Chapter 14: International Taxation and Exogenous Growth

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.[1] In fact, in the extreme case, such as the federal system (as in the US and Germany), the ability of individual states to tax capital income is severely constrained, since capital can move freely across state borders.

This chapter addresses the issue of the taxation of capital income for a growing small open economy, completely integrated into the world capital markets.[2] We bring together in a simple growth model three major considerations. First, Chamley (1986) and Judd (1985) show that it is not efficient to tax capital income in a steady state of a closed economy, since capital has essentially a perfectly elastic supply in the steady state. This result is extended to a small open economy by appealing to the efficiency of a residence-based taxation (e.g., Frenkel, Razin and Sadka 1991). However, a steady-state analysis can provide a limited guidance for policy making.

Second, when enforceability of taxation of foreign-source income is not feasible and containing capital flight is impossible, then it would be efficient to tax exempt capital income from domestic sources as well (see Razin and Sadka 1991). This result has important policy implications as it holds at any moment and not only when a steady state is reached, if at all.

Third, even though it is efficient to let capital flow freely in and out of the country when such a flow does not undermine the ability to tax foreign-source income, it is efficient to restrict capital export and reinstate capital taxation, when foreign source income cannot effectively be taxed (see Razin and Sadka 1991).

14.1 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 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.[3]

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:

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

τ_A - effective rate of the *additional* 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.[4]

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

$$r(1-\tau_D) = r^*(1-\tau_N^*-\tau_A). \qquad (14.1)$$

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:

$$r^*(1-\tau_D^*) = r(1-\tau_N-\tau_A^*). \qquad (14.2)$$

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 (14.1) and (14.2) must be linearly dependent, i.e.

$$(1-\tau_D)(1-\tau_D^*) = (1-\tau_N-\tau_A^*)(1-\tau_N^*-\tau_A). \qquad (14.3)$$

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.[5]

It is noteworthy that if both countries adopt one of the two aforementioned polar principles of taxation, residence or source, then condition (14.3) is fulfilled. To see this, observe that if both countries adopt the residence principle, then

$$\tau_D = \tau_A, \qquad \tau_D^* = \tau_A^*, \qquad \tau_N = \tau_N^* = 0. \qquad (14.4)$$

If both countries adopt the source principles then

$$\tau_D = \tau_N, \qquad \tau_D^* = \tau_N^*, \qquad \textit{and} \qquad \tau_A = \tau_A^* = 0. \qquad (14.5)$$

Evidently, the joint constraint (14.3) is fulfilled if either (14.4) or (14.5) 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 (14.3) is not met, and a viable equilibrium may not exist.

The structure of taxation also has important implications for the international allocation of investments and savings. If all countries adopt the residence principle (that is, condition (14.4) holds), then it follows from either (14.1) or (14.2), 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.[6] 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 (14.5) holds), then it follows from either (14.1) or (14.2) 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.

14.2 Optimal Capital Taxation in a Small Open Economy

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 Lucas (1990), consider a small open economy with an infinitely-lived representative agent, endowed with one unit of human capital input (divisible into leisure and labor) and K_0 units of capital. Assume, for simplicity, that the exogenous growth rates of population and skills are zero. Unlike Chapter 12, this chapter is based on the convention that investment in physical capital is done by the firm rather than the household. The maximization problem of the representative agent is specified by:

$$\max_{(c_t,L_t)} \sum_{t=0}^{x} \beta^t u(c_t, L_t) \qquad (14.6)$$

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

where β denotes the subjective discount factor, c_t and L_t denotes 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, $\bar{w}_t$ 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:

$$L = \sum_{t=0}^{\infty} \{ \beta^t u(c_t, L_t) + \lambda P_t [\bar{w}_t (1 - L_t) - c_t] \},$$

where $\lambda \geq 0$ is a Lagrange multiplier.

Underlying the specification in (14.6) is the idea that households sell their endowments of capital to firms at $t = 0$, and at this point of time the government confiscates these incomes, since they amount to lumpsum incomes.[7] 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 optimization probem, while income originating from new capital is incorporated into the household budget constraint, as the latter is presented in present value terms.

