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OPTIMAL TAXATION OF INTERNATIONAL INCOME
FLOWS

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1. INTRODUCTION

Taxation problems arise with respect to international income flows because economic units earn income in one country but live in another. It is therefore possible that the unit could be taxed twice, once in each country. This has been regarded as undesirable.

The response has been to develop international tax conventions to avoid "double taxation". These conventions are often made explicit in bilateral international tax agreements. It is argued in this paper that the opposite of current practice is appropriate. Presuming that the target of each country is to raise revenue at minimum deadweight cost, it is shown that explicit cooperation of the type currently observed may not be required for optimal results and that it is generally optimal to tax income twice.

Questions about the optimum system for taxing international income flows and the rate to apply have been the subject of previous work (see Caves (1982, ch.8) for a review). The model used here is based on MacDougall (1960). The optimal tax treatment of income flows by a capital exporting country was examined by Musgrave (1969). Corden (1967, 1974) derived optimal tax rules for a capital importer in some special cases. Musgrave (1969) and Horst (1980) have examined the optimal tax on international income flows which maximises the joint surplus of the capital exporter and importer for given domestic tax rates in each country.

This literature has not recognised the general optimality of

double taxation nor the possibility that unilateral action can achieve the optimal result. These results are derived here by combining aspects of previous work. The method used is to derive optimal tax rates from the perspective of a capital importer and exporter and compare these to the world point of view. Optimal tax rules are derived for a capital importer given a variety of tax systems in the capital exporting country. Revenue targets of capital importers and exporters are made explicit and taxes on both domestic and international income flows are varied simultaneously.

The analysis is restricted to a partial equilibrium model. This approach seems a reasonable first step, given the existing literature. Also the integration of the partial equilibrium models provided here is sufficient to generate striking results about the optimality of taxing an income flow twice and about the possibility that unilateral action by factor importing and exporting countries can lead to an optimum solution. A topic for further work is to extend the analysis to a general equilibrium model (Kemp, 1966; Jones, 1967; Hartman, 1980).

The plan of the paper is that tax rules which could be used are defined in the next section. Then the optimum rules are derived, first, from the perspective of an individual country, either a capital importer or capital exporter. Then the optimum taxes are derived from the joint perspective of a capital importer and a capital exporter. The method used in all cases is to set taxes to minimise the deadweight costs of achieving a revenue target. The discussion refers to capital but would apply to internationally mobile labour.

2. INTERNATIONAL INCOME TAX SYSTEMS

Systems that can be applied are listed in Table 1 with the effective tax rate under each.

Exemption

Under the exemption system, income is taxed in only one of the countries concerned. If the exemption is given by the country of destination of the income flow, only the tax rate at the origin will apply. The income is then exempt from the tax in the home country of the investor.

Credit

Under this system, tax paid in one country is allowed as a credit against the tax liability in another. This means, for example, income earned in country O would be taxed at t_O . In D, the tax rate t_D could apply to all income but the tax paid in O would be a credit (credit based on origin). Hence the actual rate paid would be the maximum of t_O and t_D .

Deduction

The foreign tax is allowed as a deduction against taxable income. As evident in Table 1, the deduction system gives less relief than the other systems.

Double Taxation

The effective tax rate is the sum of the tax rates in the two countries.

TABLE 1^a
TAXATION RULES AND RATES

RULE	RATE
<u>Exemption</u>	
(i) given by country of origin ^b	t_D
(ii) given by country of destination ^c	t_O
<u>Credit</u>	
(i) based on country of origin	$\text{Max } (t_D, t_O)$
(ii) based on country of destination	$\text{Max } (t_D, t_O)$
<u>Deduction</u>	
	$t_D + t_O(1-t_D)$
	$= t_O + t_D(1-t_O)$
<u>Double Taxation</u>	$t_D + t_O$

Notes: (a) Based on Adams and Whalley (1977), Table 2, p.54

(b) Origin of income flow (O)

(c) Destination of income flow (D)

3. OPTIMUM TAXATION RULES
- 3.1 Single Country Perspective
- 3.1.1 Capital Importer

Tax rules are now derived from the perspective of a single country, initially the capital importer. The country's problem is to set taxes so as to raise a target level of revenue at minimum

deadweight cost. This is the type of problem specified in the optimum taxation literature (Atkinson and Stiglitz, 1980). It is assumed here that the only tax base to which policy makers have access is income from capital. They can vary two taxes, one on income earned by domestically owned capital and the other on income earned by foreign owned capital.

