

A Welfare Comparison of International Tax
Regimes
with Cross-Ownership of Firms

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Abstract

This paper considers a world of many symmetric countries where public goods in principle are financed by taxes on saving, investment and pureprofits. In theory, countries could use all three taxes in combination. In practice, however, the tax instrument set may be restricted by, for instance, tax evasion of a particular kind or some international agreement. This paper compares welfare levels if countries set taxes noncooperatively across different tax instrument sets. We find that depending on the strength of preferences for public goods, tax evasion that renders either saving or investment taxes infeasible may be welfare improving, if firms are in part foreign-owned.

1 Introduction

This paper considers the implications for welfare of changes in the availability of capital income tax instruments in a world economy with cross-ownership of firms.

In the open economy, capital income taxation can generally be levied according to either the residence principle or the source principle, or both.¹ Capital income taxation according to the residence principle implies the taxation of savings, whereas if the source principle is applied, this is tantamount to taxation of investment. Of course, this distinction is immaterial for a closed economy, but it is crucial in the open economy, where a saving tax and an investment tax are very different instruments. Hence, whether an open economy has access to only one of these tax instruments in lieu of both should in general impinge on welfare in that country.

The issue of availability of capital income tax instruments is an important one, very relevant for tax policy in today's world economy. Capital has become increasingly mobile, due to changes in policy and to decreasing transactions costs associated with financial placements abroad by firms and individuals. Since at the same time there are virtually no international agreements as to the exchange of tax information between countries, it has become easy for individuals in many countries to conceal the return on their foreign securities and deposits from domestic authorities. Thereby, domestic savers can escape saving taxation by simply relocating funds abroad. As a result, residence-based capital income taxation is under threat and may over time be rendered completely ineffective. Instead of having access to both source- and residence-based capital income taxes, countries would then in effect only have source-based taxes left. Would this development imply a decrease in welfare on the part of countries in the world economy?

To answer this question, it appears important to introduce a few realistic features of the international economy as of today. First, despite several attempts there is very little coordination of capital income tax policies in the world economy. Not even in the EU has it become possible to achieve any measurable degree of coordination between member states.² In setting their capital income tax policy, countries basically worry about domestic effects of domestic taxes (rather than their international effects), while taking the tax policies of other countries as given. Moreover, there is as said close to no exchange of information between tax authorities in different countries on capital income accruing to foreigners. In consequence, capital income tax policies in the international economy are best characterized as *non-cooperative*.

Second, two additional characteristics of the world economy seem crucial. Nowhere in the world does one find full taxation of pure profits or rents (return to fixed factors). On the contrary, rates of tax on pure profits seem to be con-

¹According to the residence principle, capital income is taxed where it is received, whereas following the source principle, it is taxed where it originates.

²For instance, the main recommendations in the Ruding Report (1992) have never been carried out.

strained to effective levels well below one hundred percent. These *limitations on profit taxation* may have to do with an inability to distinguish pure profits from the ordinary return to capital, or with a fear that in the end, pure profits result from entrepreneurial effort which may not be in entirely inflexible supply. Further, in industrialized countries there is a significant degree of foreign ownership of domestic firms and, vice versa, domestic ownership of foreign firms. The reasons for this *cross-ownership* can be many, but the unimpeded mobility of capital across countries has been instrumental in establishing the cross-ownership pattern.

When firms with a partly international ownership generate pure profits, income flows between countries will feature not only ordinary return to capital, but also cross-country profit flows. Since countries via their capital income (and profit) taxes are able to affect the size of outgoing after-tax profit flows, non-cooperative capital income taxation will generate international externalities, entailing inefficiencies in tax policy as seen from the world as a whole. Given this insight, would it really be detrimental for individual countries if they were to lose the saving tax instrument, i.e. if they moved from non-cooperative tax policy with both source and residence taxes to non-cooperative tax policy with only source taxes available?

In principle, the effective loss of one of the two capital income tax instruments can also be brought about if the world's countries were to agree on exclusive application of the residence principle or the source principle in capital income taxation. For completeness, we therefore also wish to investigate what would happen if the world's countries were to move from a situation with both saving and investment taxes available to a situation in which they effectively have access to just residence-based taxes on saving.

The main result of the paper is that under certain conditions the loss of residence-based taxation of saving will be beneficial for countries in the world economy. Apart from incomplete profit taxation and cross-ownership of firms, the requirement for this to hold is that preferences for public goods are not too strong. The intuition for the result is as follows: The presence of cross-country profit flows leads to a desire on the part of governments to snatch part of the profits accruing to foreign owners of domestic firms. With limited profit taxes this is accomplished by means of source-based investment taxes, resulting in overtaxation of capital income relative to taxation under coordination. If saving taxes are eliminated, then capital income will as a whole be less heavily taxed, yielding a better approximation to taxation under coordination. This reasoning applies when preferences for public goods are not too strong; otherwise, the negative international externality associated with the beggar-thy-neighbor tax will be offset by a more subtle positive externality operating through the income effect of international taxation on national saving.³

Given the possibility of a positive welfare effect of losing residence-based capital income taxation, it may not make a lot of sense for the world's countries to spend vast resources to combat evasion of saving taxation (unless perhaps internal redistribution is the preeminent goal of tax policy).

³Details on this latter externality are provided later on.

In a similar way we also demonstrate in the paper that if countries in the world were to agree on exclusive use of residence-based capital income taxation (while abolishing source-based taxes), then such an international agreement could actually be welfare-improving.⁴

Despite the importance and policy relevance of the problem, the literature on capital income taxation in open economies has until now not focused on the welfare implications of restrictions on the set of feasible capital income tax instruments in a setting with cross-ownership of firms. All the same, it is helpful to review key contributions to the literature. Several authors have examined the optimal capital income taxation in a small open economy. An important result in Gordon (1986), Frenkel et al. (1991) and others is that a small economy optimally does not levy a source-based investment tax if the tax instrument set is not restricted. With a restricted profit tax, however, source-based investment taxes are generally optimally applied. Huizinga and Nielsen (1997) examine in detail how the desired mix of saving and investment and profit taxes in this setting depends on the feasibility of profit taxation and on the extent of foreign ownership of domestic firms. Foreign ownership renders investment and profit taxation more attractive relative to saving taxation, and the optimal sign of saving taxation may even be negative.

A relatively small literature examines whether there is a need to coordinate capital income taxes internationally. Razin and Sadka (1991) consider a model where labor and capital are inputs into a production function with constant returns to scale. They show that two countries have no reason to coordinate either saving or investment taxes if they take the world interest rate as given. Bucovetsky and Wilson (1991) consider labor, saving and investment taxes in a similar model, but they let the world interest rate be endogenous. They find, among other things, that countries have no need to coordinate co-existing saving and investment taxes, while Krelove (1992) finds that the coordination of investment taxes alone may entail either a lower or a higher investment tax.

Following the discussion of international capital income tax coordination (cfr. OECD (1991), the Ruding Report (1992), and Sørensen (1993)), we in Huizinga and Nielsen (1996) extend our small open economy model to examine the scope for tax coordination in a model of many symmetric small countries. We show that when profits are fully taxed or there is no foreign ownership, noncooperative joint saving and investment taxes are in fact optimal. In other instances, there generally is a need to coordinate capital income taxes, as one country's tax policy has first order implications for any other country's private welfare or tax revenues.

