ELSEVIER Journal of International Economics 42 (1997) 149–165

Journal of INTERNATIONAL ECONOMICS

Capital income and profit taxation with foreign ownership of firms

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Received 11 May 1995; revised 5 September 1995; accepted 23 April 1996

Abstract

This paper establishes optimal rules for capital income and profits taxation in the open economy with or without foreign ownership of domestic firms. We show that if there are constraints on the feasibility of profits taxation, both saving and investment taxes generally enter the optimal tax package. If instead profits can be fully taxed, then source-based investment taxes vanish. If domestic firms are in part owned by foreigners, then source-based investment taxes can be used to shift income away from these to domestic citizens and they may even be used to finance lump sum transfers to domestic residents. ©1997 Elsevier Science B.V. All rights reserved.

Key words: Capital income taxation; Foreign firm ownership

JEL classification: F21; H21

1. Introduction

This paper characterizes the optimal taxation of capital income and profits in a small open economy. The optimal saving and investment tax rates, in particular,

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0022-1996/97/$17.00
PII S0022-1996(96)01449-3

are related to the degree of foreign ownership of domestic firms and to the extent to which a profit tax is feasible. We show that a government optimally does not apply a source-based tax on investment or capital[1] if profits can be fully taxed. An investment tax is, however, generally part of the optimal tax package in the absence of complete profit taxation. The optimal investment tax rate, if positive, is shown to decline with the feasible rate of profit taxation. At the same time, a higher foreign ownership of domestic firms increases the scope for the investment tax, if profits are not completely taxed.

The previous literature (see, for example Gordon (1986, p. 1096), Frenkel et al. (1991) and Bruce (1992b)) finds that small countries optimally do not apply source-based investment taxes, if there are no restrictions on the set of available tax instruments. This finding can be seen as an application of the Diamond and Mirrlees (1971) principle of striving for production efficiency. Frenkel et al. (1991, p. 103) specifically note that "the necessary conditions for the attainment of the result is that all commodities (including labour) and all profits and rents be taxable; in particular, depending on the government's budgetary needs these profits and rents may be fully taxed away." Bruce (1992a) clarifies the role of the profit tax for capital income tax policy, using the partial equilibrium framework in Findlay (1986). Giovannini (1989, p. 367), Apel and Dillén (1994, p.2) and Huizinga (1995) similarly find that neither the pure source nor the pure residence principle of capital income taxation is optimal if profits cannot be fully taxed.[2]

This paper explicitly investigates how the optimal mix of residence and source level capital income taxes depends on the feasibility of profit taxation and also on the foreign ownership of domestic firms. The feasible rate of profit taxation is given exogenously which reflects that institutional and other constraints may prevent it from being 100%.

The paper is organized as follows. Section 2 describes the two-period model of a small open economy. The country may levy source- and residence-based capital income taxes, and it may at least in part tax away profits. Section 3 derives the optimal rates of source- and residence-based capital income taxes for the general case where part of domestic firms are owned by foreigners. In this instance, lump-sum transfers from the government to the country's residents may well be part of the optimal tax scheme. Section 4 presents some comparative statics results concerning how the optimal rate of investment tax varies with the maximum rate of profit tax and the share of foreign firm ownership. Section 5 concludes.

[1] According to the source principle, a tax is levied where the income originates, while according to the residence principle the income is taxed where it is received.

[2] Apel and Dillén (1994) specifically examine the merits of the polar cases of the residence and source principles in a multi-country setting, when profits can be taxed fully, not at all, or at the same rate as interest.

2. The model

The model extends in several ways the work in Huizinga (1995).[3] We consider a two-period model of a small open economy that is financially well integrated with the rest of the world. The domestic interest rate equals the exogenously given world interest rate, r. In the first period, the representative domestic agent receives an endowment of the single good denoted Y. These resources are divided between first-period consumption, C_1, and saving, S. The economy's firms invest K in the first period. This investment is productive only in the second period. A share α, with $0 \leq \alpha \leq 1$, of domestic firms is assumed to be owned by foreigners. This is also the share of after-tax profits of domestic firms accruing to foreign citizens.

The government requires second-period revenues equal to G. These government revenues are spent entirely on goods that do not directly affect private utility or production (think of this, for example, as defense expenditure). The government has three tax instruments at its disposal in the second period: a tax on the returns to saving at a rate t_s, a tax on the returns to capital investment at a rate t_k, and a profit tax at a rate z. The tax t_s has the effect of lowering the net return to saving, while the tax t_k on investment increases the effective user cost of capital to $(1 + r/(1 - t_k))K$.[4] Finally, let T, with $T \geq 0$, be the size of a government transfer, if any, to domestic households. As we shall see below, the transfer to domestic private agents is generally part of the optimal fiscal scheme, if the optimal profit and investment tax revenues exceed the government's second-period revenue requirement, G.[5]

2.1. Firms

Firms produce output equal to $F(K)$ units in the second period. The production function F is assumed to be strictly concave. As already mentioned, given the world rate of interest and the taxation of investment, the user cost of capital is

[3] Huizinga (1995) does not consider the taxation of profits or the foreign ownership of domestic firms in the small open economy.