First-order conditions are given by:

$$\beta^t u_c(c_t, L_t) - \lambda P_t = 0. \qquad (14.7a)$$

$$\beta^t u_x(c_t, L_t) - \lambda P_t \bar{w}_t = 0. \qquad (14.7b)$$

These conditions, substituted into the budget constraint in (14.6), generate the household's implementability constraint for the optimum tax problem, as follows:

$$\sum_{t=0}^{\infty} \beta^t [U_L(c_t, L_t)(1 - L_t) - u_c(c_t, L_t) c_t] = 0. \qquad (14.8)$$

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

$$\sum_{t=0}^{\infty} q_t \{(1-\tau_t) F(K_t, H_t) - [K_t + 1 - (1-\delta) K_t] + \tau_t \delta_K K_t - (1-\tau_t) w_t H_t\}, \qquad (14.9)$$

where q_t denotes the tax adjusted present value factor from period t to period 0, δ_K denotes the rate of physical 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, $K_{t+1} - (1-\delta_K)K_t$, plus the tax saving resulting from the depreciation allowance, $\tau\delta_K K_t$, minus the tax adjusted wage bill $(1-\tau)w_t L_t$.[8] The present value factor, q_t, associated with the tax adjusted domestic rate of interest, evolves according to the familiar relationship:

$$q_t / q_{t+1} = 1 + (1 - \tau_{t+1}) r_{t+1} \tag{14.10}$$

where r_t is the pre-tax rate of interest from period t to period t+1. As the depreciation allowance for tax purposes is equal to the true economic depreciation and the firm finances its investment entirely by issuing debt (rather than equity), 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:

$$F_H(K_t, H_t) = w_t. \tag{14.11}$$

and

$$F_K(K_t, H_t) - \delta_K = r_t. \tag{14.12}$$

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, $1\text{-}L_t = H_t$, K_t, w_t and r_t so as to maximize the household utility function

$$\sum_{t=0}^{\infty} \beta^t u(c_t, L_t),$$

subject to the present-value resource constraint of the small open economy,

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

and to the implementability conditions (14.8), (14.11) and (14.12), 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 (14.11) and (14.12). Hence, the two control variables w_t and r_t and the two constraints (14.11) and (14.12) may be omitted initially from the tax optimization problem. Once the problem is solved one can then employ (14.11) and (14.12) in order to set w_t and r_t. The Lagrangean expression for the optimal tax problem is then:

$$\begin{aligned} L = \sum_{t=0}^{\infty} \beta^t u(c_t, L_t) + \phi \sum_{t=0}^{\infty} \beta^t [u_x(c_t, L_t)(1 - L_t) - u_c(c_t, L_t) c_t] \\ + \mu \sum_{t=0}^{\infty} [1 + r^*(1 - \tau_N^*)]^{-t} \\ . \{F(K_t, 1 - L_t) - (K_{t+1}) - [K_{t+1} - (1 - \delta_K)K_t] - c_t - g_t\}, \end{aligned} \qquad (14.13)$$

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: gross investment, $K_{t+1} - (1\text{-}\delta_K)K_t$, private consumption, c_t, and public consumption, g_t.[9]

Setting the derivative of (14.13), with respect to K_t, equal to zero, yields

$$-[1 + r^*(1 - \tau_N^*)]^{-t+1} + [1 + r^*(1 - \tau_N^*)]^{-t} [F_K(K_t, 1 - L_t) + 1 - \delta_K] = 0.$$

Hence:

$$F_K(K_t, 1 - L_t) - \delta_K = r^*(1 - \tau_N^*). \qquad (14.14)$$

Equation (14.14) implies that under the optimum tax regime the net (after depreciation) marginal product of capital must be equal to the 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:

$$r_t(1-\tau_{Dt}) = r^*(1-\tau_N^* - \tau_{At}). \qquad (14.15)$$

Matching up conditions (14.12), (14.14) and (14.15), 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 $\tau_{Dt} = \tau_{At}$). Thus, at the optimum, investment is *efficiently* allocated between the home country and the rest of the world: the production efficiency result.[10]

