the consumer's (intertemporal) marginal rate of substitution, it follows that the intertemporal marginal rates of substitution are not equated internationally. Thus, the international allocation of world savings is inefficient.

Alternatively, if all countries adopt the source principle (that is, condition (5) holds), then it follows from either (1) or (2) that $r(1-\tau_D) = r^*(1-\tau_D^*)$. Thus, the intertemporal marginal rate of substitution is equated internationally and the allocation of world savings is efficient. If, however, the tax rate on income from capital is not the same in all countries, then $r \neq r^*$. That is, the marginal product of capital varies across countries and the world-wide allocation of investment is inefficient.

1/ Efficiency emerges when corporate and individual taxes are fully integrated and interest income faces the same tax rate as equity income. Evidently, a nonuniform treatment of different components of the capital income tax base would violate efficiency.

II. Optimal Taxation

Optimal taxation of capital income is usually subject to two conflicting forces. On the one hand, the income from existing capital is a pure rent, and taxing all of it away must be efficient. On the other hand, the taxation of the returns on current and future investment in capital may retard growth and thus may be an inefficient policy.

Following Diamond and Mirrlees (1971), and Lucas (1990), consider a small open economy with an infinitely-lived representative agent, endowed with one unit of leisure and K_0 units of capital. The maximization problem of the representative agent is specified by:

$$\max_{(c_t, x_t)} \sum_{t=0}^{\infty} \beta^t u(c_t, x_t) \tag{6}$$

$$\text{subject to:} \quad \sum_{t=0}^{\infty} P_t[\bar{w}_t(1-x_t) - c_t] \geq 0,$$

where β denotes the subjective discount factor, c_t and x_t denote consumption of goods and leisure at period t, respectively, P_t denotes the consumer (post tax) present value factor from period t to period 0, w_t denotes the post-tax wage rate at period t, and u is the instantaneous utility function of the household. The Lagrangean expression for this problem is $L = \sum_{t=0}^{\infty} \{\beta^t u(c_t, x_t) + \lambda P_t[\bar{w}_t(1-x_t) - c_t]\}$, where $\lambda \geq 0$ is a Lagrange multiplier.

Underlying the specification in (6) is the idea that the household sells its endowment of capital to the firm, at $t=0$, and at this point of time the government confiscates this income, since it amounts to a lumpsum income. Consequently, the life-time budget constraint implies that the discounted flow of consumption must be equal to the discounted flow of labor income. In other words, income originating from the existing capital should appear nowhere in the household problem while income originating from new capital should appear only in the representative firm's problem.

First-order conditions are given by:

$$\text{(a)} \quad \beta^t u_c(c_t, x_t) - \lambda P_t = 0, \qquad (7)$$

$$\text{(b)} \quad \beta^t u_x(c_t, x_t) - \lambda P_t w_t = 0.$$

These conditions, substituted into the budget constraint in (6), generate the household implementability constraint for the optimum tax problem, as follows:

$$\sum_{t=0}^{\infty} \beta^t [u_x(c_t, x_t)(1-x_t) - u_c(c_t, x_t)c_t] = 0. \qquad (8)$$

Assume that the representative firm is equipped with a constant returns to scale production function, $F(K_t, L_t)$; where K_t denotes the capital stock and L_t denotes the employment of labor at period t. Denote the rate of corporate income tax at period t by τ. The firm's objective is to maximize the present value of its net cash flows. Thus, the firm chooses $\{K_t, L_t\}$ so as to maximize:

$$\sum_{t=0}^{\infty} q_t((1-\tau_t)F(K_t,L_t)-[K_{t+1}-(1-\delta)K_t] \qquad (9)$$

$$+ \tau_t\delta K_t-(1-\tau_t)w_tL_t) \quad ,$$

where, q_t denotes the tax adjusted present value factor from period t to period 0, δ denotes the rate of depreciation, and w_t denotes the pre-tax wage rate at period t. The net cash flow of the firm at period t consists of the after tax value of output, $(1-\tau_t)F()$, minus gross investment, $K_{t+1}-(1-\delta)K_t$, plus the depreciation allowance, $\tau\delta K_t$, minus the tax adjusted wage bill, $(1-\tau)w_tL_t$. The present value factor, q_t, associated with the tax adjusted domestic rate of interest, evolves according to the familiar relationship:

$$q_t/q_{t+1} = 1+(1-\tau_{t+1})r_{t+1}. \qquad (10)$$

where r is the pre-tax rate of interest from period t to period $t+1$. Notice that the corporate income tax in this setting works essentially as a cash-flow tax (because capital used in the production process in period t is cashed on in that same period). Consequently, the corporate tax does not affect firm's behavior as can be seen from the following first-order conditions for the firm's optimization problem.

$$F_L(K_t,L_t) = w_t \qquad (11)$$

and

$$F_K(K_t, L_t) - \delta = r_t \tag{12}$$

These last two conditions generate the firm implementability constraint for the optimum tax problem.