[4] With this rental price of capital, the investor receives a return after depreciation and investment taxation (but before a possible savings tax) equal to the international interest rate. We ignore foreign taxes on any foreign suppliers of capital. Similarly, foreign suppliers of capital do not receive a foreign tax credit at the margin for domestic investment taxes.

[5] For most of the discussion we assume that lump-sum transfers to domestic private agents are possible, even though lump-sum taxes are not. Stiglitz and Dasgupta (1971, p. 160, fn. 1) suggest that a reason for this asymmetry in practice perhaps is that when individuals are not identical, lump-sum transfers are progressive in their effect on distribution, while lump-sum taxes are generally regressive. The issue of profit taxation with heterogeneous agents is taken up in Dasgupta and Stiglitz (1972). The implications for the optimal tax scheme of the absence of lump-sum transfers in the present paper are discussed in Section 3.

$(1+r/(1-t_k))K$. After-tax profits of firms then amount to $(1-z)[F(K)-(1+r/(1-t_k))K]$.[6] We here assume that the investment tax is deductible from the profit tax. In actual tax systems, profit-like taxes may instead be deductible from investment-like taxes. The maximization of these profits on the part of firms yields that the capital stock is given by,

$$F'(K) = 1 + \frac{r}{1-t_k} \tag{1}$$

2.2. Households

The two-period budget constraint of households can be stated as follows,

$$C_2 = (Y - C_1)[1 + r(1-t_s)] + (1-z)(1-\alpha)\left[F(K) - \left(1 + \frac{r}{1-t_k}\right)K\right] + T$$

Second-period consumption of households equals the sum of saving, from the previous period, that part of after-tax profits which accrues to domestic citizens, and the government transfer, if any.

Households maximize a life-time utility denoted by $U(C_1,C_2)$. The first-order condition regarding the intertemporal consumption choice is as follows,

$$U_1 = U_2[1 + r(1-t_s)] \tag{2}$$

2.3. The government

The government's second-period tax revenues have to cover the sum of government spending, G, and government transfer, T, as follows,

$$0 < G + T = t_s rS + \frac{t_k r}{1-t_k}K + z\left[F(K) - \left(1 + \frac{r}{1-t_k}\right)K\right] \tag{3}$$

The two capital income taxes, t_k and t_s, are both levied on the return to capital. Alternatively, we can define a tax on saving at a rate $u \equiv rt_s$, and a tax on investment at a rate $v \equiv rt_k/(1-t_k)$. In the analysis below, it will be convenient to characterize optimal tax policy first in terms of these direct taxes on saving and on investment. The tax revenues from the direct taxes on saving and on investment equal uS and vK, respectively.[7]

Finally, we assume that the profit tax rate, z, cannot exceed its maximum $\bar{z}$, i.e. $z \leq \bar{z}$. The maximum profit tax rate, $\bar{z}$, in turn cannot exceed one.

[6] The tax base for the investment tax t_k is $[F'(K)-1]K$. If instead the tax base were taken to be $F(K)-K$, then after-tax firm profits would be given by $(1-\hat{z})[F(K)-(1+r/(1-t_k))K]$ with $\hat{z} = 1-(1-z)(1-t_k)$, so that the analysis below would be materially unchanged.

[7] Note that $t_s = u/r$, while $t_k = v/(r+v)$.

3. Optimal taxation of capital and profits with foreign firm ownership

The government wishes to maximize the utility of the representative domestic agent subject to its minimum revenue requirement. Through most of this section we assume that the foreign ownership share, α, is positive. At the end, we briefly consider the case of α equal to zero.

The optimal tax problem is one of choosing the tax rates z, u and v as well as the transfer T so as to maximize the following Lagrangean expression,[8]

$$L = U(C_1,(Y - C_1)(1 + r - u) + (1 - z)(1 - \alpha)[F(K) - (1 + r + v)K] + T) + \lambda(uS + vK + z[F(K) - (1 + r + v)K] - G - T) + \mu(\bar{z} - z) + \nu T$$

where λ, μ and ν are the Lagrange multipliers associated with the government budget constraint (Eq. (3)), the maximum profit tax, $\bar{z}$, and the non-negativity of the lump-sum transfer, T.

Let us first consider the profit tax, z. It is clear that this tax does not influence firm behavior. In addition, with foreign ownership of domestic firms, the profit tax in part serves to shift income from the foreign owners of domestic firms to the domestic government. As a result, we can show that the profit tax rate, z, is optimally set equal to its maximum value, $\bar{z}$. To this end, let us consider the derivative of the Lagrangean with respect to z,

$$\frac{\partial L}{\partial z} = [F(K) - (1 + r + v)K][\lambda(1 + (1 - \alpha)up) - U_2(1 - \alpha)] - \mu = 0 \qquad (4)$$

The Lagrange multiplier λ in Eq. (4) can be interpreted as the marginal cost of public funds measured in terms of private utility, while U_2, of course, is the marginal utility of second-period consumption. The variable p is the propensity to consume in the first period out of second-period income.[9]

If the profit tax rate, z, is set below $\bar{z}$, then the associated Lagrange multiplier μ equals zero. From Eq. (4), we see that this implies that $\lambda = U_2(1 - \alpha)/[1 + (1 - \alpha)up]$ so that $\lambda < U_2$. Turning to the derivative of the Lagrangean with respect to T,[10]

[8]We observe, without explicitly indicating so in the expression, that consumption, saving and investment are all implicit functions of tax rates. Moreover, we invoke the first-order conditions (Eq. (1) and Eq. (2)) in the following.