Building on the above work, this paper focuses on a symmetric multi-country world with cross-ownership of firms and examines how welfare in each country depends on the feasible tax instrument set. The analysis presupposes that countries do

⁴An international agreement of this kind would probably need to be backed up by a commitment technology, since otherwise it would be in any single country's interest to reintroduce the source-based tax. Also, the argument presupposes that an international agreement on the tax instrument set may be feasible where an agreement on the rates of taxation is not.

not coordinate their tax policies. To be precise, we compare the welfare of each individual country in the Nash tax-setting equilibria across various models that differ in the set of available tax instruments. The tax instrument set in principle consists of a (limited) profit tax, a saving tax and an investment tax. A restricted tax instrument set is taken to be an instrument set that does not include either a saving tax or an investment tax. The paper specifically focuses on comparing a setting in which both saving and investment taxation are feasible with settings where only one of these is feasible.

We organize the paper as follows. Section 2 considers the mix of saving, investment and profit taxation that is optimal from the perspective of a single country that can levy a limited profit tax. It also considers optimal tax policy in the small open economy, if either the saving tax or the investment tax is unavailable. Section 3 instead examines optimal tax policy for a closed economy that imposes a single tax wedge between the gross return to investment and the net return to saving. Sections 2 and 3 are prerequisites for the welfare comparison of various tax regimes in section 4. For a given (limited) feasibility of profit taxation and a given cross-ownership of firms, we consider two welfare comparisons: i) joint saving and investment taxation against only investment taxation, and ii) joint saving and investment taxation against only saving taxation. As special cases, we also briefly consider that profits are fully taxed, or there is no cross-ownership of firms. Section 5 concludes.

2 Tax policy in the small open economy

This section examines the optimal capital income tax policy from the perspective of a small open economy. The analysis in this section corresponds to Huizinga and Nielsen (1997) with the exception that in this paper we do not consider the possibility of government lump sum income transfers to domestic citizens, and that public goods supply is endogenously rather than exogenously determined. The section first outlines the basic model. It then considers optimal tax policy in turn for the cases where (a) saving, investment and profit taxes are all available, (b) only investment and profit taxes are available, and (c) only saving and profit taxes are available.

2.1 The basic model

A small open economy is one of many symmetric small open economies in the world economy. The economy, which exists for two periods, takes the world interest rate, r , as given. Each country's representative agent receives an endowment, Y , of a single good in the first period. This endowment is allocated between first period consumption, C_1 , and saving, S . In the first period, firms make investments, K , which are only productive in the second period. In the second period households spend their net-of-tax return from saving and profit income to consume C_2 .

Consumers also enjoy a public good, G , provided by the government in the second period. To finance this public good, the government can impose a saving tax at the rate u , and an investment tax at the rate v , both payable in the second period. In addition, second period firm profits are taxed at a rate z . Profits are positive because there is some factor of production, e.g. land or entrepreneurial services, in inelastic supply or, alternatively, there are decreasing returns to scale in capital investments. The investment tax bill, vK , is deductible from taxable profits. The profit tax rate, z , cannot exceed a maximum of $\bar{z} \leq 1$. There are no other restrictions on the sizes or signs of the three taxes, u , v , and z . Finally, we assume that a firm and thus its profit stream are in part foreign-owned. In particular, let us assume that a share $\alpha \geq 0$ of each country's firms is owned by foreigners. Conversely, domestic citizens own a total share of α^* of foreign firms.

Firms produce an output $F(K)$ in the second period, where the production function F is assumed to be strictly concave. Firms' after-tax profits are equal to $(1 - z)[F(K) - (1 + r + v)K]$, where $1 + r + v$ is the user cost of capital. The maximization of profits on the part of firms yields the following optimal investment rule,

$$F'(K) = 1 + r + v \quad (2.1)$$

Households face the following two-period budget constraint,

$$\begin{aligned} C_2 = & (Y - C_1)(1 + r - u) + (1 - z)(1 - \alpha)[F(K) - (1 + r + v)K] \\ & + (1 - z^*)\alpha^*[F(K^*) - (1 + r + v^*)K^*] \end{aligned} \quad (2.2)$$

where stars denote foreign variables.⁵

Consumers derive utility from consumption in both periods and from the public good, G . Lifetime utility is assumed to be additively separable, and is written as $U(C_1, C_2) + V(G)$. The first order condition regarding the private consumption choice is as follows,

$$U_1 = U_2(1 + r - u) \quad (2.3)$$

The budget constraint of the government stipulates that overall tax revenues equal the provision of the public good, G , as follows,

$$0 < G = uS + vK + z[F(K) - (1 + r + v)K] \quad (2.4)$$

Tax policy is set so as to maximize the utility of the representative agent. Formally, the government faces the problem of choosing the tax rates z , u and v so as to maximize the following Lagrangean expression,

$$L = U(C_1, (Y - C_1)(1 + r - u) + (1 - z)(1 - \alpha)[F(K) - (1 + r + v)K] +$$

⁵Note that profits earned abroad qua domestic ownership of foreign firms are not taxed at home, so deductibility or creditability of foreign profit taxes is irrelevant. In effect, the profit tax is solely source-based. Further, the profit tax does not discriminate between foreign and domestic owners of domestic firms. These assumptions could be altered without significantly affecting qualitative results.

$$(1 - z^*)\alpha^*[F(K^*) - (1 + r + v^*)K^*] + V(G) \\ + \lambda(uS + vK + z[F(K) - (1 + r + v)K] - G) + \mu(\bar{z} - z) \quad (2.5)$$

where λ and μ are Lagrange multipliers associated with the government budget constraint (2.4) and the upper bound on the profit tax, \bar{z} . The first order conditions regarding the tax rates z , u and v and the volume of public goods, G , associated with (2.5) can be stated as follows,

$$[\lambda(1 + (1 - \alpha)up) - U_2(1 - \alpha)][F(K) - (1 + r + v)K] - \mu = 0 \quad (2.6)$$

$$-U_2 + \lambda(1 - ue_u) = 0 \quad (2.7)$$

$$-U_2(1 - z)(1 - \alpha) + \lambda[(1 - z)(1 + (1 - \alpha)up) - e_v v] = 0 \quad (2.8)$$

$$V'(G) - \lambda = 0 \quad (2.9)$$

where $e_v = -(dK/dr)/K$ is the semi-elasticity of investment with respect to the investment tax v , $e_u = -(dS/du)/S$ is the uncompensated semi-elasticity of saving with respect to the saving tax u , and p denotes the propensity to consume in the first period out of second period income. It can be seen that $e_u^c = e_u + p > 0$ is the compensated semi-elasticity of saving with respect to the saving tax, u . The uncompensated semi-elasticity e_u will also be taken to be positive in what follows.

The first order conditions (2.6)-(2.9) form the basis of the description of optimal tax policy in the cases where all three tax instruments are available, or where either the saving tax or the investment tax are not part of the instrument set. Below, we briefly characterize the optimal tax policy in the three cases in three subsections.⁶ Throughout this section, we maintain the assumptions of $\alpha > 0$ and $\bar{z} < 1$, i.e. that there is some cross-ownership of firms and that profits can only be taxed incompletely, which ensures that there is a positive profit flow from domestic firms to foreign residents. At the end of section 4, we briefly discuss the cases where either $\alpha = 0$ or $\bar{z} = 1$.

