

Fuest, Clemens; Huber, Bernd; Mintz, Jack

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## Capital Mobility and Tax Competition: A Survey

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# CAPITAL MOBILITY AND TAX COMPETITION: A SURVEY

CLEMENS FUEST  
BERND HUBER  
JACK MINTZ

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# CAPITAL MOBILITY AND TAX COMPETITION: A SURVEY

## Abstract

This paper surveys the literature on the implications of international capital mobility for national tax policies. Our main issue for consideration in this survey is whether taxation of income, specifically capital income will survive, how border crossing investment is taxed relative to domestic investment and whether welfare gains can be achieved through international tax coordination. We develop a “working horse model” of multinational investment which allows to derive many of the key results from the literature on international taxation in a unified framework. Moreover, we put special emphasis on the problem of tax competition and financial arbitrage.

JEL Code: H21, H25.

Keywords: tax competition, capital mobility, tax policy.

*Clemens Fuest*  
*Center for Public Economics*  
*University of Cologne*  
*Albertus Magnus-Platz*  
*50923 Köln*  
*Germany*  
*clemens.fuest@uni-koeln.de*

*Bernd Huber*  
*Department of Economics*  
*University of Munich*  
*80539 München*  
*Germany*  
*huber.office@lrz.uni-muenchen.de*

*Jack Mintz*  
*University of Toronto*  
*Rotman School of Management*  
*105 St. George St.*  
*M5S 3E6 Toronto, ON*  
*Canada*  
*jmintz@cdhowe.org*

## I. Introduction

Tax competition and co-ordination is one of the most pressing issues for tax authorities in modern economies. It is also a highly controversial subject. Some argue that tax competition is beneficial by forcing governments to impose efficient tax prices on residents for the provision of public services (Tiebout (1956)). In other words, if tax competition leads to less use of source-based taxes (such as taxes on businesses), this would improve the tax policy in competitive economies. Further, some argue that tax competition is also beneficial by limiting the power of governments to levy taxes (Kehoe (1989) and Edwards and Keen (1994)).

Others take a different view. Taxes levied by jurisdictions can impose spillover (or fiscal externality) costs on other jurisdictions (Mintz and Tulkens (1986) and Gordon (1983)). This can take the form of “tax base flight” whereby a jurisdiction’s tax results in mobile factors fleeing to low-tax jurisdictions (Zodrow and Mieszkowski, 1986). Alternatively, unco-ordinated taxes can result in “tax exportation” whereby a government shifts the tax burden of financing local public services onto non-residents (e.g. taxes on foreign corporations). Therefore, in a world without co-ordinated tax policies, governments choose sub-optimal levels of public services financed by inefficient taxes that are either too high or too low by ignoring spillovers imposed on other jurisdictions.

In recent years, the OECD and the European Union have become increasingly concerned about tax competition. Historically, the OECD developed a model “tax treaty” to limit tax avoidance and reduce “tax exportation” arising from double taxation of income earned by a multinational parent with operations in a capital importing country. A recent OECD project, controversially named “harmful tax competition”, is intended to reduce the scope for “tax base flight” externalities by removing incentives to shift tax bases to low-tax jurisdictions. The European Union has not only been looking to implement a “code of conduct” to limit the scope of tax competition but the member countries have also been forced to adopt limitations on tax exportation that discriminates between foreigners and domestic owners of capital.<sup>1</sup> Agreements to limit tax competition have not been easily achieved. Even in the latest round of negotiations, some countries like Luxembourg and the United Kingdom have objected to EU or OECD attempts to limit tax competition.

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<sup>1</sup>Recent European court cases induced Britain and other EU countries to revise their tax systems for the integration of corporate and personal taxes. Most governments only provided a dividend tax credit for domestic shareholders as an offset for corporate taxes paid on income prior to distribution to shareholders. Effectively, a German company operating in Britain argued that the dividend tax credit should also be extended to German shareholders as part of the European Union. The court determined that a tax credit should be paid to shareholders in other European countries. Rather than try to pay credits to foreign shareholders, the United Kingdom changed its existing system to integrate corporate and personal taxes by abolishing the a corporate level tax on distributions and reducing personal taxes on dividends to a level so that the combined corporate (30%) and personal tax rate (10%) on dividends was approximately equal to the top rate on salary and other income (40%).

The purpose of this survey is to draw out the most important issues of un-coordinated tax policy at the international level for cross-border transactions. The discussion focuses on mobile tax bases, specifically in relation to investment and financial transactions. Two important caveats are thus in order. The first is that, even though labour is mobile to some degree, there is still relatively little labour mobility at the international level (Helliwell (2000)). Thus, we concern ourselves with tax competition in relation to mobile capital and finance.<sup>2</sup> The second is that investment and financial transactions are taxed at the business level and household level. Although there is certainly some significant concern on part of authorities that individual residents can escape taxation on income by investing wealth in low-tax offshore jurisdictions, the most substantial problems arise with respect to business income and financial transactions taxes since most cross-border transactions involve companies and financial intermediaries.

Our main issue for consideration in this survey is whether taxation of income, specifically capital income will survive, how border crossing investment is taxed relative to domestic investment and whether welfare gains can be achieved through international tax coordination. The survey should be seen as complementing related contributions which include Keen (1993), Wilson (1999), Wellisch (2000), Gresik (2001) and Haufler (2001). One difference to these surveys is that our paper attempts to derive some of the key results on the taxation of international investment income in a kind of working horse model which we develop in section II. Moreover, we devote a lot of attention to the problem of tax competition and financial arbitrage, an issue which is somewhat neglected in the existing surveys.

The outline for the paper is the following. The paper consists of two major parts. The first part (section II) deals with the implications of tax competition for national tax policy. Section II. 1. begins with a discussion of some basic results for the optimal taxation of border crossing direct investment. In the following sections, we extend our analysis to include the role of double taxation agreements (section II.2), public goods provision (section II.3), portfolio investment (section II.4) and transfer pricing (section II.5). In section II.6 deals with the role of the financing decisions and financial arbitrage for investment and tax policy under tax competition. The second major part of the paper (section III.) deals with the problem of tax coordination. We start with the basic idea that tax competition leads to an underprovision of public goods (section III. 1.) and then consider the role of labour taxes (section III.2), residence based capital income taxes (section III.3), and redistributive income taxation (section III.4). Section III.5 discusses reasons why taxes may be too high rather than too low under tax competition. Finally, section III.6 focuses on the problem of regional versus global tax coordination. Section IV concludes the survey.

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<sup>2</sup> On fiscal competition with household mobility see Richter and Wellisch (1996) and Wellisch (2000).

## **II. International Capital Income Taxation and Tax Competition**

### **1. How should foreign investment income be taxed?**

An early analysis of the taxation of foreign investment income is due to Musgrave and Brewer (1963) and Musgrave (1969). They argue that a country should tax the income from foreign investment of domestic firms “in order to ensure that further investment is not made if the net foreign return is below the gross return on domestic investment”(Musgrave, 1969, p. 98). One way of achieving this is to tax foreign profits at the same rate as domestic profits but let foreign taxes be deducted from the tax base. A formal treatment of this question which leads to the same result can be found in the seminal paper by Feldstein and Hartman (1979). These authors analyse the optimal taxation of capital income resulting from international direct investment. The key result can be derived from a simplified version of their model.

Consider a world of two jurisdictions denoted as the home country and the foreign country. There is a multinational firm that has its headquarters in the home country and produces domestically and abroad. Domestic output is  $Y^d = F^d(K^d, L^d)$  and output produced in the foreign country is  $Y^f = F^f(K^f, L^f)$ , where K and L are capital and labour and the subscripts d and f refer to the home country and the foreign country, respectively. Labour is assumed to be internationally immobile and fixed in supply. The production functions  $F^d(K^d, L^d)$  and  $F^f(K^f, L^f)$  have the usual neoclassical properties and exhibit constant returns to scale. Moreover, denote by  $t^d$  the domestic profit tax rate and by  $t^f$  the profit tax rate in the foreign country. The home country owns the entire capital stock  $S^d = K^d + K^f$  and  $S^d$  is fixed. Assuming that all investment is equity financed, after tax profits of the multinational firm (P) can be expressed as

$$P = (1 - t^d)(F^d(K^d, L^d) - w^d L^d) + (1 - t^E)(F^f(K^f, L^f) - w^f L^f) \quad (1)$$

where  $w^d$  and  $w^f$  denote the domestic and foreign wage rates,

$$t^E = t^f(1 - a) + t^d \quad (2)$$

is the effective tax rate on foreign investment and a is a parameter which captures the treatment of foreign profits and taxes paid in the foreign country by the domestic tax system. For example,  $a = t^d$  would imply a deduction system while  $a = 1$  would represent the case where foreign taxes are (fully) credited. The profit maximizing investment decision implies

$$(1 - t^d)F_K^d = (1 - t^E)F_K^f, \quad (3)$$

that is the firm equates the marginal productivity of capital net of taxes in the two countries. Equation (3) thus describes the allocation of the capital stock across countries, given the tax policies of the home and the foreign country.