The stock of capital is the sum of foreign owned stock (M) and locally owned stock (S). The value of output is

$$V = V(S+M)$$

The cost of the locally owned stock is

$$C = C(S)$$

It is assumed there is no divergence between social and private values and costs. The tax applying to income from locally owned capital is t so, at the margin,

$$V_1(1-t) = C_1$$

where the subscript denotes a derivative.

Let $f(M)$ be the schedule of net-of-all-tax returns required by capital exporters. This schedule depends on investment opportunities and taxes in the domestic sector of the capital exporting country. Suppose n^* is the tax applied to international income receipts by the government of the capital exporting country. Both $f(M)$ and n^* are fixed from the point of view of the capital importer. The cost of the foreign owned capital depends on whether the capital exporting country operates an exemption, credit or deduction system.

Suppose the capital exporting country exempts income earned by foreign investment if it has already been taxed by the capital

importing country. Then the capital importer faces a cost of capital schedule of $f(M)$. The tax (n) which it applies to income earned by the foreign owned stock is defined by

$$V_1(1-n) = f(M)$$

If the capital exporting country operates the deduction system, then capital exporters will require $f(M)/(1-n^*)$ net of taxes by the capital importing country to compensate them for investing overseas. In this case the tax imposed by the importing country is defined by

$$V_1(1-n) = f(M)/(1-n^*)$$

If the exporting country operates the credit system, capital exporters will require gross earnings of at least $f(M)/(1-n^*)$ to compensate them for investing overseas. The host country can still impose a tax but if its rate is less than n^* , the difference $(n^* - n)$ will be taken by the capital exporting country. The importing country can, therefore, raise more revenue without affecting the capital flow by raising its tax rate to n^* . Thus it always pays the importing country to tax at rate n^* . Under this arrangement the effective tax rate is determined by the capital exporting country. The importing country can undo this effect by simultaneously paying a subsidy and collecting tax at a rate $n=n^*$. In that case, the size of the capital stock increases, the gross rate earned by the capital falls but the gross rate reported by the foreign investor is unchanged since the difference is made up by a subsidy. If the subsidy rate is s , the effective tax rate becomes $(n-s)$. By this mechanism, the credit system becomes equivalent to the exemption system.

In all cases, tax revenue of the importing country is

$$R = tV_1S + nV_1M$$

The problem of the importing country is summarised by the Lagrangean

$$(1) \quad L = V(S+M) - C(S) - Mf(M)/(D_1(1-n^*)) + a(tV_1S+nV_1M-R) \\ + b(V_1(1-t)-C_1) + e(V_1(1-n) - f(M)/(D_1(1-n^*))).$$

$D_1 = 1$ if the deduction system applies and is zero otherwise.

The decision variables are S , M , t and n .

The relationship between optimal n and t is defined by

$$(2) \quad nV_1 = Mf_1/(D_1(1-n^*)) + (tV_1)V_{11}(S+M)/(V_{11}(S+M)-SC_{11})$$

The first term in this expression reflects the market power of the capital importing country. When $f_1 > 0$, it pays to raise the tax so as to lower the cost of imported capital (Kemp, 1962, McCormick, 1982). If $f_1 = 0$, equation (2) becomes

$$(3) \quad n = t.A$$

$$\text{where } A = V_{11}(S+M)/(V_{11}(S+M)-SC_{11})$$

Since $V_{11} < 0$ and $C_{11} > 0$, A is positive but less than unity. Hence $n < t$. Therefore, at the optimum in the small country case, income from imported capital should be taxed at a lower rate than income from locally owned capital.