2.2 All tax instruments available

From conditions (2.6)-(2.9), the optimal saving tax, u , can be seen to be either positive or negative, while the investment tax, v , is always non-negative. The exact sizes of the capital income taxes depend on the desired level of public goods and on the maximum profit tax rate, \bar{z} . Five separate cases in increasing public goods demand can be distinguished as follows:

In case i), the maximum profit tax rate, \bar{z} , is not binding and the marginal cost of public funds, $\eta \equiv \lambda/U_2$, is less than one at $\eta = (1 - \alpha)e_u^c/(e_u^c - \alpha p)$. The saving tax is negative at $u = -\alpha/[(1 - \alpha)e_u^c]$, while the investment tax v is zero. The negative saving tax enables the tax authorities to redistribute foreign profit income, as taxed

⁶A more detailed discussion can be found in Huizinga and Nielsen (1996).

via the profit tax, to domestic residents.⁷ In the borderline case ii), the profit tax constraint \bar{z} is just binding so that we have $u < 0$ and $v = 0$ as in case i) with the marginal cost of funds (MCPF) also as in case i). In the intermediate case iii), preferences for public goods are so strong that the investment tax contributes as a substitute profit tax to finance the public goods provision and the saving subsidy, while the MCPF remains below unity. Next, in case iv) the saving tax rate, u , is just equal to zero, and the cost of funds, η , equals unity, while the investment tax rate is at the national income maximizing value of $v = \alpha(1 - \bar{z})/e_v$. Finally, in case v) both saving and investment taxes are positive with the MCPF exceeding one.

The various possible combinations of optimal tax rates with all three instruments available are illustrated in Figure 1, panel (a). The tax rates are there depicted as functions of the marginal cost of public funds which functions as an indicator of the strength of preferences for public goods.

2.3 Only investment and profit taxation

Absent the saving tax, optimal tax policy is found from equations (2.6), (2.8) and (2.9), with u set equal to zero in (2.6) and (2.8).

Some inspection reveals that three cases can be distinguished. For relatively weak preferences for public goods, only the profit tax, z , will be used (at a rate below the maximum rate \bar{z}) in the noncooperative equilibrium with $v = 0$. The marginal cost of public funds then is $\eta = (1 - \alpha)$. In the second case, the profit tax constraint is just binding, while v and η are still equal to 0 and $1 - \alpha$, respectively. With even stronger preferences for public goods, the country sets the profit tax at its maximum \bar{z} and the investment tax, v , above zero, resulting in a MCPF exceeding $1 - \alpha$. In this third case, the investment tax, v , can be written in terms of the MCPF as $v = (1 - z)[1 - (1 - \alpha)/\eta]/e_v$.

Figure 1, panel (b) depicts how the profit and investment tax rates z and v are related to the strength of preferences for public goods as proxied by η .

2.4 Only saving and profit taxation

Without an investment tax (perhaps due to some international agreement), the first order conditions (2.6), (2.7) and (2.9) with $v = 0$ characterize the optimal saving and profit tax rates and the optimal provision of public goods.

Again, three cases in increasing preferences for public goods provision can be distinguished. The first case has an underused profit tax, i.e. $z < \bar{z}$, a negative

⁷To be exact, the existence of this and the subsequent case requires $\bar{z} \geq \alpha K/[e_u^c(1 - \alpha)(F(K) - (1 + r)K)]$, i.e. a relatively high maximum profit tax rate, high saving elasticity, and low foreign ownership share. This condition is taken to hold without any implication for our conclusions.

saving tax at $u = -\alpha/[(1 - \alpha)e_u^c] < 0$, and a marginal cost of public funds at $\eta = (1 - \alpha)e_u^c/[e_u^c - \alpha p]$. In this instance, the pressure to finance public goods is so low that some profit tax revenues are used to finance a negative saving tax so as to redistribute income to domestic residents. A borderline case then follows where the profit tax constraint is just binding and where the values of the saving tax rate and the MCPF as in the previous case. With even stronger preference for public goods, the profit tax rate constraint is strictly binding, and the saving tax increases eventually to a positive level. The MCPF similarly rises from the value given above. Note that with a saving tax equal to zero, the MCPF just equals unity.

The possible configurations of profit and saving tax rates in the absence of the investment tax are illustrated in Figure 1, panel (c).

3 Tax policy in the closed economy

In this section, we consider the optimal capital income and profit tax policy in a closed economy. The closed economy is taken to be identical to the single small open economy considered in the previous section. Obviously, the closed economy's savings and investment have to be equal, i.e. $S = K$. The closed economy's tax policy corresponds to the coordinated tax policy in a world of many identical small open economies. This section therefore sets the stage for the later welfare evaluation of different noncooperative tax regimes in section 4.⁸

In the closed economy, the tax authority has a single tax instrument, x , to introduce a wedge between the gross return to investment and the net return to saving. The tax x can be thought to be levied on saving so that the net return to saving is $r - x$, while r is the return to investment and the market rate of interest. As before, the tax authority can tax profits at a rate $z \leq \bar{z}$.

Profit maximization on the part of firms now yields the following investment rule,

$$F'(K) = 1 + r \quad (3.1)$$

The budget constraints for private agents and the government are given by,

$$C_2 = (Y - C_1)(1 + r - x) + (1 - z)[F(K) - (1 + r)K] \quad (3.2)$$

$$0 < G = xS + z[F(K) - (1 + r)K] \quad (3.3)$$

Again, the government chooses tax policy, i.e. the tax rates x and z , so as to maximize the utility of the representative agent. The optimality conditions with

⁸By focusing on symmetric countries we concentrate on average externalities between countries in non-cooperative tax policy equilibria. The implications of asymmetry for tax competition have been studied by, e.g., Bucovetsky (1991).

respect to the two tax instruments, z and x , and the provision of public goods, G , are as follows,

$$[-U_2(1 + z\frac{e_s p}{e_u e_v}) + \lambda(1 + xp\frac{e_s}{e_u} + z\frac{e_s p}{e_u e_v})][F(K) - (1 + r)K] - \mu = 0 \quad (3.4)$$

$$-U_2(1 - z\frac{e_s}{e_v}) + \lambda(1 - xe_s - z\frac{e_s}{e_v}) = 0 \quad (3.5)$$

$$V'(G) - \lambda = 0 \quad (3.6)$$

In these expressions, $e_s \equiv -(dS/dx)/S$ is the semi-elasticity of saving with respect to the tax wedge, x , accounting for any endogenous change in the interest rate. The semi-elasticity e_s can be expressed as follows,

$$e_s = (1 - \frac{dr}{dx})e_u - (1 - z)\frac{dr}{dx}p \quad (3.7)$$

Next, the saving-investment balance implies that dr/dx can be found as,

$$\frac{dr}{dx} = \frac{e_s}{e_v} \quad (3.8)$$

so that e_s can be written as,

$$e_s = \frac{e_v e_u}{e_v + (1 - z)p + e_u} \quad (3.9)$$

Optimality conditions (3.4) and (3.5) take into account that unlike in the small open economy changes in either the profit tax, z , or the capital income tax, x , affect the interest rate r . The change in the interest rate independently affects economic behavior and also overall capital income tax revenues.