Feldstein and Hartman concentrate on the tax policy of the capital exporting country and assume that the government pursues the objective of maximizing domestic income including domestic tax revenue. There is no public sector revenue requirement such that tax policy is used exclusively to influence international capital movements. The capital exporting country takes the wage rate  $w^f$  and the tax policy of the foreign country as given. Domestic income is

$$F^d(K^d, L^d) + (1 - t^f)(F^f(K^f, L^f) - w^f L^f). \quad (4)$$

For a given  $t^f$ , the domestic government can control  $K^d$  (and, since  $S^d = K^d + K^f$  also  $K^f$ ), using its tax instruments  $t^d$  and  $a$ . The policy which maximizes domestic income implies

$$F_K^d = (1 - t^f) F_K^f. \quad (5)$$

The explanation for this result is that, at the optimum, the contribution to domestic income of a marginal unit of capital invested domestically, including the tax revenue it generates, should equal the marginal productivity of capital invested abroad, net of foreign taxes, as already stated by Musgrave (1969). The implication of (5) for domestic tax policy is easily derived by substituting (5) and (2) into (3), which yields  $a = t^d$ . The home country will thus fully tax repatriated profits but allow the multinational to deduct taxes paid abroad from the tax base (full taxation after deduction).

One important assumption made in the Feldstein-Hartman model is that countries face no legal constraints in the taxation of income from foreign investment. While this is a useful benchmark case for theoretical analysis, empirical tax policy vis-à-vis multinational firms is usually constrained by double taxation agreements. This is why a large part of the literature on the taxation of international direct investment takes into account the rules stipulated in double taxation agreements.

## **2. Tax competition and double taxation agreements**

Most existing double taxation agreements follow the OECD Double Taxation Convention (OECD, 1997). According to this model treaty, countries are allowed to tax the income from foreign investment of their multinational firms either according to the credit system or the exemption system. Under the exemption system, foreign profits are exempt from domestic taxation. If the exemption system is applied, after tax profits of the multinational firm are

$$P = (1 - t^d)(F^d(K^d, L^d) - w^d L^d) + (1 - t^f)(F^f(K^f, L^f) - w^f L^f) \quad (6)$$

In contrast, if the tax credit system is applied, foreign profits are subject to domestic taxation. Taxes on foreign profits paid abroad are credited against domestic taxes on foreign profits. The maximum credit is, however, the domestic tax liability on foreign profits, i.e. the domestic government does not fully refund foreign taxes if the foreign tax rate is higher than the domestic one. After tax profits can then be written as

$$P = (1 - t^d)(F^d(K^d, L^d) - w^d L^d) + (1 - \max[t^d, t^f])(F^f(K^f, L^f) - w^f L^f). \quad (7)$$

A large part of the literature on the taxation of multinational firms has concentrated on the tax credit system. An important question in the literature on tax policy under the foreign tax credit system is whether it leads to more efficient outcomes than the deduction system. In the earlier literature (Musgrave, 1969), the full taxation after deduction system is usually seen as inefficient from a global point of view because it gives rise to a double taxation of income from international investment and thus discriminates foreign relative to domestic investment. Under the credit system, in contrast, no such double taxation occurs. For given tax rates, the deduction system is thus less favourable to trade in capital than the credit system. However, this does not mean that the tax credit system necessarily leads to more efficient outcomes. An important contribution analysing tax policy under the credit system is Bond and Samuelson (1989). They use a variant of the Feldstein-Hartman-model to analyse the outcome of tax competition under the credit system. It turns out that, if one takes into account that the level of tax rates depends on system of double taxation relief, the bias against trade in capital is much worse under the credit system.<sup>3</sup>

The anti trade bias of the credit system can be demonstrated using the model introduced above. The foreign tax credit system implies that the effective tax rate on foreign investment is  $t^E = \max[t^{df}, t^f]$ , where  $t^{df}$  now denotes the domestic tax rate on corporate income from foreign investment. The tax rate on domestic profits ( $t^d$ ) is assumed to be zero. The profits of the multinational firm are  $F^d(K^d, L^d) - w^d L^d + (1 - \max[t^{df}, t^f])(F^f(K^f, L^f) - w^f L^f)$ . The firm's optimal investment behaviour is thus determined by the condition

$$F_K^d = (1 - \max[t^{df}, t^f])F_K^f. \quad (8)$$

The optimal level of employment in the foreign country ( $L^f$ ) satisfies the standard marginal productivity condition  $F_L^i = w^i$ ,  $i=d,f$ . The analysis thus assumes that firms take the factor prices  $w^d$  and  $w^f$  as given.

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<sup>3</sup> A similar result is derived by Oakland and Xu (1996).

Under tax competition, the capital exporting and the capital importing country simultaneously set their tax rates to maximize domestic income. Consider first the capital importing country. Note that, if  $t^f < t^{df}$ , raising  $t^f$  increases tax revenue in the capital importing country but leaves the capital stock  $K^f$  unchanged. Therefore, the capital importing country will always set  $t^f \geq t^{df}$ . What about the capital exporting country? For the capital exporting country, it is also suboptimal to choose a lower tax rate than the capital importing country. Effectively, if  $t^{df} < t^f$ , the credit system is equivalent to the exemption system and the level of  $t^{df}$  plays no role. So the question arises whether the domestic country would want to raise  $t^{df}$  above  $t^f$ . It turns out that this is the case if and only if the volume of capital exports  $K^f$  affects the wage rate in the capital importing country. National income of the capital exporting country is  $F^d(K^d, L^d) + (1 - t^f)(F^f(K^f, L^f) - w^f L^f)$ . Using  $S^d - K^d = K^f$  and the conditions for the firm's optimal investment and employment decisions, the effect of a marginal increase of  $t^{df}$  on domestic welfare, evaluated at  $t^{df} = t^f$ , can be written as

$$-(1 - t^f)w_{t^{df}}^f L^f = (1 - t^f)K^f F_{KK}^f K_{t^{df}}^f > 0. \quad (9)$$

It thus turns out that the capital exporting country will always want to set  $t^{df} > t^f$ . As equation (9) shows, the reason for the capital exporting country to raise its tax rate above that of the capital importing country is that the wage rate  $w^f$  in the foreign country declines if  $t^{df}$  increases (and  $K^f$  declines). Since the capital exporting firms are assumed to take  $w^f$  as given, there is an incentive to use tax policy as an instrument of exploiting market power vis-à-vis the capital importing country. Of course,  $t^{df} > t^f$  cannot hold in equilibrium because the optimal tax policy of the capital importing country implies  $t^f \geq t^{df}$ . This implies that the only equilibrium under the foreign tax credit system is an equilibrium where tax rates are so high that border crossing investment vanishes.

A critical assumption underlying the above analysis is that countries may levy different tax rates on income from foreign and domestic investment. The OECD Double Taxation Convention (1997)<sup>4</sup> forbids this type of discrimination.<sup>5</sup> Many contributions to the literature therefore rule out the possibility of raising different tax rates on domestic and foreign source income (Gordon, 1992, Janeba, 1995, Davies, 1999, Fuest and Huber, 2002). In our model, this implies  $t^{df} = t^d$ . So let  $t^d$  be the uniform tax rate on domestic and foreign source income of the capital exporting country. Under this assumption, it can be shown that tax competition under the credit system leads to an equilibrium with positive international capital flows.

To see this, note first that the capital importing country will pursue the same policy, i.e. it will always set  $t^f \geq t^d$ . In contrast, the policy of the capital exporting country changes. It is an immediate implication of nondiscrimination that the capital exporting country cannot increase its welfare by raising  $t^d$  above  $t^f$ . The reason is that, if  $t^d \geq t^f$ , an increase in  $t^d$  does not affect the capital allocation.

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<sup>4</sup> For an economic analysis of the OECD double taxation convention see Mintz and Tulkens (1990).

This implies that the terms of trade effect which drives the result in Bond and Samuelson (1989) cannot occur here. The tax increase only shifts income from the firm owners to the government of the capital exporting country. This has no effect on welfare. So the next question whether the capital exporting country wants to reduce  $t^d$  below  $t^f$ . If  $t^d < t^f$ , a reduction in  $t^d$  reduces the tax burden on domestic investment but leaves the tax burden on foreign investment unchanged. For  $t^d < t^f$  we therefore have  $K_{t^d}^d < 0$ . This implies that the capital exporting country may still strategically reduce the supply of capital to the foreign country by reducing  $t^d$ . However, this comes at the cost of distorting domestic investment. If  $t^d < t^f$ , the effect of a marginal increase in  $t^d$  on domestic income is

$$t^d F_K^d K_{t^d}^d - (1 - t^f) w_{t^d}^f L^f. \quad (10)$$

Equation (10) implies that the capital exporting country will subsidise domestic investment in equilibrium. The optimal subsidy balances the marginal benefit from the subsidy, the reduction in the foreign wage rate, against the cost, which is a distortion of domestic investment. Note that, if the capital exporting country is assumed to be small, i.e. it takes  $w^f$  as given, it will simply set  $t^d=0$ .

What is the response of the capital importing country? National income of the capital importing country can be written as  $F^f(K^f, L^f) - (1 - t^f) K^f F_K^f$ . Maximizing this expression over  $t^f$  immediately leads to the result that the capital importing country will set  $t^f=0$  if it is small, i.e. it takes the required return to investment  $(1 - t^d) F_K^d$  as given. If it is large, it takes into account that a relocation of capital to the capital exporting country lowers the required rate of return. In this case, it exploits its market power and sets  $t^f > 0$ . The assumption of nondiscrimination between corporate taxes on domestic and foreign profits thus leads to the well known finding that capital exporting countries will subsidize domestic investment in order to improve their terms of trade in capital whereas large capital importing countries will tax capital for the same reason (see, for instance, Sinn, 1988). The result that tax credits lead to vanishing trade in capital does not hold anymore.<sup>6</sup> So an important policy conclusion emerging from the discussion in this section is that nondiscrimination clauses in international tax treaties help to avoid an excessive taxation of international direct investment.