[9]An unimportant model property renders the profit tax even more attractive than normally. The tax is only levied in the second period, while private saving takes place in the first. An increase in the profit tax rate by one unit then lowers second-period income of households by $(1 - \alpha)[F(K) - (1 + r + v)K]$, leading to a rise in saving equal to $p(1 - \alpha)[F(K) - (1 + r + v)K]$ and, with u positive, also to an increase in the revenue from saving taxation. This mechanism is represented by the term $(1 - \alpha)up$ in Eq. (4).

[10]Due to the model property mentioned in footnote 9, the transfer T strictly speaking is not lump sum in general, as a change in T may affect saving and hence the revenue from the saving tax.

$$\frac{\partial L}{\partial T} = U_2 - \lambda(1 + up) + \nu \leq 0 \tag{5}$$

we see, however, that λ must be at least as large as $U_2/(1 + up)$, which is greater than $U_2(1 - \alpha)/[1 + (1 - \alpha)up]$, when $\alpha > 0$. This contradiction with the earlier equality establishes the following result.

Proposition 1. With foreign ownership of domestic firms, the profit tax, z, is optimally set equal to its limit $\bar{z}$, regardless of the government revenue requirement, G.

Another, perhaps more intuitive, explanation of the proposition is as follows. An increase in the profit tax, coupled with an equal-size increase in the transfer, leaves all prices faced by agents unchanged, but it raises second-period income of domestic citizens. Hence, the profit tax should be carried to its limit.

With $z = \bar{z}$, we can obtain expressions for the the optimal size of the saving and investment tax rates, u and v, as follows. We first differentiate the Lagrangean with respect to u and find,

$$-U_2 + \lambda(1 - ue_u) = 0 \tag{6}$$

where we have introduced the semi-elasticity $e_u \equiv -(\partial S/\partial u)/S$. Note that $e_u^c \equiv e_u + p > 0$ is the compensated semi-elasticity of saving with respect to the tax on saving. A consequence of Eq. (5), Eq. (6) and the fact that $e_u^c > 0$ is that $T > 0$ implies $u = 0$, while $u > 0$ implies $T = 0$. Hence, optimal tax policy cannot simultaneously feature positive transfers and saving taxes.

Differentiation of the Lagrangian with respect to v yields,

$$U_2(-(1 - \bar{z})(1 - \alpha)) + \lambda((1 - \bar{z})(1 + (1 - \alpha)up) - e_v v) = 0 \tag{7}$$

where $e_v \equiv -(\partial K/\partial v)/K$[11]

After combining Eq. (6) and Eq. (7) we get,

$$\lambda[u(1 - \alpha)e_u^c - e_v v/(1 - \bar{z}) + \alpha] = 0$$

Observing that λ is positive, we can express v in terms of u as follows,

$$v = (1 - \alpha)\frac{(1 - \bar{z})ue_u^c}{e_v} + \alpha\frac{(1 - \bar{z})}{e_v} \tag{8}$$

Note that the optimal investment tax, v, in the absence of foreign ownership of firms is given by $(1 - \bar{z})ue_u^c/e_v$, while the optimal investment tax with full foreign ownership is equal to $(1 - \bar{z})/e_v$ (this rate maximizes total revenue from taxation

[11]In deriving Eq. (6) and Eq. (7), we use the facts that K depends on v, while S depends on both u and v. The term $(1 - \bar{z})(1 - \alpha)up$ in Eq. (7) is equal to $(\partial S/\partial v)(u/K)$.

of profits and investment). The first term is a familiar elasticity rule stating that the relation between the tax on savings and the tax on investment depends on the relative size of the interest elasticity of investment and the compensated interest elasticity of savings. The elasticity rule is modified by the second term, reflecting the additional incentive to tax foreigners by way of the investment tax. The negative relationship between either part of the optimal investment tax and the maximum profit tax rate, $\bar{z}$, clearly indicates that the investment tax, v, serves as a substitute profit tax. The general optimal investment tax in Eq. (8) evidently is a weighted average of the two extreme optimal tax rates, with weights equal to the domestic and foreign firm ownership shares. From Eq. (8) and the financing constraint we can solve for the saving and investment tax rates as follows,[12]

$$u = \frac{(G + T - \bar{z}[F(K) - (1 + r)K])e_v - (1 - \bar{z})^2 K\alpha}{e_v S + (1 - \bar{z})^2 K(1 - \alpha)e_u^c} \tag{9}$$

and

$$v = \frac{(1 - \bar{z})[(G + T - \bar{z}[F(K) - (1 + r)K])(1 - \alpha)e_u^c + \alpha S]}{e_v S + (1 - \bar{z})^2 K(1 - \alpha)e_u^c} \tag{10}$$

The expressions for u and v in Eq. (9) and Eq. (10) give the optimal saving and investment tax rates, if these tax instruments are used. In several cases, however, one or both of these tax instruments is optimally not in use, depending in part on the size of the maximum profit tax revenue relative to the government revenue requirement. It is convenient to distinguish the two cases where the maximum profit tax rate, $\bar{z}$, is equal to and less than 1.