Underlying the optimality conditions (3.4)-(3.6), we can distinguish three optimal tax regimes that differ in the extent to which the maximum profit tax rate is binding. For rather weak preferences for public goods, the optimal profit tax is less than its maximum \bar{z} and the capital income tax wedge, x , is zero. In a borderline case, the profit tax constraint is just binding, i.e. $z = \bar{z}$, while the tax wedge, x , remains equal to zero. Next, the profit tax limitation is strictly binding, and the authorities meet any additional tax revenue need with a positive capital income tax, x .

Figure 2 illustrates the possible regimes for optimal profit and capital income tax policy in the closed economy.

4 Welfare comparisons across different tax instrument sets

This section investigates the welfare consequences of the nature of the available tax instrument set in a world where many small identical countries fail to coordinate

their capital income tax policies. More precisely, the section compares national welfares across different noncooperative Nash taxation equilibria that differ in the tax instrument set available to each country. Throughout, a (limited) profit tax instrument is taken to exist, and in most of the analysis the profit tax rate, z , equals its maximum, i.e. $z = \bar{z} < 1$. Again, the saving tax, u , and the investment tax, v , are allowed to be of any size, if they are in the tax instrument set. This means that there are essentially three scenarios depending on the availability of saving and investment taxes: i) both investment and saving taxation exist, ii) only saving taxation exists, iii) only investment taxation exists. We focus on the following two direct welfare comparisons: i) a comparison of both saving and investment taxation against only investment taxation, and ii) a comparison of both saving and investment taxation against only saving taxation.⁹ The twin comparisons are carried out in two subsections below.

The general strategy of comparing welfare in two tax regimes – call them a and b – is as follows. We start out with a certain strength of preferences for public goods, as proxied by the marginal cost of public funds in regime a . This MCPF corresponds to certain rates of saving and investment tax and thereby a certain wedge between the gross return to investment and the net return to saving. We then investigate whether, given the MCPF, regime a is preferable to the other regime b . The way our model has been set up implies that welfare in a single country will be concave in the saving-investment tax wedge. Hence, if the tax wedge in regime a is closer to the wedge under coordination than is the wedge in regime b , and the differences between each of the non-cooperative tax wedges and the coordinated tax wedge are of the same sign, then regime a is indeed preferable to regime b .

Consequently, for regimes a and b we need the answers to three questions: i) going from regime a to full international tax coordination, do countries increase or reduce the overall saving-investment tax wedge, $x = u + v$? ii) going from regime b to full coordination, do countries increase or reduce the overall saving-investment tax wedge? and iii) going from regime a to regime b , do countries increase or reduce the overall saving-investment tax wedge? Combining the answers to the three questions, we may or may not be able to unambiguously rank national welfares in regimes a and b .¹⁰

To formalize the welfare comparison based on tax wedges, let us introduce the following notation: x^{uv} is the Nash equilibrium tax wedge with both tax instruments available, while x^u and x^v are the Nash equilibrium values of u and v with only the saving and investment taxes available, respectively. Finally, x^* is the fully coordinated tax wedge in all three situations¹¹. Similarly, η^{uv} , η^u , η^v and η^* denote the

⁹There is a tradition in the international tax literature of comparing the pure source and residence principles of capital income tax, cfr. for example Giovannini (1989). This would here correspond to comparing only saving taxation to only investment taxation.

¹⁰Questions i) and ii) in reality concern the scope for international tax coordination and are also addressed in our companion paper, Huizinga and Nielsen (1996).

¹¹And hence equal to the saving (or investment) tax rate in the corresponding closed economy

(perceived) marginal costs of funds in the four cases. The switch from regime a , which can be the uv , u , v or $*$ regime, to a different regime b leads to a larger tax wedge, if given x^a the regime switch lowers the (perceived) marginal cost of public funds,

$$\eta^b < \eta^a \quad (4.1)$$

Equivalently, x^b in regime b is to be increased beyond x^a , if the (perceived) increase in utility resulting from more public goods dominates the (perceived) reduction in utility resulting from less private consumption. Formally, this is the case if,¹²

$$\left[\frac{dV/dx}{-dU/dx}\right]_a^b > \left[\frac{dV/dx}{-dU/dx}\right]_a^a = 1 \quad (4.1')$$

where the superscripts refer to the two tax regimes a and b under comparison, and the subscripts indicate that the value of the tax wedge in the original tax regime a , i.e. x^a , is to be inserted into the marginal expressions for the two tax regimes. The right hand side of the inequality in (4.1') contains the ratio between the marginal utility gain from extra public goods and the marginal utility loss from less private goods, associated with a unit increase in the saving-investment tax wedge from x^a . By definition, this ratio must be equal to one for x^a to be optimal in regime a .

4.1 Both saving and investment taxation vs. only the latter

Most countries de jure impose a residence-based tax on the capital income of their domestic residents. In practice, however, the residential capital income tax is often easily evaded. Tax evasion of this kind may effectively eliminate the residence-based capital income tax altogether, as communication and transportation costs decline.¹³ To assess the welfare consequences of a demise of the residential capital income tax, we first have to answer three questions: i) how does x^{uv} compare to x^* for different values of the marginal cost of public funds, η^v , in the investment-tax-only regime? ii) how does x^v compare to x^* for different values of η^v ? and finally, (iii) how does x^{uv} compare to x^v for different values of η^v ?

With noncooperative saving and investment taxes set optimally, each country is indifferent between generating tax revenues at the margin by the saving or the investment tax instrument. For convenience, any increase in the wedge, x , in any individual economy can be thought to come about through a higher saving tax, u . Using (2.7) and (3.5), we can then evaluate (4.1) to find that coordination of saving

¹²The ratios in (4.1') may also be written as $(V'/U_2)(1/\eta)$, i.e. as the ratio between marginal utilities, at the optimal point in regime a , times the inverse of the relevant marginal cost of public funds. This establishes the equivalence to the inequality between the MCPFs in (4.1).

¹³In fact, Keen (1993) and others argue that the combination of limitations on foreign tax credits, deferral and evasion of home taxes on portfolio income from abroad pushes the present situation of capital income taxation towards an effective source basis.

and investment taxes (i.e. going from regime uv to regime $*$) leads to a higher saving-investment tax wedge, x , if,

$$\frac{1 - ze_s/e_v}{1 - xe_s - ze_s/e_v} < \frac{1}{1 - ue_u} \quad (4.2)$$

where u and x are the values of the saving tax and the tax wedge in the noncooperative saving-cum-investment tax regime (for convenience the superscript ' uv ' on z , x , and u has been dropped).

Next, we can use (2.7) and (2.8) to express the saving tax, u , as a function of the overall tax wedge, x , in the saving-cum-investment tax regime as follows,

$$u = \frac{e_v x - (1 - z)\alpha}{e_v + (1 - z)(1 - \alpha)e_u^c} \quad (4.3)$$

which along with (4.2) implies that coordination leads to a larger saving-investment tax wedge, x , if,

$$x > \frac{1}{e_u^c} + \frac{1 - z}{e_v} \quad (4.4)$$

Eq. (4.4) indicates that a larger saving-investment tax wedge is warranted, if the non-cooperative tax wedge is already relatively large. To see why, note that a larger saving-investment tax wedge implies a larger required gross return to investment. A higher tax wedge, x , therefore lowers domestic profits accruing to foreign residents. Lower second-period profit income for foreigners has a positive income effect on their first-period saving, and it thus leads to larger foreign saving tax revenues for a given saving tax rate. This represents a positive international externality of national capital income tax policy that is overlooked, absent tax coordination. For low values of x , eq. (4.4) instead immediately implies that international tax coordination leads to an even lower tax wedge, and a reduction in the provision of public goods. In these instances, the noncooperative saving-investment tax wedge is in fact too high, as the existence of foreign ownership leads to beggar-thy-neighbor-type, high investment taxes.