### 3. The role of public goods provision

In the literature discussed so far, corporate income taxes essentially have the function to influence the terms of trade in capital. While this may well be a relevant factor in tax policy decisions in some cases, it cannot explain corporate tax policy in general. If terms of trade considerations generally determined corporate tax policy, one would expect that tax policy depends on whether countries are

<sup>5</sup> In practice, though, many countries do discriminate between domestic and foreign income, see Hines (1988).

<sup>6</sup> The analysis also replicates the result in Janeba (1995), who shows that the exemption system and the foreign tax credit systems lead to the same allocations. Janeba does not allow for negative tax rates, but doing so does not affect the result, as the above analysis shows.

net capital exporters or capital importers. This is not consistent with the observed patterns of tax policy (Gordon, 1992). Moreover, most countries are unlikely to have significant market power in international capital markets.<sup>7</sup>

Of course, the main reason for levying taxes in general is that governments have to finance their expenditure on publicly provided goods. However, this does not necessarily imply that corporate income taxes will be used. In fact, a well known result of optimal tax theory states that a small open economy should not levy source based capital taxes if other tax instruments such as, for instance, labour taxes, are available (Diamond and Mirrlees, 1971, Gordon, 1986). In the light of this theoretical finding, the empirical observation that countries do levy corporate income taxes is puzzling. Gordon (1992) discusses possible explanations for this puzzle. He argues that, in a world where public goods have to be financed via distortionary taxes, positive corporate income taxes may be explained by the existence of tax credits.

Gordon's results can be derived in an extended version of the model used in the preceding sections. Let the utility function of the representative household residing in the capital exporting country be  $U^d = M(C^d) + H(G^d)$  where  $C^d$  and  $G^d$  denote private and public consumption and  $M(\cdot)$  and  $H(\cdot)$  are concave functions with the usual properties. The government may finance  $G$  via two tax instruments: the corporate income tax and a tax on the income of the fixed factor  $L^d$ . Residence based taxes on capital income levied at the household level are ruled out. We assume, though, that the government would like to raise residence based taxes, which implies that  $H_G > U_C$  holds. We assume further that the income of the fixed factor is taxed at a rate of 100%. It is well known that, if there are untaxed rents, it is optimal to levy positive source based capital taxes, so that it would not be surprising to find positive corporate income taxes if rent taxation is restricted. For the capital importing country, we make the same assumptions.<sup>8</sup>

What is the equilibrium tax policy emerging under tax competition? Consider first the capital importing country. In order to exclude terms of trade considerations from the analysis, Gordon assumes that the government takes the required rate of return for capital imports  $(1 - t^d)F_K^d$  as given. It turns out that the capital importing country will never set  $t^f < t^d$  because, if  $t^f < t^d$ , it can always raise tax revenue by increasing  $t^f$  without changing domestic investment. It is also easy to show that the capital importing country will not raise  $t^f$  above  $t^d$  (provided that  $t^f \geq 0$ ) because this would distort investment while the increase in corporate tax revenue would be smaller than the decline in rent tax revenue. The capital importing country thus always sets  $t^f = t^d$ .

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<sup>7</sup> Gordon and Varian (1989) develop a model where countries are small but have specific risk characteristics, this is also a source of market power. However, the optimal tax policy implies that countries would subsidise rather than tax domestic investment.

<sup>8</sup> On the optimal taxation of capital in the presence of untaxed rents, see Horst (1980) and Keen and Piekkola (1997). By assumption, the household residing in the capital importing country has no capital income. The government may therefore want to pay transfers to the household. Our results are not affected by this issue.

What about the capital exporting country? The budget constraint of the private household in the capital exporting country is

$$C^d = (1 - t^d)F_K^d K^d + (1 - \max[t^d, t^f])F_K^f K^f \quad (11)$$

and the government's budget is

$$G^d = F^d(K^d, L^d) - (1 - t^d)F_K^d K^d + \max[t^d - t^f, 0]F_K^f K^f \quad (12)$$

The government of the capital exporting country also takes the rate of return on exported capital  $(1 - t^f)F_K^f$  as given. Consider first the case with  $t^d < t^f$ . In this case, the effect of a marginal increase in  $t^d$  on domestic welfare is  $H_G t^d F_K^d K_{t^d}^d$  which is negative for  $t^d > 0$ . Things are different if  $t^d \geq t^f$ . In this case, a marginal increase in  $t^d$  reduces the after tax rate of return on investment in both countries but leaves the capital allocation unaffected. The effect on domestic welfare is  $(F_K^d K^d + F_K^f K^f)(H_G - U_C) > 0$ . For a given corporate tax rate in the capital importing country, an increase in  $t^d$  is equivalent to an increase in a residence based tax on capital income. As long as  $H_G > U_C$ , the government of the capital exporting country will want to levy such a tax. Of course,  $t^d > t^f$  cannot be an equilibrium since the capital importing country always wants to set  $t^f = t^d$ . It thus turns out that no Nash equilibrium in pure strategies exists. One may note that this result emerges despite the assumption that the capital exporting country must set a uniform corporate income tax rate for domestic and foreign profits.

Thus, the conclusion emerging from the above analysis is that, if both countries move simultaneously and take the tax rate of the other country as given, tax credits cannot explain the existence of positive corporate income taxes. As a second step, Gordon (1992) therefore considers the case where the capital exporting country acts as a Stackelberg leader, i.e. it takes into account that the capital importing country will always set  $t^f = t^d$ . In this case, the effect of a marginal increase in  $t^d$  on the government's objective function is  $F_K^d K^d (H_G - U_C) - F_K^f K^f U_C$ . The first term is positive if  $H_G > U_C$ , which reflects that welfare increases as income is transferred from the private to the public sector. The second term is negative and captures the effect of the increase in the foreign tax rate. This implies that an equilibrium with positive corporate taxes is possible. Gordon (1992) explains this as follows: "From the investor's perspective, it is as if the country were using a residence-based tax. The government, however, cedes the tax revenue on capital exports to the other governments...reducing the attractiveness of the tax relative to a true residence based tax....The main conclusion, however, is that the tax can survive in equilibrium."(pp. 1170-71).

It thus turns out that corporate income taxes may survive under tax competition if income from foreign investment is taxed according to the foreign tax credit system. However, this result emerges in Gordon's analysis only under quite restrictive assumptions. Firstly, the capital exporting country must act as a Stackelberg leader. Secondly, it is assumed that households can only invest abroad via the multinational firm. This assumption is problematic because it excludes, for instance, international portfolio investment of domestic households. In fact, the main reason why residence based taxes on capital income are difficult to implement is that private households may avoid these taxes by investing their savings in bank accounts abroad. So a more complete picture of international capital market integration would require the possibility of international portfolio investment by households and the possibility of firms to finance their investment via the international capital market.

#### **4. Tax competition with multinational firms and portfolio investment**

In the literature, there are some papers analyzing tax policy in the presence of both multinational firms and portfolio investment (Mintz and Tulkens, 1996, Fuest and Huber, 2002). What does the introduction of portfolio investment change? If the model discussed in the preceding section is extended by portfolio investment, the result that no Nash equilibrium exists under the tax credit system, given that both countries set their tax rates simultaneously, vanishes. To see why, assume that there are many pairs of capital exporting and capital importing countries. Each pair of countries is linked by the direct investment of the multinational firm, as described in the preceding sections. However, all countries are linked by an international capital market, where households may invest their savings at the interest rate  $r$ . Firms also finance their investment via the international capital market. For each individual country, the interest rate  $r$  is given.

Consider first the investment behaviour of the firm. The required rate of return on domestic and foreign direct investment is now  $r$ . The optimal levels of  $K^d$  and  $K^f$  are therefore given by  $(1 - t^d)F_K^d = r$  and  $(1 - \max[t^d, t^f])F_K^f = r$ . Private consumption is simply  $C^d = r(K^d + K^f)$  and the government's budget can be written as

$$G^d = F^d(K^d, L^d) - rK^d + \max[t^d - t^f, 0]F_K^f K^f \quad (13)$$

So what is the tax policy under tax competition? The capital importing country will again set  $t^f = t^d$ . So we can again ask if the capital exporting country would want to raise its tax rate above that of the capital importing country. The effect of an increase in  $t^d$ , evaluated at  $t^f = t^d$ , is

$H_G((F_K^f - r)K_{t^d}^d + F_K^f K^f)$ . The first term in brackets captures the negative effect of the increase in  $t^d$ , which is a distortion of domestic investment. Since there is complete rent taxation, it is not desirable to levy a tax on domestic investment. The second term is positive. It thus turns out that,

even though the capital exporting country takes  $t^f$  as given, it will not necessarily want to raise  $t^d$  above  $t^f$ . So a Nash equilibrium with  $0 < t^f = t^d < 1$  may exist.

What is the difference to the analysis in Gordon (1992)? In Gordon (1992), an increase in  $t^d$  (departing from  $t^f=t^d$ ) does not affect investment since there is no untaxed asset.<sup>9</sup> In contrast, in the presence of portfolio investment, an increase in  $t^d$  does distort investment, both domestic and foreign. The distortion in domestic investment acts as a break on the incentives to raise  $t^d$ . So it turns out that, if taxes on domestic and foreign corporate profits are nondiscriminatory,<sup>10</sup> and if households are allowed to invest abroad through other channels than domestic firms, the existence of tax credits and multinational firms can explain the observation that even small open economies levy positive corporate income taxes. Fuest and Huber (2002) also show that positive corporate tax rates emerge under the deduction system and in the asymmetric case where one group of countries applies the tax credit system and another group applies the exemption system.