3.1. Case I: Complete profit taxation

If profits can be taxed fully with $\bar{z} = 1$, then the source-based tax, v, is optimally set equal to zero, as can be seen from Eq. (10). Regarding the optimal savings tax, u, two cases can be distinguished depending on the size of the maximum profit tax revenues relative to the governent revenue requirement, G. First, if maximum profit tax revenues, given by $F(K) - (1 + r)K$, exceed (or are equal to) the required revenue G, then the difference is returned to domestic residents in the form of a lump-sum transfer, T. This implies that $T = F(K) - (1 + r)K - G \geq 0$. In this instance, the optimal saving and investment tax rates, u and v, are both equal to zero from Eq. (9) and Eq. (10). Second, maximum profit tax revenues, $F(K) - (1 + r)K$, are less than the government revenue requirement, G. Again, Eq. (10) indicates that the optimal investment tax rate, v, equals zero. As a consequence,

[12] From these one can derive the formulas for the source- and residence-based capital income tax rates t_s and t_k; we shall leave this to the reader, though. The reader may also want to write the formulas using elasticities rather than semi-elasticities.

the government will resort to a positive saving tax to meet its revenue requirement. It is straightforward that the optimal saving tax, u, is given by $(G - F(K) + (1 + r)K)/S$. With a positive saving tax, the marginal cost of public funds exceeds the marginal utility of private consumption. The optimal transfer, T, is thus set equal to zero.

3.2. Case II: Incomplete profit taxation

In practice, complete profit taxation is rare for various reasons. First, the tax authority may have difficulty distinguishing between pure profits and the return to capital investment, in which case full profit taxation is possible but not desirable. Second, full profit taxation may be impossible, if there are institutional or legal restraints. Finally, significant profit taxation is precluded by tax competition, if firms are internationally mobile, and if profits or rents are firm-specific rather than location-specific. It is therefore imperative to consider optimal tax policy in the case of incomplete rent taxation with $\bar{z} < 1$.

Optimality first requires that the profit tax rate, z, is set equal to its maximum value, $\bar{z}$. Again, we can distinguish two cases on the basis of the size of maximum profit tax revenues (at a zero investment tax), $\bar{z}(F(K) - (1 + r)K)$, relative to the government revenue requirement, G.

(a) If the maximum revenues from profit taxation, $\bar{z}[F(K) - (1 + r)K]$, exceed the government revenue requirement, G, then the lump-sum transfer, T, is at least equal to the difference $\bar{z}[F(K) - (1 + r)K] - G$. The question arises of whether it is of interest to institute a positive investment tax rate, v, so as to increase the transfer, T, even further. The answer is in the affirmative, because with $v = 0$, the marginal national cost of funds associated with this tax, equal to $U_2(1 - \alpha)$, will be less than the marginal utility of consumption, U_2. In essence, the argument reflects the fact that the investment tax can be used to tranfer resources from the foreign owners of domestic firms to domestic consumers. This argument does not apply to the saving tax, u, and therefore the optimal saving tax equals zero. With $u = 0$, the optimal transfer, T, and the optimal investment tax, v, are given as follows,

$$T = \bar{z}[F(K) - (1 + r)K] + \alpha(1 - \bar{z})^2 K/e_v - G \tag{11}$$

and

$$v = \alpha(1 - \bar{z})/e_v \tag{12}$$

(b) Alternatively, maximum profit tax revenues are less than the government revenue requirement. By the same logic as in case II(a), the optimal investment tax rate, v, is at least equal to $\alpha(1 - \bar{z})/e_v$. If at this value of v, total tax revenues from production activity, i.e. $\bar{z}[F(K) - (1 + r + v)K] + vK$, exceed G, then the surplus optimally is paid out in the form of a transfer, T, to domestic citizens. In that instance, there is no rationale to institute a positive saving tax. If these total tax revenues from production activities are less than the revenue requirement, however, then further tax revenues by way of distortionary taxes are necessary. This requires that the investment tax, v, is optimally increased beyond $\alpha(1-\bar{z})/e_v$, while the saving tax, u, is optimally increased beyond zero. In this instance, the marginal cost of public revenues is raised above the marginal utility of private consumption, which implies that transfers, T, are optimally zero.

This completes the characterization of optimal tax and transfer policy in the case of foreign ownership of domestic firms. We can summarize the main insights as follows.

Proposition 2. With partial foreign ownership of domestic firms, source-based investment taxes are only part of the optimal tax scheme if profits cannot be taxed fully. Investment tax revenues may be used to finance lump-sum transfers to domestic citizens. This occurs if with $v=0$, $\bar{z}[F(K)-(1+r)K]$ *is greater than or only slightly less than G. A positive saving tax and positive transfers to the public cannot, however, coexist.*

It is interesting to observe that the optimal tax scheme implies the following result,

Corollary 1. With incomplete profit taxation and some foreign ownership of domestic firms, the saving and investment taxes will always be used to such an extent that,

$$G+T>\bar{z}[F(K)-(1+r)K] \tag{13}$$

There is an interesting parallel between Proposition 2 and earlier results on optimal commodity taxation if the use of the profit tax is restricted. Stiglitz (1987, pp. 1029–1030) remarks that with full profit taxation, the optimal commodity tax structure depends only on properties of the demand curves, and there should be no taxation of producers (which would interfere with production efficiency of the economy). However, if full profit taxation is not possible, then implicit producer taxation may be desirable, and optimal commodity taxes will also depend on supply elasticities. In our framework, the relative magnitude of demand and supply elasticities (i.e. saving and investment elasticities) likewise only enters the optimal tax formulae (Eq. (9) and Eq. (10)) if profit taxation is incomplete.