Analogously to (4.4), the coordination of the capital income tax wedge when both saving and investment taxes exist should lead to a higher tax wedge if the marginal cost of public funds is relatively large, and vice versa. To see this, express the optimal saving and investment tax rates in the uv regime by means of the marginal cost of public funds, applying (2.7) and (2.8). Using $x = u + v$, (4.4) then becomes equivalent to,

$$\eta^{uv} > 1 + \frac{e_u}{p} \quad (4.5)$$

Next, we compare the noncooperative tax wedge in the absence of the saving tax to the tax wedge under full tax coordination. Evaluating (4.1) for the transition from an investment-tax-only regime to full coordination, we see that this switch leads to a larger saving-investment tax wedge if,

$$v = x > \frac{(1 - z)\alpha(e_v + (1 - z)e_u^c)}{e_v[e_v + (1 - z)(p + \alpha e_u)]} \quad (4.6)$$

From (4.6), we infer that for large values of v the saving-investment tax wedge in the coordinated equilibrium is even greater than in the investment-tax-only regime. Underlying (4.6), there are two opposing externalities of national investment tax policy. First, the investment tax as usual affects foreign welfare negatively to the extent that the investment tax is borne by the foreign owners of domestic firms. This spill-over points towards an overly high investment tax in the absence of coordination. Second, a higher investment tax causes a lower international interest rate, leading to a worldwide rise in investment and thus foreign investment tax revenues. This second spill-over tends to a noncoordinated investment tax that is too low. Formula (4.6) indicates that the second externality dominates for relatively high noncooperative investment tax rates, and vice versa.

Equivalently to (4.6), going from the investment-tax-only regime to full coordination leads to an increase in the overall saving-investment tax wedge if the marginal cost of funds, η^v , in the first instance exceeds a certain critical level as follows,

$$\eta^v > 1 + \frac{\alpha(1-z)e_u}{e_v + (1-z)p} \quad (4.7)$$

In deriving (4.7), (2.8) is used to express the investment tax rate in the v regime as a function of the marginal cost of public funds in that regime. Substituting into (4.6) then yields (4.7).

What remains is to compare the size of the saving-investment tax wedge in the noncooperative regimes with co-existing saving and investment taxes and with only an investment tax. To start, let us consider that preferences for public goods are sufficiently strong that in the investment-tax-only regime the marginal cost of funds, η^v , exceeds unity so that the investment tax rate exceeds the national income maximizing value of $\alpha(1-z)/e_v$ (cfr. (2.8)). The introduction of the saving tax instrument then implies that the authorities gain access to an initially non-distortionary tax instrument. The saving tax thus will be set at a positive rate to finance additional public goods, while the investment tax rate declines. The marginal cost of public funds falls (but remains above unity), in the sense that $1 < \eta^{uv} < \eta^v$ for the given strength of preferences for public goods, and the overall saving-investment tax wedge rises.

Alternatively, we can consider that preferences for public goods are weak enough that the marginal cost of funds, η^v , in the investment-tax-only regime initially is less than unity. Then the introduction of the saving tax instrument leads to the provision of a saving subsidy to domestic residents, a cut-back in public goods provision, a higher marginal cost of public funds, a higher investment tax and a lower overall saving-investment tax wedge. In summary, we conclude that,¹⁴

$$x^{uv} > x^v \text{ iff } \eta^v > 1, \text{ i.e. iff } x^v > \frac{\alpha(1-z)}{e_v} \quad (4.8)$$

¹⁴More formally, (4.8) can be demonstrated by applying expressions for η^v and η^{uv} , as derived from (2.8), in (4.1). Further, use that in the v regime, $v = x$ and $u = 0$, while in the uv regime, u and v can be expressed via x , using formula (4.3) and $v = x - u$.

The information regarding the relative sizes of the saving-investment tax wedges in the saving-cum-investment-tax regime and the investment-tax-only regime (relative to each other and relative to a regime of full international coordination) is graphed in Figure 3. The horizontal axis in Figure 3 shows the marginal cost of public funds for the investment-tax-only regime. A varying MCPF proxies for varying strength of preferences for public goods. The vertical axis depicts the size of the saving-investment tax wedge in the three regimes, as functions of the preferences for public goods. The figure contains three curves. First, the x^v -curve depicts the saving-investment tax wedge in the investment-tax-only regime as related to the marginal cost of public funds, η^v , in this regime. This curve shows that x^v becomes positive, once the marginal cost of public funds, η^v , exceeds $1 - \alpha$ and generally increases with η^v . Second, the x^* -curve represents the fully coordinated tax wedge as related to the marginal cost of funds η^v . Reflecting (4.7), we see that x^* exceeds x^v if η^v exceeds $1 + \alpha(1 - z)e_u/[e_v + (1 - z)p]$, and vice versa. Third, the x^{uv} -curve pictures the noncoordinated tax wedge in the saving-cum-investment tax regime against the cost of funds η^v . Reflecting (4.8), the latter curve is situated above the x^v -curve for values of η^v exceeding unity, and vice versa. The particular value of η^v , denoted η' , at which the x^* -curve crosses the x^{uv} curve from below is also shown in the figure. It exceeds $1 + \alpha(1 - z)e_u/[e_v + (1 - z)p]$ and corresponds to a value of η^{uv} of $1 + e_u/p$, cfr. (4.5).

Now we are in a position to compare national welfares in the noncooperative saving-cum-investment tax and investment-tax-only regimes. From the figure, we can see that $x^{uv} > x^v \geq x^*$ for values of η^v in the half-open interval $(1, 1 + \alpha(1 - z)e_u/(e_v + (1 - z)p)]$. Given that welfare is concave in the saving-investment tax wedge and maximized in the $*$ regime, it follows that for preferences for public goods leading to values of η^v in this interval the investment-tax-only regime dominates the saving-cum-investment tax regime. For completeness, this conclusion is also valid for values of η^v slightly larger than $1 + \alpha(1 - z)e_u/(e_v + (1 - z)p)]$ ¹⁵. In all these instances, the intended or unintended omission of the saving tax instrument thus is welfare improving. The results are summarized as follows:

PROPOSITION 1. Suppose that countries cannot tax profits completely and that there is some cross-ownership of firms. Then for intermediate preferences for public goods, corresponding to intermediate values for the marginal cost of public funds in the noncooperative investment-tax-only regime (i.e between 1 and some value slightly above $1 + \alpha(1 - z)e_u/(e_v + (1 - z)p]$), welfare in that regime exceeds welfare in the noncooperative saving-cum-investment tax regime.

To reiterate, it is the temptation on the part of governments to capture profits which would otherwise accrue to foreigners that leads to overtaxation of capital income with access to both capital income tax instruments, provided preferences for public goods are not too strong. The elimination of the saving tax lessens this excess taxation, so is warranted in this situation.