One should note, though, that the above result is derived in a model where foreign profits can only be repatriated at one point in time. In a multi-period context, the result only holds if foreign investment income is taxed by the domestic country upon accrual or if multinational firms repatriate their profits in each period. In practice, most countries with tax credit systems tax foreign profits only when they are repatriated. Since corporate taxes in the host country have to be paid immediately whereas tax credits are only available when profits are repatriated, it is clear that corporate income taxes of the host country do affect the cost of capital and, hence, investment behaviour. The host country will therefore not be able to set  $t^f=t^d>0$  without distorting capital imports. As Gordon (2000, p. 29) notes, given that countries usually tax foreign profits only when they are repatriated, the existence of tax credits would encourage the use of withholding taxes for dividend distributions rather than the use of corporate income taxes.

Another simplifying assumption made in the above analysis is that the multinational firm only invests in one foreign country. If it invests in more than one foreign country, it may use excess credits for profits generated in high tax countries to shelter profits repatriated from low tax countries. If this “averaging” allows multinational firms to entirely avoid domestic taxation of foreign profits, the domestic corporate income tax becomes a tax on domestic investment only. As mentioned above, it is inefficient for a small open economy to have such a tax.

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<sup>9</sup> In Gordon's (1992) model, the level of investment changes because savings respond to the decline in the after tax return to savings. In the simpler model used here, investment does not change since savings are fixed.

<sup>10</sup> One may note that, if the capital exporting country was allowed to tax foreign and domestic profits at different rates, the Bond-Samuelson-Gordon-result would reappear.

## 5. Transfer prices and international income shifting

In the literature discussed so far, it has been assumed that it is possible for the government to observe the location where the income of multinational firms is generated, i. e. that it is possible to distinguish clearly between domestic and foreign source income. This assumption is problematic for a number of reasons. One important issue is that, in most multinational firms, there is a significant amount of intra firm trade. When a multinational parent provides a service or sells a non-marketed good to a foreign subsidiary, a transfer price has to be charged. If market prices are not available, multinational firms may manipulate the transfer price in order to shift taxable income to the jurisdiction where taxes are lower.<sup>11</sup> Of course, this gives rise to tax savings only if income generated abroad escapes domestic taxation. This is the case, for instance, if the home country applies the exemption system or, to a somewhat lesser extent, if the home country operates a tax credit system with deferral.

The transfer pricing problem raises several policy issues. Firstly, governments may take the manipulation of transfer prices as given and adjust their tax policy accordingly. Secondly, governments may impose transfer pricing rules in order to prevent profit shifting. The first issue is analysed in Haufler and Schelderup (2000). These authors consider a standard model of tax policy in a small open economy, where the government may set corporate tax rates and bases. If the possibility of transfer price manipulation by multinational firms is ruled out, the optimal corporate tax policy allows for a full deduction of the costs of capital, i.e., the corporate income tax is a cash flow tax which implies that the marginal tax burden on domestic investment is zero. The authors then allow firms to manipulate transfer prices in order to shift income to low tax jurisdictions. In this case, countries reduce their profit tax rates in order to limit profit shifting to low tax countries. The opportunity of profit shifting thus acts as a restriction on profit taxation. In the presence of such a restriction, it is optimal to distort the investment decision. The tax on the marginal investment acts as a substitute for the restricted profit tax.

Elitzur and Mintz (1996) analyse the issue of transfer price setting by the government. They consider a model where a multinational parent sells a non-marketed good to a foreign subsidiary which is run by a local management partner. The profit of the foreign subsidiary is a function of the manager's effort, which cannot be observed by the parent. The parent thus faces a principal agent problem and offers a compensation to the manager which contains a share in the subsidiary's profits. This profit also depends on the transfer price charged by the parent for the good sold to the subsidiary. Since the government is assumed not to observe the actual transfer price, it has to set a transfer price for tax purposes. This is done by employing a simple mark-up rule. Given this transfer price and the behaviour of the parent and the management partner, countries choose positive corporate income tax rates. In this framework, it turns out that governments use unilateral transfer pricing regulations as an

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<sup>11</sup> As Slemrod (1995, 484) puts it, "...the *location* of the income of an integrated global enterprise is a conceptual nightmare;".

instrument to shift tax revenue from the foreign country to the home country (see also Mansori and Weichenrieder, 1999).

## 6. The financial structure of firms

### 6.1. The exemption system

Another complication for the allocation of a firm's income to a location is due to the possibility of changing a firm's financial structure. We have assumed so far that all investment is equity financed. This neglects that firms may at least partly finance their investment via debt. Given that firms may deduct the interest payments on debt from the corporate tax base, they may shift income from one country to another simply by changing the financial structure of the firm. For example, the domestic firm may borrow funds and use them to increase the equity of a subsidiary. This has important implications for the cost of capital faced by multinational firms. As in the case of transfer pricing, the tax incentives to change the financial structure of firms depend, among other things, on the system for the taxation of foreign profits in the multinational firm of the home country. To begin, we consider the impact of taxes in the presence of the exemption system so that a taxpayer only pays corporate income taxes to the government where income is earned at source. In the next section, the more complicated foreign tax credit regimes are considered.

As in the preceding sections, we consider a multinational firm with two sources of profits in two countries, the domestic country (with superscript d) and the foreign country (with superscript f). Since this section focuses on the effects of financing decisions on a multinational firm's cost of capital and the shifting of profits across borders, we now suppress the fixed factor L and assume that any rents earned by this factor accrue as corporate income. The main difference to the models analysed so far, though, is that we now allow for debt financing. To keep things simple, we assume that the interest rate is identical for domestic and foreign debt and we abstract from personal income taxes and source taxes on interest or dividend payments. Interest payments on debt are deductible from the corporate tax base. The multination firm's profits are given by

$$P = (1 - t^d)(F^d(K^d) - rB^d) + (1 - t^f)(F^f(K^f) - rB^f) \quad (14)$$

where  $B^d$  and  $B^f$  denote domestic and foreign debt. The question of how the financial structure of firms is determined in general is a complicated issue which cannot be discussed at length here. For our purposes, it is sufficient to simply assume that the firm finances a share  $\beta$  of its overall investment through debt. The firm thus faces the financing constraint

$$B^f + B^d = \beta(K^d + K^f). \quad (15)$$

The tax arbitrage among businesses facing differing corporate tax rates can be seen from equation (14). For instance, a multinational can finance all of its capital from one country and transfer equity funds to the other. It would do so if there are tax benefits from this strategy. If the corporate tax rate in the foreign country is less than the home country tax rate ( $t^f < t^d$ ), then it is obvious that the optimal financial policy is to finance investment with borrowing in the home country and a transfer of equity to the foreign country so that  $B^d = \beta(K^d + K^f)$ . The cost of capital for multinational investment in each country would be the following:

$$F_K^d = \beta r + (1 - \beta) \frac{\rho}{(1 - t^d)} \quad (16a)$$

for the home country and

$$F_K^f = \beta r \frac{(1 - t^d)}{(1 - t^f)} + (1 - \beta) \frac{\rho}{(1 - t^f)} \quad (16b)$$

for the foreign country, where  $\rho$  is the required rate of return on equity investment. Compared to a situation where the firm can only raise funds in the country where the real investment ( $K$ ) takes place,<sup>12</sup> the foreign country now has a lower cost of capital. Moreover, the government of the home country loses tax revenue amounting to  $t^d \beta K^f$  while the foreign country government gains  $t^f \beta K^f$ . The implications for the nationally optimal tax policy will be discussed further below.

## 6.2. Foreign tax credit regimes

Consider now the case of a foreign tax credit regime. Normally, governments do not refund taxes when the host country tax liability is more than the home country tax liability. Under the foreign tax credit system, the government will levy tax on income earned in or repatriated from the foreign jurisdiction by a multinational reduced by a foreign tax credit for taxes paid to the host country. Under the *accrual* system, a tax is imposed on income earned abroad whether or not it is repatriated back to the home country. This treatment is commonly used for the taxation of branch income and passive income earned by controlled-foreign corporations. Under the *deferral* system, income is only taxed if repatriated back to the home country. The tax will therefore be imposed on dividends but not on profits reinvested in foreign entities.

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<sup>12</sup> In this case, the cost of capital in the foreign country would be  $F_K^f = \beta r + (1 - \beta) \frac{\rho}{(1 - t^f)}$ .

## A. The Accrual System

In the case of accrual taxation, the domestic tax on foreign profits is equal to  $t^d(F^f(K^f) - rB^f)$ .

The tax is reduced by a foreign tax credit equal to  $t^f(F^f(K^f) - rB^f)$ . As long as the foreign and home government define the multinational tax base as the same in both countries, the tax on income earned by the multinational in the foreign country is equal to

$t^d(F^f(K^f) - rB^f)$  if  $t^d \geq t^f$  (deficient tax credit position) and equal to  $t^f(F^f(K^f) - rB^f)$  if  $t^f \geq t^d$  (excess credit position). Thus, the tax rate on foreign source income is  $\max(t^f, t^d)$  and the profits of the multinational firm are

$$P = (1 - t^d)(F^d(K^d) - rB^d) + (1 - \max(t^f, t^d))(F^f(K^f) - rB^f). \quad (17)$$

As a consequence, if  $t^d \geq t^f$ , there are no gains from shifting debt from the foreign country to the home country. In this case, the costs of capital in the home country is given by

$$F_K^d = \beta r + (1 - \beta) \frac{\rho}{(1 - t^d)}. \quad (18a)$$

The cost of capital for investment in the foreign country is the same:

$$F_K^f = \beta r + (1 - \beta) \frac{\rho}{(1 - t^d)}. \quad (18b)$$

In contrast, if  $t^f > t^d$ , and given that there is accrual taxation, the foreign tax credit system is equivalent to the exemption system, i.e. the analysis of the preceding section applies.