To conclude this section, let us in turn consider the special cases, where either lump-sum transfers are not available, so that $T=0$, or all domestic firms are owned at home, so that $\alpha=0$. We confine ourselves to a situation of incomplete profit taxation.

Above, we have assumed that the transfer cannot be negative, as head taxes are difficult to enforce in practice, and as they eliminate all interesting optimal tax problems. Head transfers, however, may also be prevented in practice. We therefore now consider the case where head transfers are impossible. In this instance, the optimal values of u and v are found by setting $T=0$ in Eq. (9) and Eq. (10). Above, we argued that if the government revenue requirement, G, is large relative to the maximum profit tax revenues, then optimally $T=0$. In this case, constraining the transfer, T, to be zero is, of course, immaterial.

Suppose now that optimally $T>0$, if transfers are feasible, and assume further that required government revenues, G, can be covered by profit tax revenues at a tax rate less than the maximum rate. This implies that the two capital income tax rates, u and v, could be set equal to zero. Now consider a small increase in the profit tax rate, z, and assume that the additional profit tax revenues are used to reduce the saving tax rate, u, below zero. This increases domestic welfare, as the incidence of the profit tax is in part on foreigners, and as the implicit saving subsidy is nondistortionary at $u=0$. Similarly, if maximum profit tax revenues are just insufficient to cover the government revenue requirement, G, then it pays to levy a small investment tax, v, to in part finance a small saving subsidy. In both instances, the negative saving tax serves as a second-best transfer to the private sector.

We may conclude this discussion as follows.

Corollary 2. If lump-sum transfers are infeasible, the optimal tax scheme may imply a saving subsidy, provided that maximum profit tax revenues are greater than or only slightly less than the government revenue requirement, and that firms are partly foreign-owned.

Finally, we consider the special case of no foreign ownership of domestic firms. In this instance, the optimal tax scheme changes in several respects. Lump-sum transfers will now never be part of the optimal tax policy, as is implicit in Corollary 2. If maximum profit tax revenues exceed the government revenue requirement, G, then only the profit tax is optimally used, at less than its maximum rate. Alternatively, if maximum profit tax revenues are less than the government revenue requirement, G, then the profit tax is used at its maximum rate, jointly with positive saving and investment taxes.

4. Comparative statics results

This section presents some comparative statics results that relate the optimal saving and investment tax rates to underlying model parameters. We consider how the optimal capital income tax rates depend on key model parameters such as the maximum profit tax rate and the extent of foreign ownership of domestic firms. We will assume that there is incomplete rent taxation and partial foreign ownership, i.e. $0<\alpha$, $\bar{z}<1$. As indicated above, we can distinguish case II(a) with no saving tax and a positive transfer from case II(b) with a positive saving tax and no transfer. The comparative statics for these two cases are presented in turn, with the aid of diagrammatic analysis. We only consider changes in parameters that are so small as to preclude a regime change.

4.1. Case II(a)

In this case, the optimal tax policy implies the existence of a positive transfer, T, as in Eq. (11), a positive investment tax, v, as in Eq. (12), along with a zero saving tax, u. For simplicity we take the semi-elasticity, e_v, to be constant in the following.

In the (T,v) diagram in Fig. 1 we have drawn two lines, denoted by VV and TT respectively. The horizontal line VV corresponds to Eq. (12), and it shows that the investment tax, v, on the vertical axis is independent of T on the horizontal axis for given exogenous values of α, $\bar{z}$ and G. The upward sloping TT line represents the government budget constraint, $T=\bar{z}[F(K)-(1+r+v)K]+vK-G$, giving rise to a positive relationship between v and T for given values of $\bar{z}$ and G.

The figure indicates that an increase in the foreign ownership share, α, moves the VV curve upwards. A larger share of the profits indirectly captured by the investment tax now stems from foreigners. This reduces the marginal cost of public funds at the going rate of investment tax, leading to an increase in the rate. This generates a higher total tax revenue and accordingly a higher transfer. A rise

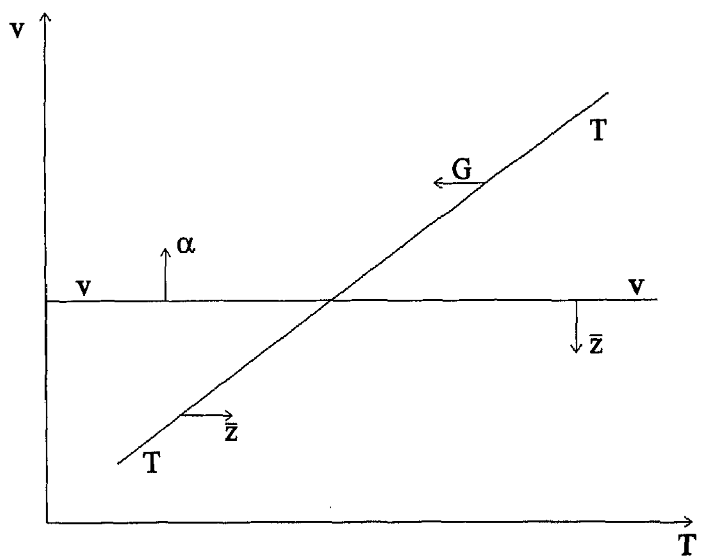

Fig. 1. The determination of T and v in case II(a).

in the maximum profit tax rate, $\bar{z}$, instead causes an outward shift of the TT curve, and a downward move in the VV curve. The higher profit tax rate implies a reduced scope for the investment tax as an indirect way to tax profits. Therefore, v unambigously falls. The rise in the maximum profit tax rate and the fall in the investment tax rate have opposing effects on total tax revenue, so that the total effect on the transfer, T, is ambiguous.