¹⁵As well as for values of η^v equal to or slightly larger than the minimum of $1 - \alpha$

4.2 Both saving and investment taxation vs. only the former

As stated in the introduction, several authors have argued that optimally small open economies do not levy source-level investment taxes and that thus a residence-based system of capital income taxation is desirable.¹⁶ Section 2 already demonstrated that the conclusion that single countries optimally do not levy source-based investment taxes has to be modified, once incomplete profit taxation is taken into account. This section considers whether a system of residence-based capital income taxation only (and thus an elimination of the investment tax) may nevertheless improve welfare, given that countries fail to coordinate their tax policies. We demonstrate that going to only residence-based capital income taxation (from a combined residence- and source-based capital income tax regime) indeed improves national welfare, if preferences for public goods are moderate enough as to lead to a marginal cost of public funds (in the residence-taxation-only regime) close to one. Generally, however, the elimination of source-level investment taxation reduces national welfare.

To start, we have to compare the saving-investment tax wedge in the saving-cum-investment tax regime and the saving-tax-only regime (to each other and to the full-coordination tax wedge). The comparison of saving-investment tax wedges in the noncooperative saving-cum-investment tax regime and the full-coordination regime has already been made in subsection 4.1. To proceed, we compare the noncooperative saving-tax-only tax wedge to the full-coordination tax wedge. Evaluating (4.1), we see that going from the saving-tax-only regime to the full-coordination regime leads to a larger saving-investment tax wedge if,

$$\frac{1 - ze_s/e_v}{1 - ue_s - ze_s/e_v} < \frac{1}{1 - ue_u} \quad (4.9)$$

Eq. (4.9) simply reduces to $u > 0$, which implies that a positive saving tax in the saving-tax-only regime is increased under coordination. To see why, note that a higher saving tax raises the international pre-tax interest rate, r , and thus foreign-country saving and saving tax revenues. In the absence of coordination, this positive externality of higher national saving tax rates is ignored, which gives rise to a non-coordinated saving tax rate that is too low. Conversely, eq. (4.9) might seem to suggest that a negative Nash equilibrium saving tax is reduced even further under coordination. This is not the case, however,¹⁷ as under full coordination there cannot exist a negative saving-investment tax wedge. The negative saving tax in the saving-tax-only regime is financed by a maximum profit tax. Instead, coordination lowers the profit tax rate to restore a zero saving-investment tax wedge, whence in this instance the cost of funds is unity (rather than less than unity as in the noncoordinated case with a saving subsidy). This also implies a cutback in public goods provision. Coordination (starting from the saving-tax-only regime) thus always leads

¹⁶A similar claim is found in Mintz and Tulkens (1996).

¹⁷Technically, application of the criterion (4.9) presupposes full utilization of the profit tax in both regimes.

to an increase in the saving-investment tax wedge, unless the saving tax is zero, in which case it remains zero.

Finally, we compare the saving-investment tax wedge in the noncooperative saving-cum-investment tax regime and the noncooperative saving-tax-only regime. The simplest way to approach the question is to apply the saving-tax-only regime as the starting point, and then examine the introduction of an investment tax. First, consider that in the saving-tax-only regime the profit tax is strictly at its maximum and the saving tax is negative. The saving tax then exceeds its minimum value of $-\alpha/[(1-\alpha)e_u^c]$, and the marginal cost of public funds, $\eta^u = 1/(1-ue_u)$, is less than unity, but greater than the minimum value of $(1-\alpha)e_u^c/(e_u^c - \alpha p)$. With a newly available investment tax, the marginal cost of public funds drops to $(1-\alpha)/[1+(1-\alpha)up]$, triggering a positive investment tax rate. The investment tax proceeds are in part used to enhance the saving subsidy and in part to increase the provision of public goods. A larger supply of public goods implies that the introduction of the investment tax leads to a larger (less negative) overall saving-investment tax wedge.

Alternatively, we can consider that the saving tax is positive in the noncooperative saving-tax-only regime. There then similarly is a scope for a positive investment tax if made available. Specifically, the introduction of the investment tax leads to a lower saving tax rate and marginal cost of public funds, and a larger provision of public goods. With an initially binding profit tax,¹⁸ the introduction of an investment tax into a saving-tax-only regime thus always leads to a larger noncooperative saving-investment tax wedge,¹⁹

$$x^{uv} > x^u \text{ iff } \eta^u > \frac{(1-\alpha)e_u^c}{e_u^c - \alpha p}, \text{ i.e. iff } x^u > \frac{-\alpha}{(1-\alpha)e_u^c} \quad (4.10)$$

The tax wedge comparisons discussed in this subsection are reflected in Figure 4. Again, the strength of preferences for public goods, as proxied by the marginal cost of public funds η^u in the noncooperative saving-tax-only regime, varies along the horizontal axis in the figure, while the vertical axis contains the saving-investment tax wedge in the uv , u and $*$ regimes. The three curves - labeled x^{uv} , x^u , and x^* - indicate how the saving-investment tax wedges in the corresponding regimes are related to the MCPF in the saving-tax-only regime. In the figure, the x^{uv} -curve always lies above the x^u -curve with the trivial exception of their common minimum point where the profit tax is not fully utilized, and where adding the investment tax would be immaterial. The figure now enables us to compare national welfares under the noncooperative saving-cum-investment and noncooperative saving-tax-only regimes. In so doing, we again apply that welfare is maximized under coordination, and that welfare is concave in the saving-investment tax wedge. First, note that if η^u exceeds η'' in the figure (here $\eta^u = \eta''$ corresponds to $\eta^{uv} = 1 + e_u/p$ as in (4.5)),

¹⁸If the profit tax does not bind, there is no scope for an investment tax.

¹⁹To demonstrate this more formally, use (2.7) and the fact that in the u regime, $x = u$, while in the uv regime, u is related to x by (4.3).

then the saving-cum-investment-tax regime clearly dominates the saving-tax-only regime. Enforcing a purely residence-based capital income tax system by agreeing to eliminate source-based investment taxes thus is a bad idea for relatively strong preferences for public goods. Second, for η^u in the vicinity of unity, corresponding to only moderate preferences for public goods, we see that the saving-tax-only regime dominates the saving-cum-investment tax regime. This is the case where the introduction of an investment tax instrument just leads to an overly high investment tax to get at the foreign owners of domestic firms. In this instance, a move to a residence-based-only tax regime is clearly welfare improving. These results are summarized as follows:

PROPOSITION 2. Suppose that countries can only tax profits incompletely and that there is some cross-ownership of firms. Then for rather moderate preferences for public goods, corresponding to values for the marginal cost of public funds around unity in the saving-tax-only regime, this regime welfare dominates the saving-cum-investment tax regime.

4.3 No foreign firm ownership or complete profit taxation

Our analysis this far has been carried out under the twin realistic assumptions that there are constraints on the extent of profit taxation, and that there is cross-ownership of firms. For completeness, we here briefly consider the opposite cases in which either complete profit taxation is possible, or all firms in every country are owned by domestic citizens.

If firms are owned exclusively by domestic residents, there will be no cross-country profit flows. This effectively brings us back to the setting in the paper by Bucovetsky and Wilson (1991). They demonstrate that non-cooperative capital income tax policy with both saving and investment taxes corresponds completely to the coordinated policy stance (and to tax policy in the parallel closed economy). Hence, there is no scope for policy coordination, and losing either the saving tax or the investment tax is bound to be detrimental to welfare.