## B. The Deferral Tax System

The deferral tax system generally applies in the case that the multinational business is organized as a foreign subsidiary in the host country. Dividends and other charges remitted to the parent are subject to tax by the home country. Assuming no withholding tax on dividends, the home country tax is equal to  $t^d D / (1 - t^f)$  ( $D$  denoting dividends paid by the subsidiary to the parent). The foreign tax credit is equal to the corporate income taxes deemed to be paid on distributed profits  $d(F^f(K^f) - rB^f)t^f$ ,  $d$  being the dividend payout ratio of the subsidiary. If the profits measured for tax purposes by the home country is the same as that taxed by host country, then the dividend payout ratio is simply the dividend  $D$  divided by after tax profits in the foreign country  $d = D / [(F^f(K^f) - rB^f)(1 - t^f)]$ .

Therefore, the foreign tax credit is  $t^f D / (1 - t^f)$ . If  $t^d \geq t^f$ , the repatriation tax to the home country is thus equal to

$$t^d D / (1 - t^f) - t^f D / (1 - t^f) = \frac{(t^d - t^f)}{(1 - t^f)} D \equiv \Theta D. \quad (19)$$

The multinational's income in the presence of the deferral system is equal to the following

$$P = (1 - t^d) \left( F^d (K^d) - rB^d \right) + (1 - t^f) \left( F^f (K^f) - rB^f \right) - \Theta D. \quad (20)$$

It is clear, therefore, that the optimal financial strategy is for the subsidiary not to pay dividends to the parent in order to avoid the repatriation tax. With reinvestment of profits (therefore deferral of the home country tax), the cost of equity finance would be equal to the discount rate for equity finance.

The deferral method therefore results in a model somewhat similar to the pecking order model in that reinvestment of profits is preferable to financing investment with new equity. As Sinn (1990) points out, a firm in its gestation phase of growth may not have sufficient internal cash flow to finance investment. It must either rely on tax deductible debt or take equity transfers from the parent. If transfers of equity are used, the multinational anticipates that the income is "trapped" in the subsidiary in that any future dividends paid would attract the repatriation tax. Therefore, the cost of equity finance is greater for parent transfers compared to reinvested earnings. However, debt finance may still be more attractive to use than retained profits to finance the subsidiary's capital investments. Some countries have tried to limit deferral through limitations on the amount of reinvested profits that qualify for exempt taxation (Weichenrieder, 1996).

If the firm is in its mature stage, the cost of capital for the multinational for the deferral case would be the following

$$F_K^d = \beta r + (1 - \beta) \frac{\rho}{(1 - t^d)}. \quad (21a)$$

For the home country and:

$$F_K^f = \beta r + (1 - \beta) \frac{\rho}{(1 - t^f)}. \quad (21b)$$

Compared to the accrual method (equation (18b)), the cost of capital is lower in the foreign country since the subsidiary avoids payment of home country taxes on the income earned by the foreign subsidiary.

### C. Some Complications

The above characterization of multinational finance in the presence of the foreign tax credit regime is typically used for analysis. However, it fails to account for some important tax planning complexities, depending on the existing regime.

One issue is that home countries may not define the income of the foreign subsidiary in the same way as the host country (Leechor and Mintz, 1993). For example, the US and the UK use a different definition of income to determine the tax base of the subsidiary than that used by host country. For example, suppose  $y^f$  is the taxable income of the subsidiary as defined by the foreign country tax authorities (for example, some income could be exempt or cost deductions differ from accounting cost measures). Suppose further that the home country defines taxable income of the subsidiary as  $y^d$ . In this case, the foreign tax credit is given by  $dy^f t^f$  while the dividend pay out ratio is calculated as  $d = D / (y^d (1 - t^f))$ , so that the repatriation tax would therefore be equal to  $\frac{(t^d - t^f)}{(1 - t^f)} \frac{y^d}{y^f} D$ .

Since  $y^d \neq y^f$ , the repatriation tax is no longer exogenous – instead the ratio of  $y^d / y^f$  will depend on the capital stock and financing decisions of the subsidiary. Therefore, the cost of capital for the subsidiary should incorporate the impact of capital stock decisions on the repatriation tax. In some situations, the cost of capital could be lower if the capital stock decision expand taxable income of the host country so much more than that defined by the home country such that the repatriation tax declines. Further, it is no longer case that it may optimal to only reinvest profits -- instead, it might be optimal to repatriate dividends especially if it permits greater use of debt finance that has its own tax benefits.

A further complication is that foreign tax credit systems often permit multinationals to calculate tax liabilities on income remitted from various sources on a “global basis”. Income received from several sources (different countries or different types of income such as interest and dividends) are aggregated to calculate the home country’s tax liability and foreign tax credits. Thus, excess tax credits on high-tax foreign sources of income (due to high foreign tax rates) can be used to offset the repatriation tax owing on income lightly taxed by foreign tax jurisdictions. Thus, multinationals when repatriating income earned from abroad average foreign tax rates to avoid paying the repatriation tax (see Altshuler and Newlon, 1993). This can be achieved, for example, by simultaneously repatriating dividend and host country tax deductible charges paid by the subsidiary such as royalty income (the latter often subject to low withholding tax rates). They will also try to repatriate income with as little excess tax credits as possible – otherwise, they are paying too much tax to foreign income. Thus, a multinational firm in an excess tax credit position will push up leverage in foreign subsidiaries that are subject to high levels of tax.

### 6.3. Third Country Financing

A typical international tax planning strategy at the international level is to route financing through third countries rather than the parent transferring directly funds to finance subsidiary investments. An example of this strategy is the following:

1. The parent borrows to finance a transfer of equity to a subsidiary operating in a jurisdiction with a low tax regime (the tax preference provided is possibly limited to income earned by international financing entities). Usually, the jurisdiction chosen is one with a tax treaty with the home country.
2. Little or no withholding taxes are imposed on dividends repatriated from the entity to the parent. The parent may be exempt from paying corporate tax on the dividends or may be in an excess credit position if the home country tax foreign income with a credit on a global basis.
3. The financing entity in the intermediary country lends funds to a subsidiary in the host country.
4. The subsidiary remits interest, often exempt from withholding tax by treaty. Such interest earned by the subsidiary is exempt from taxation by the home country since the interest is viewed as paid from active business income rather than passive income (passive income may be subject to accrual taxation by the home country).
5. Effectively, the multinational is able to deduct interest incurred to finance a subsidiary in two jurisdictions – in the host country and home country.

Other structures similar to the above are used for insurance receipts, factoring and service charges. Many possible third country regimes are available to multinationals to take advantage of the tax benefits provided through intermediary financing. Depending on treaty arrangements, these include low-tax regimes in Barbados, Ireland, Belgium, Netherlands, Switzerland, Cyprus and Mauritius. The key elements are little or no withholding taxes imposed on dividends and other remitted income, low taxes imposed by the intermediary country and the absence or low taxes levied by the home country on income earned in the intermediary country. It is frequent to route income through many countries, creating multiple deductions for interest expense for one investment project.

The implications of such financing schemes is to lower the cost of capital. Effectively, for each dollar of borrowing by the subsidiary, interest expense is written off at the rate  $t^f$  in the host country and then at the rate  $t^d$  in the home country. Ignoring some small transaction and tax costs for routing income through intermediary country, the effective cost of debt finance for investment in the host country is  $r(1 - t^d - t^f)$ . This implies that the cost of capital is the following:

$$F_K^d = \beta r + (1 - \beta) \frac{\rho}{(1 - t^d)} . \quad (22a)$$

For the home country and

$$F_K^f = \beta r \frac{(1 - t^f - t^d)}{(1 - t^f)} + (1 - \beta) \frac{\rho}{(1 - t^f)} \quad (22b)$$

for the foreign country.

#### **6.4. Implications of financial arbitrage for tax competition**

How will the possibility of financial arbitrage affect incentives for tax competition? A simple model of tax competition with financial arbitrage is developed in Mintz and Smart (2001), and their main theoretical result can also be derived in the model developed above. Assume for simplicity that the governments of both the domestic and the foreign country pursue the objective to maximize corporate tax revenue, which we denote by  $T^d$  and  $T^f$ , respectively. Assume further that the level of debt for the firm as a whole must be zero, i.e.  $B^d + B^f = 0$ . This implies that debt financing can only occur in the form of a credit from the parent company to the subsidiary, financed by issuing equity in the domestic country or vice versa. We also assume that the level of debt in a jurisdiction cannot exceed the level of real investment ( $K$ ). The optimal financing strategy of the firm is the following. Assume that the domestic country is the high tax country, i.e.  $t^d > t^f$ . In this case, the firm will simply issue equity  $K^d + K^f$  in the foreign country and give a credit of  $K^d$  to the parent company. Effectively, domestic investment is thus entirely debt financed. The firm's overall profits are

$$P = (1 - t^d) \left( F^d (K^d) - rK^d \right) + (1 - t^f) \left( F^f (K^f) + rK^d \right) \quad (23)$$

What are the implications for tax revenue? Tax revenue in the domestic (high tax) country is

$$T^d = t^d \left( F^d (K^d) - rK^d \right). \quad (24)$$

For the foreign country, we have

$$T^f = t^f \left( F^f (K^f) + rK^d \right). \quad (25)$$

The key theoretical result derived by Mintz and Smart (2001) is that there is no symmetric Nash equilibrium. Firstly, if  $t^d = t^f > 0$ , country d (f) can achieve an increase of its tax base by  $rK^f (rK^d)$  through a marginal reduction of its tax rate. Secondly,  $t^d = t^f = 0$  cannot be an equilibrium because each country could raise its tax revenue by increasing its tax rate. As a result, there can only be an asymmetric equilibrium, where one country pursues a high tax strategy and the other country sets low taxes in order to attract tax part of the tax base from the high tax country.<sup>13</sup> A high tax country may be efficient if domestic investment earns high inframarginal rents. Levying high tax rates in order to tax these rents may make it worthwhile to tolerate some income shifting to other countries.