Finally, an increase in the government revenue requirement, G, can be seen to have no effect on the investment tax rate. Such an increase leads to a one-for-one fall in the transfer.[13]

4.2. Case II(b)

In case II(b) there optimally is a positive savings tax, u, but there is no positive transfer, T. The government budget constraint and the optimality condition (Eq. (8)) can now be restated as follows,

$$G = uS + vK + \bar{z}[F(K) - (1 + r + v)K] \tag{14}$$

and

$$ve_v = u(1 - \bar{z})(1 - \alpha)e_u^c + (1 - \bar{z})\alpha \tag{15}$$

From the first equation, we see that an increase in the government revenue requirement, G, can be satisfied by an increase in either the saving tax, u, or the investment tax, v. A lower profit tax rate, $\bar{z}$, similarly can be met with an increase in at least one of the two capital income tax rates, u and v. Eq. (14) is represented by the negatively sloped GG schedule in Fig. 2.[14]

Assuming that e_u, e_v and p are constant, we can represent Eq. (15) by the

[13] Note that all the comparative statics results presented for case II(a) remain as stated if generally e_v is not constant. In particular, it can be shown that

$$\frac{\partial v}{\partial \alpha} = \frac{(1-\bar{z})v}{(e_v v)[(\epsilon + 1)e_v v + 1]} > 0$$
$$\frac{\partial T}{\partial \alpha} = K(1-\bar{z})(1-\alpha)\frac{\partial v}{\partial \alpha} > 0$$
$$\frac{\partial v}{\partial \bar{z}} = \frac{-\alpha v}{e_v v[(\epsilon + 1)e_v v + 1]} < 0$$
$$\frac{\partial T}{\partial \bar{z}} = [F(K) - (1 + r + v)K] + \frac{\partial v}{\partial \bar{z}}K(1-\bar{z})(1-\alpha)$$

where $\epsilon \equiv F'''(K)K/F''(K)$, and where $(\epsilon + 1)e_v v + 1 > 0$ from the second-order requirement that the choice of v is locally strictly optimal.

[14] With constant e_v, e_u and p, a sufficient condition for an increase in α to raise v is $(1 - e_u^c u) > up(1 - \bar{z})[F(K) - (1 + r + v)K](1 - \alpha)e_u^c / [(1 - e_u u)S]$. This condition, assumed to hold in what follows, is slightly stronger than the condition $(1 - e_u u) > 0$, which must be satisfied at the optimum following Eq. (6).

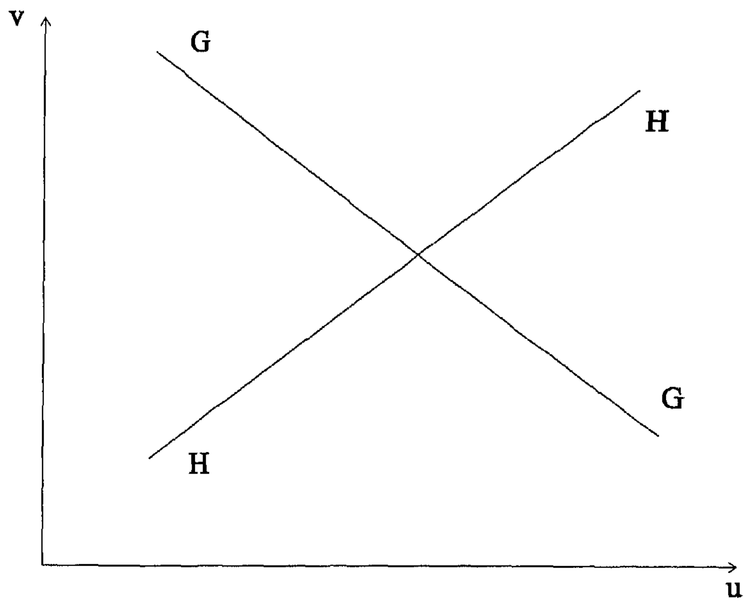

Fig. 2. The determination of u and v in case II(b).

positively sloped HH curve in Fig. 2. This curve in essence indicates optimal combinations of the capital income tax rates, u and v, for different government revenue requirements. We again examine how the two capital income tax rates are affected by changes in (i) the degree of foreign ownership, α; in (ii) the maximum profit tax rate, $\bar{z}$; and in (iii) the government revenue requirement, G.