Equation (3) can be interpreted by imagining the only tax in place is the tax on income from locally owned capital. This tax would create a distortion because the size of that stock would be too small. The decrease in the locally owned stock would be offset by an increase in imports and there would be no distortion of the size of the total stock of capital. If a tax is now imposed on income from foreign-owned stock, the size of the total stock of capital in the importing country will shrink and a

second distortion will be created. This distortion depends on the tax rate n . As the total stock of capital declines, its marginal product rises. This increases the net return to locally owned capital and the stock of that capital increases which reduces the extent of the first distortion. The size of the first distortion is related to the difference between the tax rates $(t-n)$. At the optimum, the marginal costs of the distortions should be equal.

Equation (3) can be rearranged as equation (4) to illustrate this point -

$$(4) \quad (T-N)/N = e_v/e_c$$

where $T = t/(1-t)$, $N = n/(1-n)$, e_v is the elasticity of the marginal product curve ($e_v = -V_1/((S+M)V_{11})$) and e_c is the elasticity of the supply of capital curve ($e_c = V_1(1-t)/(C_{11}S)$). Hence the greater is the elasticity of the marginal product curve, the greater should be the surcharge $(t-n)$ relative to n . This is a standard elasticity result for setting tax rates to minimize the costs of achieving a revenue target.

The result that $t > n$ can be explained by examining some special cases. Suppose the supply curve is perfectly inelastic ($e_c = 0$). In that case, all revenue can be raised through a tax on income from the locally owned stock and n should be zero. Alternatively, suppose the marginal product curve is perfectly inelastic ($e_v = 0$). Then revenue can be raised without distortion by taxing income from the two stocks at equal rates ($t=n$). The general case will lie between these extremes so that $t > n$ at the optimum.

3.1.2 Capital Exporter

The country exporting capital generally provides tax relief. Hence the capital exporter can be regarded as facing a schedule of net-of-foreign-tax returns denoted by $g(X)$, where X is the exported stock of capital. Let S^* be the total stock of capital owned by the capital exporter then surplus is

$$V^*(S^*-X) + g(X).X - C^*(S^*)$$

The capital exporter is assumed to impose a tax t^* on income from capital invested at home so

$$V_1^*(1-t^*) = C_1^*$$

The problem is how to maximize surplus by varying t^* and n^* , which is the tax applied to income from stock invested overseas and where

$$g(1-n^*) = C_1^*$$

so as to attain a revenue target. Total revenue is defined by

$$R^* = t^*V_1^*(S^*-X) + n^*gX$$

At the optimum the relationship between the taxes is given by

$$(5) \quad n^*g = -Xg_1 + t^*V_1^*C_{11}^*S^*/(C_{11}^*S^*-V_{11}^*(S^*-X))$$

The first term in equation (5) reflects the market power of the exporter. The tax n^* should be greater the larger is the fall in returns to exports for a marginal increase in exports. Assuming $g_1=0$, equation (5) can be written as

$$(6) \quad n^*/(1-n^*) = B.t^*/(1-t^*)$$

where $B = C_{11}^*S^*/(C_{11}^*S^*-V_{11}^*(S^*-X))$. Since $B < 1, n^* < t^*$.

The nature of the result can be highlighted by redefining (6) in terms of elasticities as in equation (7),

$$(7) \quad (t^* - n^*)/n^* = e_c^*/e_v^*$$

where e_c^* is the elasticity of the supply curve of capital in the exporting country ($e_c^* = g(1-n^*)/(S^*C_{11}^*)$) and e_v^* is the elasticity of the marginal product curve ($e_v^* = -V_1^*/((S^*-X)V_{11}^*)$). When $e_c^* = 0$, the supply of capital is perfectly inelastic and income from domestic and foreign investment should be taxed at the same rates ($t^* = n^*$). When $e_v^* = 0$, all revenue required can be raised without cost by taxing income from domestic investment so $n^* = 0$. The general case lies between these extremes so $t^* > n^*$.

3.2 World Welfare

Optimum tax rates have been derived above using the perspective of individual countries. In this section, these rules are compared to those which maximize world welfare.