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

$$\begin{aligned}\beta^t\{u_c(c_t,L_t) - \phi[u_{cc}(c_t,L_t)c_t + u_c(c_t,L_t) - u_{cL}(c_t,L_t)(1-L_t)]\}\\ = \mu[1+r^*(1-\tau_N^*)]^{-t},\end{aligned} \qquad (14.16)$$

$$\begin{aligned}\beta^t\{u_c(c_t,L_t) - \phi[u_{cx}(c_t,L_t)c_t - u_{cc}(c_t,L_t)(1-L_t) + u_L(c_t,L_t)]\}\\ = \mu[1+r^*(1-\tau_N^*)]^{-t}F_t(K_t,1-L_t),\end{aligned} \qquad (14.17)$$

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 (absence of consumption tilting, see Chapter 5), that is:

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

or:

$$r^{*}(1 - \tau_N^{*}) \;=\; \beta^{-t} - 1. \qquad (14.18)$$

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

$$(P_t/P_{t+1}) - 1 \;=\; (1 - \tau_{Dt+1})\,r_{t+1}$$

(see condition (14.7)).

Thus:

$$(1 - \tau_D)\,r \;=\; \beta^{-1} - 1 \;=\; r^{*}(1 - \tau_N^{*}),$$

by equation (14.18). 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. This is essentially the results of Chamley (1986) and Judd (1985).

14.3 Zero Tax at Any Moment

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. We show that in this case it will be efficient to abolish altogether the tax on capital income immediately, if capital mobility cannot be restricted.

To see this, note that with no tax on foreign source income ($\tau_A = 0$), the arbitrage condition (14.15) becomes:

$$(1-\tau_{Dt})r_t = (1-\tau_N^*)r^*. \qquad (14.19)$$

Matching up (14.19) with (14.12) and (14.14) implies that:

$$\tau_{Dt} = 0, \qquad t = 0, 1, 2, \ldots$$

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.

14.4 Reinstating the Tax on Capital Income

When foreign-source income cannot be taxed, another possibility is to try to contain capital of residents within the national boundaries and tax it. Can such "nonliberal" policy be efficient?

The answer is in the affirmative! Starting from a case where capital is freely mobile and hence efficiently untaxed, the net marginal product of domestic capital is equal to the world rate of interest (net of foreign tax); see equation (14.14). At this point the domestic economy loses nothing in terms of GNP by marginally shifting the capital of home residents from abroad to home (by introducing a quota on capital exports). On the other hand, such a shift increases the capital income tax base, thereby allowing a reduction of the tax rates on all other sources, for a given level of public consumption (and, consequently, given tax revenue needs). Such a reduction in the tax rates must raise welfare. Put differently, a forced reduction in capital exports starting from this initial point amounts, essentially, to a lump-sum transfer of income from the representative consumer to the government, brought about by the expansion in the tax base. Such a transfer must improve welfare because with distortionary finance the social value of a marginal dollar in the hands of the government must exceed the social value of this dollar in the hands of private consumers.

How severe should the restrictions on capital exports be? Should capital exports be banned altogether? If, under autarky, r is close to $r^*(1-\tau_N^*)$, then there is little gain for society as a whole from investing abroad, because this gain is equal only to the difference between $r^*(1-\tau_N^*)$ and r_t. However, the private sector can still gain considerably from investing abroad if $r_t(1-\tau_D)$ is considerably below $r^*(1-\tau_N^*)$. Therefore, a significant quantity of capital may fly abroad, and the government will lose a significant amount of tax revenues from such an outflow of capital. Therefore, in this case, it may be efficient to totally disallow exports of capital.

No capital-income tax, whatsoever, can efficiently be 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 resulting 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. Countries therefore should have strong incentives to coordinate their tax collection activities so as to enforce taxation of foreign-source income. In the absence of such coordination each country may do well by trying to contain its residents' capital within its national borders, at least partially. These considerations are not restricted to the Chamley-Judd steady-state framework, which has limited relevance for policy design. Rather, they apply to the on-going policy making.

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1. See Christiansen, Hagen and Sandmo (1994) for an interesting discussion of the scope of taxation in an open economy.

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

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

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

5. 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.

6. 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.

7. It is well known that the solution obtained depends on the credibility of government which must promise never again to tax away all of the existing capital income. That is, it is a full commitment solution.

8. This specification of the net cash flow of the firm assumes that the depreciation allowance for tax purposes is equal to the true economic depreciation (δ).

9. For simplicity, it is assumed that the foreign tax rate (τ_N^*) and the world rate of interest (r^*) are constant over time.

10. 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.