If profit taxes can be levied without limit, the investment tax which basically functions as a second best tax on profits disappears from the optimal tax package in the noncooperative tax equilibria with access to both saving and investment taxes. Obviously, losing the investment tax will then be immaterial, so that welfare levels in the saving-and-investment-tax and saving-tax-only regimes are the same. If furthermore the profit tax is fully utilized (at one hundred percent), these two regimes both correspond to coordinated tax policy.

However, if there is cross-ownership of firms, and if non-cooperative tax policy implies less than full use of the unbounded profit tax, welfare will improve if countries no longer have access to the saving tax. In the situation in which the profit tax is not used in full it partly finances a saving subsidy to domestic citizens as a second best means of transferring income from foreign owners of domestic firms to national

residents. Since coordination of tax policies would eliminate such a negative saving tax, moving from the saving-and-investment-tax regime to the investment-tax-only regime would clearly be beneficial in such a situation. Thus, despite the assumed availability of complete profit taxation we have identified yet another instance in which the loss of a capital income tax instrument will be welfare improving.

5 Conclusions

This paper has compared national welfare across various noncooperative capital income tax regimes. The international tax regime for the case where there are saving, investment and profit taxation is generally inefficient when there is incomplete profit taxation and some foreign ownership of domestic firms, entailing cross-country profit flows. The paper shows that in this second-best world the elimination of either the saving tax or the investment tax may improve national welfare in all countries.

At present, most countries de jure levy both residence-based saving taxes and source-based investment and profit taxes. Residence-based capital income taxes, however, are increasingly difficult to enforce, as international capital markets become more integrated. The evasion of residential capital income taxes could ultimately lead to the effective elimination of the taxation of saving. Proposition 1 of the paper indicates that such an elimination paradoxically may improve welfare, as it may bring the saving-investment capital income tax wedge closer to the tax wedge that is optimal under coordination. This will occur if preferences for public goods are not too strong. At the other extreme, a switch to exclusively residence-based capital income taxes (and thus the elimination of source-based investment taxes), as has been recommended by many scholars, may also improve overall welfare, given the current absence of international tax coordination. As established in Proposition 2, this will only happen if preferences for public goods are rather weak.

Using the techniques in this paper, a direct comparison of a combination of saving and profit taxes and a combination of investment and profit taxes can also be undertaken. With both incomplete profit taxation and cross-ownership of firms, the comparison becomes somewhat involved. Either tax regime can in principle dominate in welfare terms. As a general tendency, however, the saving tax regime is more likely to be preferred, the larger is the investment semi-elasticity relative to the saving semi-elasticity, and vice versa.

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Figure 1 (a)

Non-cooperative tax policy with both saving and investment taxes

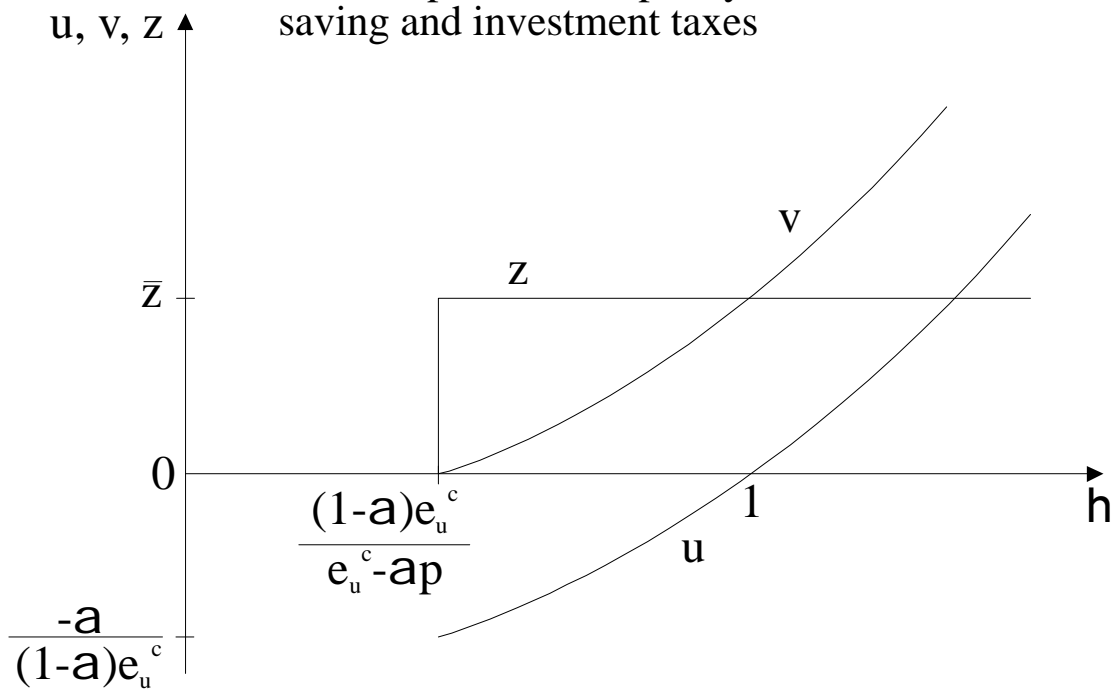


Figure 1 (b)

Non-cooperative tax policy without saving taxes

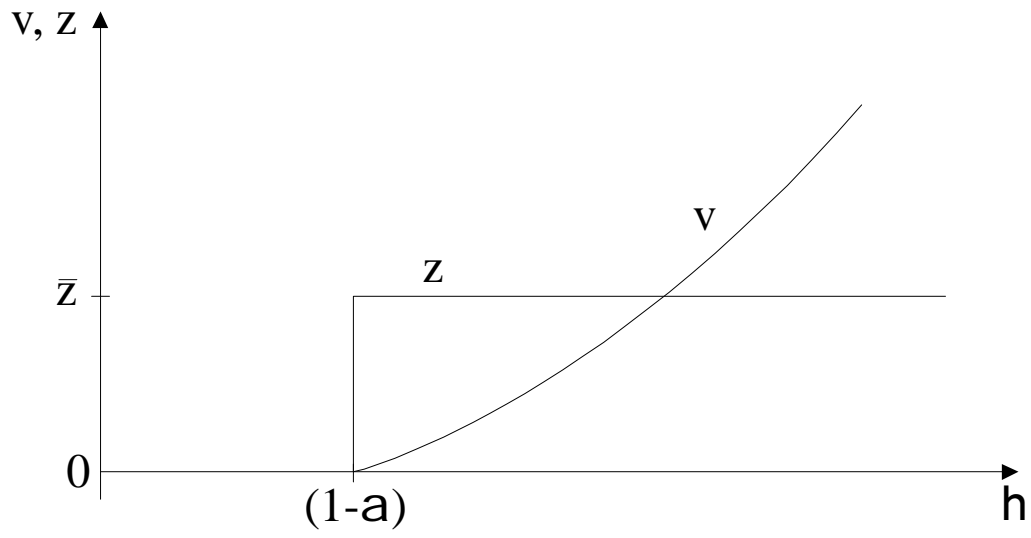


Figure 1 (c)