First, let us consider a higher foreign ownership share, α, as illustrated in Fig. 3(a). This increase moves the HH schedule upwards, while the GG schedule shifts downwards to reflect higher saving. Thus, the rise in α causes an unambiguous decrease in u, while the effect on v is less clear. Intuitively, a higher foreign ownership share provides the government with an incentive to capture additional income from foreigners by putting more weight on the investment tax as opposed to the saving tax. At the same time, since a higher ownership of foreigners in domestic firms means lower second-period income and therefore higher saving at home, there is an increase in the saving tax revenue, *ceteris paribus*, allowing a decline in the two capital income tax rates. Altogether, some room is created for a lower saving tax. However, mild conditions are sufficient to ensure that the net effect on the optimal investment tax rate is an increase.[15]

[15]The negative slope of the GG curve in Fig. 2 stems from the fact that an increase in either u or v must increase government revenue. Otherwise, a reduction in any of these two tax instruments would increase government revenue and private utility.

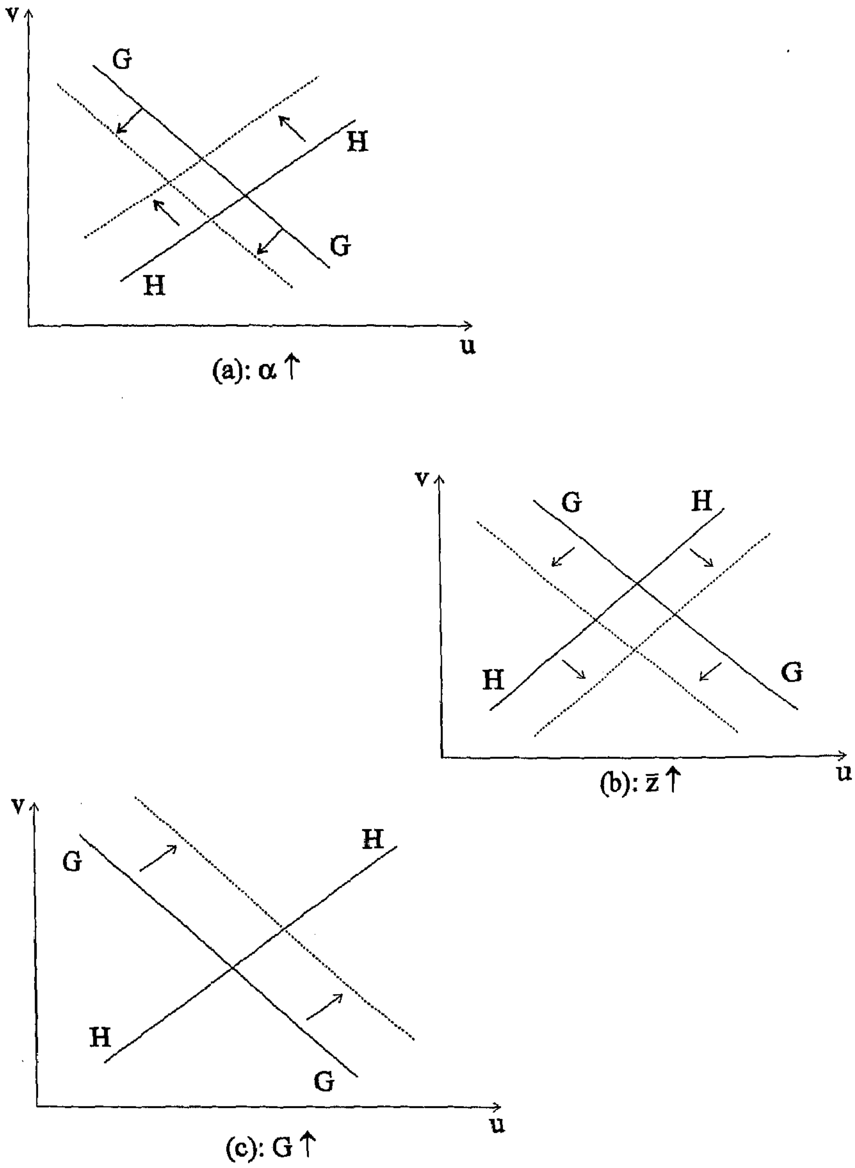

Fig. 3. The effect of shocks to α, $\bar{z}$ and G on u and v.

Next, let us consider an increase in the maximum profit tax rate, $\bar{z}$, as indicated in Fig. 3(b). In the figure, both the GG and HH schedules move downwards, which implies that the investment tax rate falls, while the saving tax rate may either rise or fall. The downward movement in the HH schedule reflects that the marginal cost of public funds from investment taxation relative to saving taxation rises. With fewer profits not captured by the profit tax, there is a reduced scope for the investment tax as a second-best tax on firm profits. The movement of GG simply indicates the higher revenue from the profit tax. The rise in the profit tax and the fall in the investment tax have opposite effects on overall tax revenues from production activity. As a result, the induced change in the saving tax rate, u, is ambiguous.

Finally, let us examine a higher government revenue requirement, G, with the aid of Fig. 3(c). This increase in G does not affect the HH schedule, while it moves the GG schedule upwards. As a result, the investment and saving tax rates both rise as indicated by the upward movement along the stationary HH schedule.[16]

We can state the main comparative statics results as follows.