The optimal tax problem for the benevolent government can now be specified, as follows. The government chooses c_t, $1-x_t = L_t$, K_t, w_t and r_t so as to maximize the household utility function $\sum_{t=0}^{\infty} \beta^t u(c_t, x_t)$, subject to the present-value resource constraint of the small open economy,

$\sum_{t=0}^{\infty} (1+ r^*(1-\tau_N^*))^{-t}(F(K_t, 1-x_t)-[K_{t+1}-(1-\delta)K_t]-c_t- g_t)$, and to the

implementability conditions (8), (11) and (12), where g_t denotes government's spendings in period t. Notice that in this optimal tax problem w_t and r_t appear only in constraints (11)-(12). Hence, the two control variables w_t and r_t and the two constraints (11)-(12), may be omitted initially from the tax optimization problem. Once the problem is solved one can then employ (11)-(12) in order to set w_t and r_t. The Lagrangean expression for the optimal tax problem is then:

$$L = \sum_{t=0}^{\infty} \beta^t u(c_t, x_t) \qquad (13)$$

$$+ \phi \sum_{t=0}^{\infty} \beta^t [u_x(c_t, x_t)(1-x_t) - u_c(c_t, x_t)c_t]$$

$$+\mu \sum_{t=0}^{\infty} (1+r^*(1-\tau_N^*))^{-t}(F(K_t, 1-x_t) - [K_{t+1}-(1-\delta)K_t] - c_t - g_t),$$

where $\phi \geq 0$ and $\mu \geq 0$ are Lagrange multipliers. The resource constraint for the small open economy is equal to the discounted (using the world net of tax rate of interest, $r^*(1-\tau_N^*)$) sum of output flows, F(), minus the discounted sum of gross investment, $K_{t+1}-(1-\delta)K_t$, private consumption, c_t, and public consumption, g_t.

Setting the derivative of (13), with respect to K_t, equal to zero, yields $[1+r^*(1-\tau_N^*)]^{-t+1}+[1+r^*(1-\tau_N^*)]^{-t}[F_k(K_t, 1-x_t) + 1-\delta] = 0$. Hence,

$$F_K(K_t, -x_t) - \delta = r^*(1-\tau_N^*). \qquad (14)$$

Equation (14) implies that under the optimum tax regime the net (after depreciation) marginal product of capital must be equal to the ~~(net-of-tax)~~ world rate of interest (net of foreign tax) at each period of time. As was already pointed out in the preceding section, if individual residents can freely invest abroad, they must earn the same net return whether investing at home or abroad. That is,

$$r_t(1-\tau_{tD}) = r^*(1-\tau_N^* - \tau_{tA}) \qquad (15)$$

Matching up conditions (12), (14) and (15), it follows that under the optimal tax regime the government in the small open economy must let capital move freely in and out of the country and must employ the residence principle of taxation (i.e., $r_t = r^*(1-\tau_N^*)$ and $\tau_{tD} = \tau_{tA}$). Thus, at the optimum, investment is efficiently allocated between the home country and the rest of the world: the production efficiency result. 1/

Other first-order conditions for the optimal tax problem are given by:

$$\beta^t(u_c(c_t,x_t) - \phi[u_{cc}(c_t,x_t)c_t + u_c(c_t,x_t) - u_{cx}(c_t,x_t)(1-x_t)]) \qquad (16)$$

$$-\mu[1+r^*(1-\tau_N^*)]^{-t} = 0.$$

$$\beta^t(u_x(c_t,x_t) - \phi[u_{cx}(c_t,x_t)c_t - u_{xx}(c_t,x_t)(1-x_t) + u_x(c_t,x_t)) \qquad (17)$$

$$-\mu[1+r^*(1-\tau_N^*)]^{-t} \quad F_L(K_t, 1-x_t) = 0.$$

Consider now a unique parameter configuration that yields a steady state for the optimal tax problem. For a small open-economy, this requires a specific relationship between the discount factor and the (net-of-tax) world rate of interest; that is:

1/ If rents cannot be fully taxed or if the country can manipulate world prices the choice of whether to adopt the source principle or the residence principle (or a mixture of the two principles) would depend on the interest rate elasticities of saving and investment, see Giovannini (1989). See also Gordon (1986) and Musgrave (1987) and Sinn (1990). Dixit (1985) demonstrates a related result by showing that the production efficiency proposition implies no border taxes, such as import or export taxes.

$$\beta[1+r^*(1-\tau_N^*)] = 1, \tag{18}$$

or:

$$r^*(1-\tau_N^*) = \beta^{-1} - 1. \tag{19}$$

Notice that β^{-1} -1 is the intertemporal marginal rate of substitution in the steady state (where $c_{t+1} = c_t$ and $x_{t+1} = x_t$). Utility maximization implies that $\beta^{-1} - 1$ is equated to

$$(P_t/P_{t+1}) - 1 = (1-\tau_D)r_t \text{ (see condition (7)).}$$

Thus,

$$(1-\tau_D)r = \beta^{-1} - 1 = r^*(1-\tau_N^*), \text{ by, equation (19). Hence, } \tau_D = \tau_A = 0.$$

Thus, we conclude that in the steady state the tax on capital income, from either domestic or foreign sources, vanishes entirely from the optimum tax menu.