## 6.5. Summary

Although there are some significant issues involved with modelling the cost of capital and finance for multinational investments, it is clear that there are a number of international tax planning issues that result in either higher or lower costs of capital for multinationals relative to companies only investing in domestic markets. Thus, depending on circumstances, taxes could either favour or discourage cross-border investments relative to domestic investments.

The possibility of shifting income from high to low tax jurisdictions brings a new dimension to international tax competition. Although there is yet relatively little theoretical work on tax competition with financial arbitrage, the existing literature has shown that the emerging results differ significantly from those derived in traditional models of tax competition.

### **III. Tax Competition and Tax Coordination**

In the preceding section, we have discussed the tax policy countries pursue to maximize national welfare and the way in which they interact. It is clear from the analysis in the preceding sections that the interaction of the policies of individual countries does not necessarily lead to outcomes which are efficient for the economy as a whole. Many contributions to the literature therefore argue that countries should coordinate their tax policies. One key question in this debate is whether tax rates are too high or too low under tax competition. Another key issue in the literature on tax coordination is the question of whether tax competition may be a desirable limitation of the taxing powers of national governments due to political economy considerations. This section surveys the rapidly growing literature dealing with these issues.

#### **1. Source based capital taxes and the underprovision of public goods**

There is a large number of contributions arguing that tax competition will lead to levels of taxes and public expenditure that are below the optimal level for the economy as a whole (Zodrow and Mieszkowski, 1986, Wilson, 1986, Wildasin, 1989, Bucovetsky and Wilson, 1989). In this section, we retrace the basic argument that leads to the underprovision result. We do so using a model which differs somewhat from the models used in section II. Consider a world of  $n$  jurisdictions which are economically integrated but politically independent. In each country, there is an internationally immobile representative citizen who lives for two periods. The utility of the representative citizen is  $U(C_1, C_2, G)$ , where  $C_1$  and  $C_2$  denote private consumption in periods 1 and 2 and  $G$  is a public good. To keep things simple, assume that  $U(\cdot)$  has the form  $U = M(C_1) + C_2 + H(G)$  where  $M(\cdot)$  and  $H(\cdot)$  are strictly concave. This utility function implies that there is no income effect on savings. The local public good is provided by a government that finances its expenditure via a source tax ( $t$ ) per unit of capital ( $K$ ). Capital is internationally mobile.

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<sup>13</sup> Mintz and Smart (2001) argue that the observed subfederal tax policy in Canada supports these findings. While all Provinces have significant corporate income tax rates, one province, Quebec, imposes statutory tax rates which

There is a representative firm in each country which invests  $K$  in period 1 and produces a composite commodity  $Y$  in period 2, which can be transformed into the private consumption good or the public good on a one-to one basis. The production function is  $Y=F(K)$ , with  $F_K>0$  and  $F_{KK}<0$ . The firm's profits are  $P=F(K)-(r+t)K$ , where  $r$  is the interest rate in the world capital market. Profit maximization yields the firm's capital demand function  $K(r+t)$ , with  $K_{r+t}=1/F_{KK}<0$ . Firms are assumed to be owned by the domestic household and to produce only domestically. The household's budget constraint is as follows. in the first period, the household has an initial endowment  $E$ , which may be consumed in period 1 or saved. We thus have  $E=C_1+S$ . In the second period, the household receives income from savings and the profits of the firm. For the moment, we will assume that there are neither taxes on income from savings nor taxes on pure profits (or rent taxes). The household's second period budget constraint is thus  $C_2=rS+P$ .

The household maximizes utility subject to the budget constraints for the two periods. As a result, on can derive the household's savings function as  $S=S(r)$ , with  $S_r=-1/M_{CC}>0$ . The households utility can be expressed in terms of the indirect utility function  $V=V(r,P,G)$ , with  $V_r=\lambda S$ ,  $V_P=\lambda$ , and  $V_G=H_G$ , where subscripts denote partial derivatives and  $\lambda$  is the marginal utility of private income in period 2. Note that, since  $U$  is linear in  $C_2$ , we have  $\lambda=1$  and thus  $V_r=S$  and  $V_P=1$ .

In a regime of tax competition, the government in each country sets  $t$  in order to maximize the welfare of the representative household  $U$  subject to the public sector budget constraint  $tK=G$ . We assume that the impact of each jurisdiction on the world interest rate is so small that the government neglects it when making its policy choices. If we substitute the public sector budget constraint into the indirect utility function, the government's problem may be formulated as one of simply maximizing  $V(r,P,tK)$  over  $t$ . Define the elasticity of the capital tax base as  $\eta=t K_{r+t}/K<0$ , The first-order condition  $V_t=0$ , which characterizes the optimal tax policy, can be rearranged to yield:

$$\frac{1}{H_G} = 1 + \eta \quad (26)$$

Equation (26) shows that the marginal utility of the public good,  $H_G$ , is higher than the marginal utility of private consumption in the second period, which equals unity. This implies that, under tax competition, there is an underprovision of public goods relative to the first-best allocation. Oates and Schwab (1988) explain this as follows.“Communities realize that as they raise the tax rate to finance the local public good, they will drive out capital. Thus, they raise the tax rate only to the point at which the cost of the public good, including the negative effects of a smaller capital stock, equals the benefits.”(ibid., pp. 342-343). Of course, the finding that there will be an underprovision of public goods in the sense that  $H_G > 1$  is not a specific problem of tax competition. If public expenditure is

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are significantly lower than those of other provinces.

financed with distortionary taxes as, for instance, a capital tax, it is clear that the optimal level of public goods provision will be different from the first best level, which would be  $H_G = 1$ .

In fact, the notion that tax competition gives rise to an underprovision of public goods refers to a different issue. Given that public expenditure has to be financed via distortionary taxes, will tax competition lead to the second best optimal level of public goods provision for the economy as a whole? In the benchmark model considered here, the answer is that public goods provision is inefficiently low. This can be demonstrated as follows. Assume that, departing from the equilibrium under tax competition, all countries simultaneously raise their capital tax  $t$  by a small amount  $dt$  and use the additional revenue to increase  $G$ . Note first that the tax increase will affect the interest rate in the international capital market. It is straightforward to show that  $dr/dt < 0$ . The overall effect of this coordinated tax increase on the welfare of a representative household is  $dV = V_t dt + V_r dr$ . Since  $V_t = 0$  holds in the equilibrium under tax competition, the welfare effect boils down to  $dV = V_r dr = S - K + H_G t K_{r+t} dr$ . In a symmetric equilibrium, no country can be net capital exporter or importer, such that  $S = K$ . The welfare effect of a coordinated tax increase is thus  $dV/dt = H_G t K_{r+t} dr/dt > 0$ .

Why are source based capital taxes under tax competition too low? The reason is that an increase in the capital tax rate in one country gives rise to a positive (fiscal) externality since it triggers a capital outflow to other countries. These countries benefit from the capital inflow for the following reason: The marginal cost of capital to the country equals the interest rate  $r$ . The marginal benefit to the country, in turn, exceeds the interest rate since there is a positive capital tax. Output increases by  $F_K = r + t$ . The net welfare gain associated with a marginal capital inflow is  $t H_G$ .<sup>14</sup> One may note here that the existence of the fiscal externality is due to the fact that the government raises a distortionary capital tax. If the government could use lump sum taxes, it would set  $t = 0$ , such that the fiscal externality and, hence, the underprovision result would vanish. This suggests that the welfare implications of tax competition critically depend on the available tax instruments, as will be discussed further below.

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<sup>14</sup> The role of tax distortions for explaining the issue of fiscal externalities is emphasized by Bucovetsky and Wilson (1991).

## 2. Labour taxes

The underprovision result developed above plays an important role in the tax competition literature and has been extended but also qualified in several respects. Bucovetsky and Wilson (1991) extend the set of available tax instruments by assuming that the governments may use both labour and capital taxes to finance public expenditure. In their model, it turns out that, under tax competition, the capital tax is zero and public expenditure is financed exclusively by the labour tax, although this tax distorts the labour-leisure choice of the representative household. The reason for this result is that, since the supply of capital is perceived as infinitely elastic by each individual country, the burden of a capital tax would be borne by the factor labour anyway. It is more efficient to tax this factor directly.

The analysis in Bucovetsky and Wilson (1991) also leads to the conclusion that there is an underprovision of public goods under tax competition. The reason is that an increase in the wage tax rate to finance more public expenditure also triggers a positive fiscal externality. The higher wage tax rate reduces labour supply and thus reduces the marginal productivity of capital in the country under consideration. Consequently, capital flows to other countries. These countries benefit from the capital inflow although capital is not taxed because the capital inflow raises the marginal productivity of labour and, hence, labour supply. It is now the wage tax that drives a wedge between the marginal social cost of labour, which equals the net wage, and the marginal benefit, that is the gross wage.