The method used is to treat the two countries as if they were separate regions of one country. The policy-makers can then impose three taxes. The first two correspond to t and t^* in the individual country model. The third is a tax on the income flow between the two regions. This tax is denoted by I and it is equal to the gap between the gross return in the capital importing region and the marginal cost of the unit of capital in the exporting region. Thus

$$V_1(1-I) = C_1^*$$

In terms of earlier notation, it must be true in the world model that $X = M$. Thus tax revenue raised is

$$R = tV_1S + t^*V_1^*(S^*-M) + IV_1M$$

The revenue is collected by one authority and then transferred to each region. The Lagrangean for this optimal taxation problem is

$$\begin{aligned}
(8) \quad L = & V(S+M) - C(S) + V^*(S^*-M) - C^*(S^*) \\
& + a(tV_1S + t^*V_1^*(S^*-M) + IV_1M - R) \\
& + b(V_1(1-t) - C_1) \\
& + e(V_1^*(1-t^*) - C_1^*) \\
& + j(V_1(1-I) - C_1^*)
\end{aligned}$$

In the solution to this problem, the relationship between the tax rates is given by

$$(9) \quad IV_1 = tV_1A + t^*V_1^*B$$

The absolute tax in the world welfare optimum can be compared to the sum of the absolute taxes imposed unilaterally by the capital importing and exporting countries. Summing equations (2) and (5) and substituting A and B gives Z where

$$(10) \quad Z = tV_1A + t^*V_1^*B + X[f_1/(D_1(1-n^*)) - g_1]$$

The term in square brackets reflecting market power is always non-negative ($f_1 > 0, g_1 < 0$). However, if countries act as if they have no influence over world prices, comparison of (9) and (10) indicates that the results of unilateral action can correspond to the world welfare optimum.

Equation (9) can be further manipulated to show that

$$(11) \quad I = n^* + n(1-n^*)$$

Equation (11) indicates that the optimum tax rate I from a world point of view is the sum of the tax rates imposed unilaterally under a deduction system, when countries behave as if they have no market power. Generally, therefore, some double taxation is optimal.

Horst (1980) applied a number of special cases of the model used here to discuss the rationale for various tax systems, such

as a credit, exemption or deduction system. Not noted by Horst was the optimality of the deduction system.

For example, Horst considers a case where $e_c = e_c^* = 0$. The supply of capital is fixed in both countries so the problem is to optimally allocate the fixed world stock. The result is that $I = t^*$, the tax rate in the exporting country. This result can be derived by substituting the zero elasticity values into (4) and (7) and then substituting optimal n and n^* into (11). This result is called capital export neutrality, where the tax system does not distort exporters' decisions on how to use their funds. This rule applies in Hamada's (1966) model. Inspection of equation (7) indicates that when $e_c^* = 0$, the exporting country will have set its rate equal to t^* , so the world optimum can be achieved by unilateral action.

This result could also be attained by a negotiated credit system, as noted by Horst (1980). The credit system would operate when international tax rules establish the host country has first right to tax. In the conditions of this case, the host country should limit its tax (n) to no more than $n^* = t^*$. The allocation of capital will be the same but the distribution of tax revenue will shift in favour of the host country, compared to the results of unilateral action under the deduction system. The point of this paper is that the type of negotiation which often characterises the credit system is not required to achieve an efficient result in this and more general cases.

4. CONCLUSION

The optimal taxation of international income flows continues to be a topical issue. In this paper, characteristics of the optimal system to apply to international income flows and the rates within that system were derived.

The first result was that, from the perspective of an individual country, optimal taxation rules will generally involve some concessional tax treatment of international income flows either out of or into the country. These flows will be taxed at the same rate as domestic flows only if the supply curve of capital is perfectly inelastic, in the case of a capital exporting country, or if the demand curve is perfectly inelastic in the case of a capital importing country. In either case, the tax on the international flow does not lead to a distortion but must be set equal to taxes on internal flows, in order to obtain neutrality in sources (importing country) or uses (exporting country) of funds.

The second result was that unilateral action by each country using a deduction system can attain the world welfare optimum. This result is contrary to current practice which stresses that double taxation of income is undesirable and which uses explicit cooperation between countries to avoid it. These results only apply if countries act as if they have no market power. While the results appear inconsistent with the current form of international tax agreements, a rationale for some type of agreement could be to avoid exploitation of market power and subsequent strategic responses (Hamada, 1966, Feldstein and Hartman, 1979).

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