Proposition 3. A higher foreign ownership share of domestic firms leads to a rise in the source-based investment tax rate if profits are not fully taxed. Transfers, if positive, also rise, while the saving tax falls, if positive. A higher profit tax rate leads to a lower investment tax, while the effect on either the size of transfers or the optimal saving tax is ambiguous.

5. Conclusion

This paper has established that a source-based capital income tax is not part of the optimal taxation scheme of a small open economy if profits are fully taxable. In that instance, a residence-based income tax on savings generally is warranted. A combination of source- and residence-based capital income taxes may be optimal if profits are not fully taxed. In that instance, source-based investment taxes may even be used to finance lump-sum transfers to domestic residents.

The profit tax in this paper can be interpreted as a tax on pure profits generated by production under decreasing returns to scale. Alternatively, the profit tax can be seen as a tax on land or on inelastically supplied labor. Finally, the profit tax can be seen to apply to public goods such as infrastructure that enhance private production. The profits always are to be taxed to the fullest extent if the profit tax coexists with distortionary capital income taxes. The source-based investment tax can be seen as an indirect method of taxing profits. As a result, we show that the optimal source-based income tax increases with the extent of foreign ownership of the firms' profits stream.

The analysis of this paper may help explain why all developed countries

[16]The analysis for the general case, in which e_v, e_u and p are variable, is rather unilluminating, as second-order optimality constraints appear insufficient to derive clear-cut results. Hence, it is omitted.

simultaneously apply both source-based corporate income taxes and residence-based personal interest and dividend taxes at (statutory) rates well above zero. In essence, source-based taxes are explained as an indirect means to tax profits, not the least those accruing to foreign citizens. Other contributions instead have explained the existence of corporate income taxes as an attempt to counteract the possibilities of income shifting between personal and corporate tax bases or interjurisdictional income shifting by firms (see, in particular, Gordon and Mackie-Mason (1993)). A reason why profits are not taxed fully in practice may be that the tax authorities cannot distinguish between pure profits and the return to capital. An interesting extension of our paper therefore may be to consider the case where profits and the return to capital investment are restricted to be taxed at the same rate.

In our analysis we have taken the extent of foreign ownership of domestic firms to be exogenous. Although there is no tax-discrimination of the foreign owners of firms, it is nevertheless natural to inquire about the prior determination of the foreign ownership share, in particular to what extent it may arise from policy in the form of foreign ownership restrictions. We plan to look into this in future work. Similarly, it may be interesting to endogenize the government need for tax revenues, for instance, by introducing public goods. Domestic citizens' preferences for public goods are then decisive regarding which of the tax regimes in our analysis is relevant. Fundamental considerations concerning tax policy, however, remain as presented above. Further, it may be interesting to introduce elastically supplied labor, and to investigate the scope for investment taxes if labor is constrained to be taxed at a low rate. Finally, it may be of interest to examine capital income taxation in a two-country model along the lines of Mintz and Tulkens (1996) or in a setting where countries can affect the international interest rate. Again, the results presented in this paper are expected to carry over to these more general settings.

Acknowledgments

Comments from two referees, the editor, Robin Boadway, Kaare Hagen, Mick Keen, Jack Mintz, J. Peter Neary, Agnar Sandmo, Guttorm Schjelderup, Peter Birch Sørensen and many others are gratefully acknowledged. The activities of EPRU are financed by a grant from the Danish National Research Foundation.

References

Apel, M. and M. Dillén, 1994, International tax competition and tax coordination – effects on the allocation and formation of capital, Mimeo, University of Uppsala.

Bruce, N., 1992a, A note on the taxation of international capital flows, The Economic Record 68, 217–221.

Bruce, N., 1992b, Why are there foreign tax credits? Discussion Series #92-08, Institute for Economic Research, University of Washington, Seattle.

Dasgupta, P. and J.E. Stiglitz, 1972, On optimal taxation and public production, Review of Economic Studies 39, 87–103.

Diamond, P. and J. Mirrlees, 1971, Optimal taxation and public production, American Economic Review 81, 8–17 and 261–278.

Findlay, C.C., 1986, Optimal taxation of international income flows, The Economic Record 62, 208–214.

Frenkel, J., A. Razin and E. Sadka, 1991, International taxation in an integrated world (MIT Press, Cambridge, MA).

Giovannini, A., 1989, National tax systems versus the European capital market, Economic Policy 9, 346–386.

Gordon, R.H., 1986, Taxation of investment and savings in a world economy, American Economic Review 96, 1086–1102.

Gordon, R.H. and J. Mackie-Mason, 1993, Why is there corporate taxation in a small open economy? The role of transfer pricing and income shifting in: Feldstein, M. and J.R. Hines Jr., eds., Issues in international taxation (University of Chicago Press, Chicago).

Huizinga, H.P., 1995, The optimal taxation of savings and investment in an open economy, Economics Letters 47, 59–62.

Mintz, J. and H. Tulkens, 1996, Optimality properties of alternative systems of taxation of foreign capital income, Journal of Public Economics 60, 373–399.

Stiglitz, J.E., 1987, Pareto-efficient and optimal taxation and the new new welfare economics, in: A.J. Auerbach and M. Feldstein, eds., Handbook of public economics, Vol. 2 (North-Holland, Amsterdam).

Stiglitz, J.E. and P. Dasgupta, 1971, Differential taxation, public goods, and economic efficiency, Review of Economic Studies 38, 151–174.