## 3. Residence based taxation

Another important result in Bucovetsky and Wilson (1991) is derived for the case where the available tax instruments are a source tax and a residence based tax on capital. In this case, tax policy under tax competition is efficient and nothing can be gained from tax coordination, given that no other tax instruments are available. The important role of residence based taxes can also be demonstrated using a slightly extended version of the model developed above. Assume that, next to the source based capital tax  $t$ , the government may raise a residence based tax on the household's income from savings. In this case, the household's savings will be a function of the after tax return on savings which we denote by  $r^n$ . The government budget constraint is now  $G=tK+(r-r^n)S$  and the household's indirect utility function can be written as  $V=V(r^n, P, tK+(r-r^n)S)$ . The availability of the savings tax implies that, for a given  $r$ , the government may effectively set  $r^n$ . The first-order condition for the optimal savings tax  $V_r^n=0$  can be rearranged to yield

$$\frac{1}{H_G} = 1 - \theta \varepsilon \quad (27)$$

where  $\varepsilon = r^n S_{r^n} / S$  is the interest elasticity of savings and  $\theta = (r - r^n) / r$ . Equations (26) and (27) show that, under tax competition, the government will raise both source and residence based capital

taxes. While the source based tax distorts domestic investment, the residence based tax distorts savings. Interestingly, although the residence based savings tax is itself distortionary, it implies that the underprovision of public goods under tax competition vanishes, i.e. tax coordination cannot raise welfare. To see this, assume again that, departing from the equilibrium under tax competition, all countries raise the source based capital tax by  $dt$ , holding constant  $r^t$ , and use the revenue to increase public expenditure  $G$ . The welfare effect would be  $dV=V_t dr$ . We now have  $V_t = K + H_G(S+tK_{r+t})$ . Since  $S=K$  due to the symmetry assumption, and using equation (26), it turns out that  $V_t=0$ , such that  $dV=0$ . The coordinated tax increase does not affect welfare.

Bucovetsky and Wilson (1991) explain the absence of gains from tax coordination in the presence of both source and residence based capital taxes as follows: "The presence of both taxes allows a government to manipulate gross and net returns to capital...independently of the world return ...With both taxes, the region is effectively able to insulate itself from the capital flows that occur in response to another region's tax and expenditure policy."(ibid., p.349.). It thus turns out that the availability of tax instruments is crucial for the question of whether or not public goods are underprovided under tax competition.<sup>15</sup>

#### **4. Tax competition and optimal redistributive income taxation**

A further extension of available tax instruments, along with a relaxation of the assumption of perfect information and identical households, is considered by Huber (1999), who analyses tax competition in a Mirrlees-Stiglitz type model of optimum income taxation. In each country, there are two types of individuals which differ with respect to their earning abilities and have different endowments with capital. Capital taxation according to the residence principle is ruled out. The government uses a non-linear income tax system to finance a public good and redistribute income between individuals. Redistributive policies are constrained by the fact that abilities cannot be observed directly. The government therefore faces an incentive compatibility constraint. In this framework, the result that capital taxes tend to be too low under tax competition is confirmed for the case where individuals with higher abilities also own more capital than low ability individuals. Essentially, a capital tax increase in all jurisdictions would then redistribute income from high to low ability individuals. This leads to a welfare gain, given the second-best nature of redistributive policies in this model.

Fuest and Huber (2001a) also consider tax competition and tax coordination in a model where tax policy aims at redistributing income and faces informational constraints. In their model, individuals have equal abilities but differ with respect to their endowment with capital. Governments are able to raise a residence based capital income tax and tax labour and capital income differently, but individuals may, at some cost, shift labour to capital income and vice versa to avoid taxes. The government can only observe reported income, that is labour and capital income after shifting has

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<sup>15</sup> Tax coordination with multiple tax instruments is further analysed in Eggert and Genser (2001).

taken place. Since rich households may shift capital to labour income in order to mimick poor households, redistributive taxation has to take into account an incentive compatibility constraint. In this model, it also turns out that capital tax rates are inefficiently low under tax competition.

## **5. May capital taxes be too high under tax competition?**

The literature discussed so far suggests that tax competition leads to an underprovision of public goods so that coordinated tax increases are desirable. However, there are several reasons why capital taxes may in fact be too high under tax competition. Moreover, coordinated capital tax increases may benefit only some countries while others lose. These issues are discussed in the following paragraphs.

### **5.1. Country Size and Asymmetries**

In the contributions discussed so far, it has been assumed that jurisdictions are symmetric and small. The latter means that the capital demand of one jurisdiction has a negligible effect on the interest rate in the international capital market. If one relaxes this assumption, not much changes if large but symmetric jurisdictions are considered. Governments may now use tax policy to exploit their market power in the international capital market. Yet, an increase of the capital tax rate in one country still triggers a capital outflow. Hoyt (1991) analyses a model with large and symmetric jurisdictions, where a source tax on capital is the only tax instrument available to finance the provision of a local public good. He shows that the equilibrium tax rate and, hence, the level of public goods provision is higher, the lower the number of competing jurisdictions. Still, the problem of an inefficiently low provision of public goods under tax competition also carries over to large and symmetric jurisdictions.

Things change, however, once the assumption of symmetry is relaxed. De Pater and Myers (1994) analyse a model where jurisdictions are large and differ with respect to their endowments with capital. In this framework, capital taxes are used to strategically influence the interest rate in the international capital market. Capital importing countries tax domestic investment in order to reduce the interest rate whereas capital exporting countries do the opposite. It is clear that this leads to tax structures that are inefficient from the point of view of the economy as a whole, even if the governments may in principle use lump sum taxes to finance their expenditure. The reason is that the effect of tax policy on the interest rate gives rise to pecuniary externalities. Capital taxes will then be inefficiently high in capital importing regions and vice versa.

While the idea that large countries may use their market power to strategically influence prices is familiar from international trade theory, asymmetries between countries also affect the working of tax competition in a more subtle way. Wilson (1991) considers a two country model where the two

jurisdictions are identical except for the size of the labour force.<sup>16</sup> He shows that, under tax competition, individuals are better off in the small country. The reason is that the capital tax raised by a country is higher, the stronger the effect of its capital demand on the interest rate in the international capital market, i.e. the lower the elasticity of capital supply. The capital demand of the large country has a stronger impact on the interest rate than that of the small country. The former therefore raises a higher capital tax rate. Since the cost of capital is thus lower in the small country, per capita investment is higher and, hence, the wage rate is also higher. This advantage of being small implies that, if the size difference is sufficiently large, the small country may actually be better off under tax competition, where public expenditure is financed, on the margin, with capital taxes<sup>17</sup>, than in a coordinated equilibrium or a first-best situation where unrestricted lump sum taxes are available.<sup>18</sup>

The result that small countries benefit from tax competition, however, may not hold for all types of investment. Haufler and Wooton (1999) argue that, in the presence of imperfect competition and transport costs, large countries may actually be at an advantage when countries compete for foreign direct investment. The model considered by these authors assumes that there is a multinational firm that sells its output on a goods market with imperfect competition. Since there are transport costs, the firm will prefer to locate in the larger market. This gives rise to a locational rent for the large country, which may be exploited by tax policy, which means that the large country may raise higher taxes (or offer lower subsidies) than the small country and will still receive the investment.

## 5.2. Tax Exportation and Multinational Firms

One important reason why tax competition may lead to over- rather than undertaxation is the phenomenon of tax exportation. Tax exportation occurs if governments raise taxes which are at least partly borne by the citizens of other jurisdictions. Huizinga and Nielsen (1997) consider a model where domestic firms are owned by foreigners and the taxation of pure profits is assumed to be restricted for exogenous reasons. In this framework, it turns out that countries will raise source taxes on capital in order to indirectly tax profits and thus shift income from foreign firm owners to domestic residents. It may even be optimal for an individual country to raise capital taxes and use the revenue to make lump sum payments to its citizens. In a world with an endogenous savings decision, this may give rise to an overtaxation of capital. Here, the nature of the emerging fiscal externality is quite

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<sup>16</sup> Bucovetsky (1991) analyses a similar model but restricts the analysis to quadratic production functions.

<sup>17</sup> These results also go through if a distortionary wage tax is available next to the capital tax. However, if the supply of public goods is endogenous (as opposed to a fixed revenue constraint), the gains of small countries from tax competition are reduced, see Eggert and Haufler (1998) and Haufler (2001), chapter 5.

<sup>18</sup> As Wilson (1991) emphasizes, the result that small countries tend to benefit from tax competition is opposed to the findings of international trade theory and the theory of “tariff wars“, where small countries are at a disadvantage (see Kennan and Riezman, 1988)).

obvious. Countries do not take into account that their capital taxes reduce the profit income and distort the savings decisions of households residing in other jurisdictions.<sup>19</sup>

Another form of tax exportation may occur in the presence of multinational firms. This issue is studied in Mintz and Tulkens (1996). They show that, under tax competition, corporate income taxation of individual countries gives rise to negative externalities. Two channels of these negative externalities are identified. Firstly, countries tax the profits of foreign multinationals operating within their borders, which reduces profit income accruing to other countries.<sup>20</sup> Secondly, countries tax the foreign profits of domestic multinational firms. This has a negative impact on foreign investment and therefore reduces the tax revenue and the income of immobile factors generated abroad. These negative fiscal externalities suggest that, in the presence of international direct investment, tax competition may actually lead to over- rather than undertaxation of capital income.

Fuest and Huber (2002) explicitly analyse the welfare effects of coordinated tax increases in the presence of multinational firms. They compare the effects of tax competition under the exemption system, the deduction system and the foreign tax credit system. It turns out that capital taxes may be too high under tax competition if countries apply the deduction system or the tax credit system while taxes are too low under the exemption system. The reason is that, under the exemption system, capital taxes are effectively purely source based, so that no tax exportation occurs.