For some specific functional forms, outcome can be even stronger. Consider, for example, the log utility function:

$$u(c_t,x_t) = \alpha\log(c_t)+ (1-\alpha)\log(x_t) \tag{20}$$

In this case (since $u_{cx}=0$ and $-u_{cc}c=u_c$), condition (16) reduces to:

$$\beta^t u_c(c_t, x_t) = \mu[1+(1-\tau_N^*)r^*]^{-t}. \tag{21}$$

This implies that:

$$\frac{u_c(c_{t-1}, x_{t-1})}{\beta u_c(c_t, x_t)} = 1+ (1-\tau_N^*) r^*. \tag{22}$$

Since utility maximization implies (see condition (7)) that

$$\frac{u_c(c_{t-1}, x_{t-1})}{\beta u_c(c_t, x_t)} = 1 + r_t(1-\tau_{tD}) ,$$

it follows that $r_t (1-\tau_{tD}) = (1-\tau_N^*)r^*$. Hence, $\tau_{tD} = \tau_{tA} = 0$. Thus, for this special case the optimal tax rate on capital income is set equal to zero in <u>every</u> period.

However, steady-state zero rates of tax on capital income, or non steady-state zero rates for some specific representation of preferences constitute merely a theoretical curiosum. They do not provide us with a lot of real-world policy guidance.

III. <u>The Tax Enforcement Issue</u>

A considerable degree of coordination among countries is required to tax effectively worldwide income. International coordination takes the form of an exchange of information among the tax authorities, withholding arrangements, with possible breachments of bank secrecy laws, and the like.

This coordination enables each country to effectively tax its residents on capital income that is invested in the other country.

However, if international coordination with the rest of the world is lacking, governments cannot tax the income from capital that is invested in the rest of the world. Thus, capital can fly to low-tax countries in the rest of the world.

With no tax on foreign source income $(\tau_A = 0)$, the arbitrage condition (15) becomes:

$$(1-\tau_{tD})\ r_t = (1-\tau_N^*)r^*. \tag{23}$$

Matching up (23) with (12) and (14) implies that:

$$\tau_{tD} = 0. \tag{24}$$

Thus, the optimal tax rule for a country which cannot enforce taxes on foreign source income is to abstain entirely from capital income taxation. This capital flight possibility, leading to full tax exemption of capital income, captures the essence of a problem hindering many countries in the integrated world economy. 1/

1/ See, for example, the recent news analysis of Die Zeit, July 12, 1991. The analysis states that the German government has been caught off guard by a recent judgement handed down by the federal constitutional court that will require changes by the beginning of 1993 in the way interest and dividend income is taxed. Some economists estimate that the volume of this undeclared income is between 250b-500b DM. The German authorities' chief concern, the paper said, is to prevent a flight of capital that could provoke a vicious circle of currency weakness, rising prices, higher interest rates, and falling investment and growth. Among the policy choices open to the government, is the introduction of an unpopular withholding tax, or monitoring bank accounts to ensure that interest income is declared.

III. Conclusions

No capital-income tax, whatsoever, can be efficiently imposed by a small open economy if capital flight to the rest of the world cannot be effectively stopped. Consequently, all of the tax burden falls on the internationally immobile factor such as, labor, property, land, etc. The ensuing equilibrium is a constrained optimum, relative to the set of tax instruments that is available. Since, however, the set of tax instruments in this case is more restricted than if taxes on foreign sources of income are enforceable, it follows that the constrained optimum (in the capital-flight case) is inferior to the second-best optimum that could be reached if worldwide income taxation is implementable. The conclusion therefore is that countries must have strong incentives to coordinate their tax collection activities so as to be able to enforce taxation of foreign-source income.

References

Diamond, Peter A., and Mirrlees James (1971), "Optimal Taxation and Public Production," American Economic Review (March and June), 8-17 and 261-278.

Dixit, Avinash, (1985), "Tax Policy in Open Economies," in Alan Auerbach and Martin Feldstein (eds.) Handbook on Public Economics, Chapter 6 (Amsterdam: North Holland), 314-374.

Frenkel, Jacob, Razin, Assaf and Sadka, Efraim (1991), International Taxation in an Integrated World, (Cambridge: MIT Press).

Giovannini, Alberto (1990), "Reforming Capital Income Taxation in Open Economies: Theoretical Issues," in Horst Siebert (ed.) Reforming Capital Income Taxation, (Tubingen: Mohr).

Gordon, Roger H. (1986), "Taxation of Investment and Savings in a World Economy," American Economic Review, 76, 1087-1102.

Lucas, Robert E., Jr., (1990), "Supply Side Economies: An Analytical Review," Oxford Economics Papers, 42, pp. 293-316.

Musgrave, Peggy (1987), "International Tax Competition and Gains from Tax Harmonization," NBER Working Paper No. 3152 (October), Cambridge, MA.

Sinn, Hans-Werner (1990), Tax Harmonization and Tax Competition in Europe," NBER Working Paper No. 3263 (February), Cambridge, MA.