Non-cooperative tax policy without investment taxes

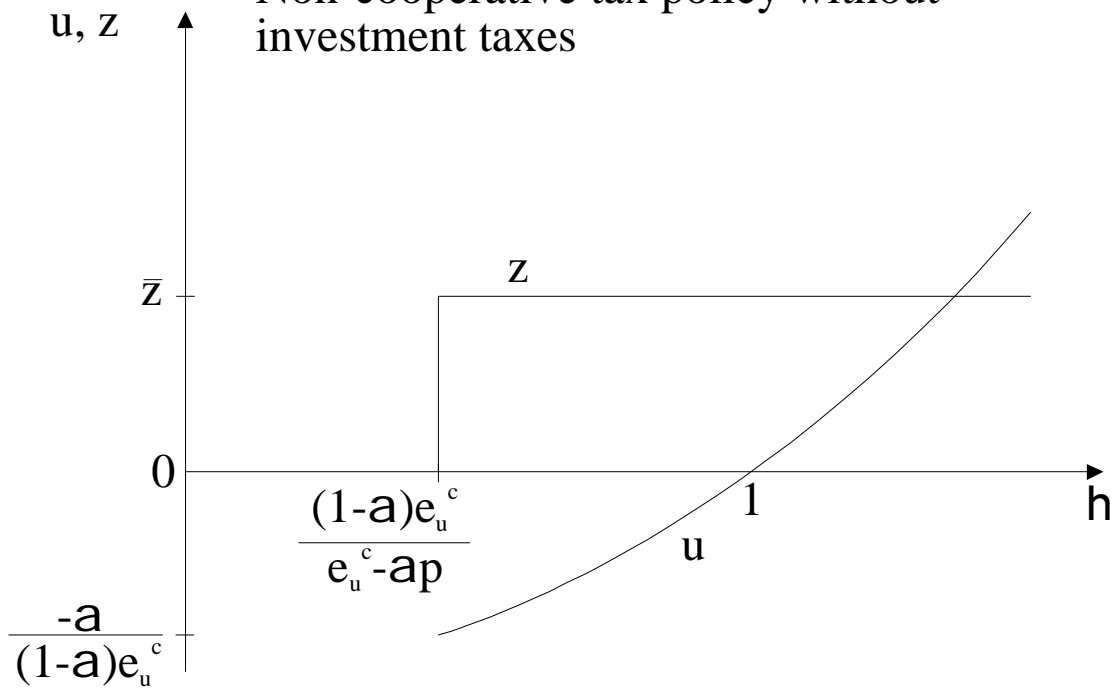


Figure 2
Closed economy tax policy

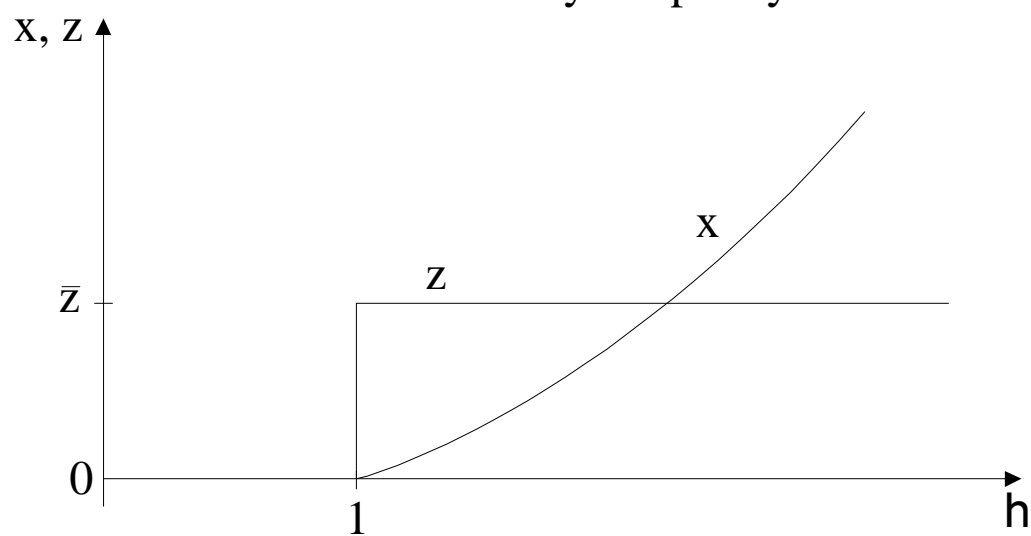


Figure 3
Saving and investment taxation
vs. only the latter

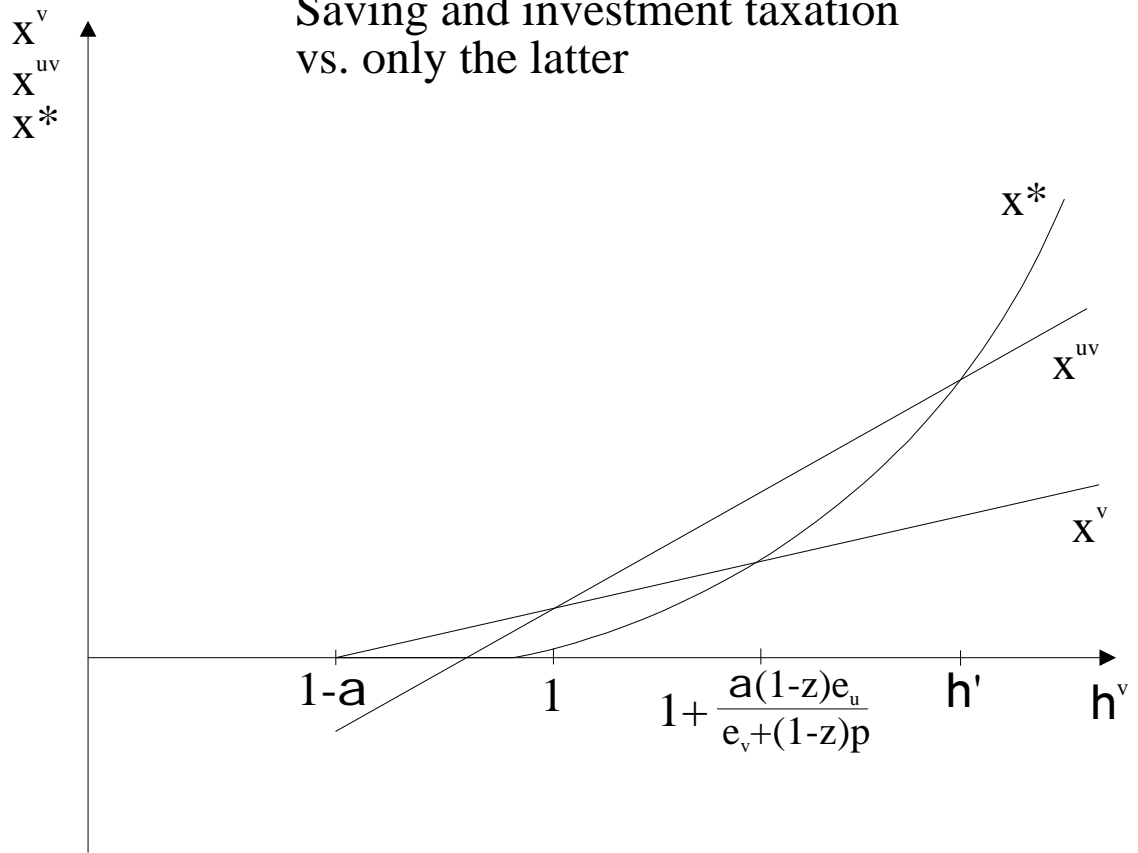


Figure 4
Saving and investment taxation
vs. only the former