### **5.3. Imperfect competition in labour markets**

Most of the literature of tax competition assumes that markets are perfectly competitive. This assumption is probably most problematic for labour markets. Especially in Europe, labour markets tend to be characterized by minimum wages and collective wage bargaining. Lejour and Verbon (1996) consider a two country model with imperfect capital mobility, where wages are set by monopoly unions. The population in each country consists of workers, who may be employed or unemployed, and capital owners who may invest at home or abroad. The government runs a social insurance system consisting of a proportional wage tax that finances transfers to the unemployed. The strategic policy variable is the tax rate of the social insurance system. Increases in the tax rate are partly shifted to capital owners via higher wages. Capital owners will therefore prefer a lower tax rate than workers. The government is assumed to maximize a generalised utilitarian welfare function of all residents.

In this model, changes in the policy of an individual country also affects the welfare of other countries. However, the fiscal externality will affect foreign workers and foreign capital owners in

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<sup>19</sup> Foreign firm ownership, though, may also give rise to suboptimally low corporate income taxes as shown by Fuest and Hemmelgarn (2003), who consider a model where the corporate income tax serves as a backstop to the personal income tax.

<sup>20</sup> This negative externality is also at the heart of the analysis in Huizinga and Nielsen (1997).

different ways. Foreign workers will benefit from an increase in the domestic social insurance tax rate since it triggers a capital flow to the foreign country. Foreign capital owners, in contrast, are affected negatively because their investment opportunities are deteriorated. On balance, however, it turns out that the positive fiscal externality dominates such that, in terms of overall welfare, social security tax rates are too low under tax competition.

Fuest and Huber (1999) also consider a model with a non-competitive labour market and unemployment. Countries are small, and the wage rate is determined via bargaining between unions and firms. The government in each country raises a wage tax and a source tax on capital to finance a public good. Under tax competition, the structure of wage and capital taxes is in general undetermined, which means that the equilibrium tax structure may differ from that emerging under competitive labour markets. The reason is that taxation may affect the outcome of wage bargaining. In this framework, it also turns out that the tax policy of individual countries gives rise to both positive and negative fiscal externalities. The positive externalities are similar to those found in models with competitive labour markets. The negative externalities are caused by the impact of capital flows on wage bargaining. A capital inflow may encourage unions to raise the wage rate in the bargaining process and thus worsen the labour market distortion. It turns out that the negative fiscal externality may dominate in this model, such that labour and capital tax rates are inefficiently high under tax competition.<sup>21</sup>

#### 5.4. Political Economy Models

The theories of tax competition discussed so far are based on the assumption that governments maximize the welfare of their citizens. This implies that the analysis abstracts from inefficiencies caused by imperfections of the political process. Public choice theorist have argued that these imperfections of the political process give rise to excessive government growth. From this perspective, tax competition may be seen as a desirable check on the expansion of the public sector. The most radical version of this argument is due to Brennan and Buchanan (1980), who model government as a revenue maximizing Leviathan without any interest in the well being of the citizens. If this view of government is taken seriously, it is clear that tax competition is a highly welcome way of restricting the power to tax. Obviously, a serious limitation of the Leviathan model is that it abstracts completely from institutions such as elections by which modern democracies create incentives for the members of governments to take into account the welfare of citizens and voters.<sup>22</sup>

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<sup>21</sup> Further contributions to issue of how tax competition affects tax policy in the presence of unemployment, but without reference to tax coordination, include Richter and Schneider (2001), Eggert and Görke () and Leite-Monteiro, Marchand and Pestieau (2003).

<sup>22</sup> Frey and Eichenberger (1996) emphasize that both economic distortions such as the underprovision of public goods and political distortions caused by imperfections of the political process should be taken into account in the analysis of tax competition.

A somewhat more balanced approach is used by Edwards and Keen (1996). These authors consider a model of a large number of small open economies with capital mobility, where the stock of capital for the economy as a whole is fixed. It is assumed that governments maximize an objective function of the type  $Z=Z(U,H)$ , with  $Z_U \geq 0$  and  $Z_H \geq 0$ , where  $U$  is the utility of the representative citizen and  $H$  is a variable that stands for resources wasted due to imperfections of the political process. The objective function  $Z$  may be interpreted as a popularity function and comprises the polar cases of a purely benevolent government ( $Z_H=0$ ) and that of a revenue maximizer ( $Z_U=0$ ).

The equilibrium under tax competition is characterized by a tax structure which is the same as that which would be chosen by a benevolent government, given the level of public expenditure. The reason is that politicians, whether selfish or benevolent, have no interest in raising revenue in an inefficient way. However, political economy considerations do make a difference with respect to the overall level and the structure of public expenditure; the structure is different because part of the revenue is now devoted to socially wasteful expenditure. In this setup, fiscal competition tends to limit government waste but also reduces socially desirable public expenditure. The authors show that a coordinated increase in capital taxes has an ambiguous effect on the welfare of the representative citizen. Welfare is more likely to increase, the higher the marginal excess burden of the tax system under tax competition and the lower the marginal propensity of the government to waste resources.<sup>23</sup>

Another set of political economy approaches to tax competition discusses the impact of increasing capital mobility on fiscal policy decisions. Persson and Tabellini (1992) consider a two-stage variant of the median voter model where, in each country, a government is elected at stage one. The governments then set tax policy in a tax competition game played at stage two. In this model, the level of public expenditure is also given, such that the relevant decision is on the distribution of the tax burden between labour and capital. Increasing capital mobility has two opposing effects. On the one hand, there is what the authors call the “economic effect”: greater capital mobility increases tax competition and therefore drives down the capital tax rate. On the other hand, the authors find a “political effect”: Voters anticipate the behaviour of their governments in the tax competition game and will elect more “leftist” governments in order to prevent an excessive reduction of the capital tax rate.<sup>24</sup> On balance, however, the economic effect dominates and a larger part of the tax burden is borne by labour as capital mobility increases.

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<sup>23</sup> Fuest (2000) extends the Edwards-Keen model by introducing a bureaucracy into the model. Politicians and bureaucrats have diverging interests and the political decision making process is modelled as a bargaining game between these two groups. It turns out that coordinated capital tax increases unambiguously reduce the welfare of the representative citizen if the bureaucrats dominate the decision making process. Sato (2001) extends the Edwards-Keen model by explicitly considering a rent seeking game. The welfare effects of coordinated tax increases are also ambiguous.

<sup>24</sup> An interesting variant of the approached developed in Persson and Tabellini (1992) is analysed by Brückner (2000). He shows that, if voters anticipate that governments will coordinate taxes, tax competition may occur at the voting (or delegation) stage, i.e. voters will delegate politicians with low preferences for public goods. It is therefore unclear whether capital tax rates are higher under tax coordination compared to a regime of tax competition.

Fuest and Huber (2001b) analyse tax competition and tax coordination in a model where individuals differ with respect to their labour income and their capital endowments and fiscal policy decisions are taken via majority voting. The government in each country raises a labour income tax and a source based capital tax and provides a local public good. Although the policy space is two-dimensional, a median voter equilibrium exists. The reason is that all voters, irrespective of their labour income, will prefer not to tax capital at source. For the wage tax and, hence, the level of expenditure on the local public good, the median voter's preferences will determine the policy outcome. In the equilibrium, the level of public good provision is determined by two countervailing forces. First, the level of public goods provision will be lower, the higher the marginal excess burden of the wage tax because the median voter will also have to bear the cost of tax distortions. Second, the level of public goods provision will be higher, the greater the difference between average and median labour income. This reflects the redistributive nature of the local public good. All residents benefit equally from the provision of this good, but the median voter's share in the cost of the public good is proportional to labour income. In the empirically relevant case where the median voter's income is below average income, there may thus be an overprovision of public goods under tax competition.

Graafland and Ypersele (2003) also consider problems of tax competition in a median voter model. The framework used is a two-country model with capital mobility, where the governments raise source taxes on capital and labour taxes. It is assumed, however, that the level of public expenditure is fixed, such that the voting decision is only over the mix between capital and labour taxes that finances the public budget. The authors show that, if countries are asymmetric, tax coordination agreements may fail to receive political support.

Gabszewicz and Ypersele (1996) also consider the effects of increasing capital mobility in a political economy model where the strategic policy variable is a transfer to unemployed workers which also constitutes a minimum wage rate. The level of the minimum wage is determined via majority voting. Essentially, the voting outcome is determined by the factor endowment of the median voter. The minimum wage rate raises the income of employed workers but also reduces employment. It turns out that, even if the median voter is endowed with labour only, increasing capital mobility drives down the equilibrium minimum wage.

Taken together, political economy models of tax competition suggest two conclusions. Firstly, although imperfections of the political process are not sufficient to overturn the result that tax competition leads to inefficiently low tax rates, contributions neglecting political economy problems give rise to an excessively pessimistic assessment of the welfare implications of tax competition. Secondly, the literature dealing with the effects of increasing capital mobility on the distribution of the tax burden between capital and immobile labour seems to confirm the intuitively plausible view according to which higher capital mobility will induce tax policy changes in favor of capital owners.

## **6. Regional versus Global Coordination**

It has been assumed so far that tax coordination involves all countries in the world. But real world tax coordination initiatives are usually restricted to a certain subgroup of countries like the EU member states or the OECD countries. If capital tax coordination only takes place among a subset of countries, the problem arises that capital may still flow to countries not participating in the coordination agreements. This raises the question whether the arguments in favour of coordinated capital tax increases are still valid if there are third countries not participating in the coordination agreement. The answer is that, if the group of countries which participates in the coordination agreement is large enough to have an impact on the international interest rate, there are potential welfare gains from regional tax coordination (see also Konrad and Schjelderup (1999)). Sorensen (2000, 2001) analyses the welfare effects of regional tax coordination in simulation models and confirms the finding that there are welfare gains from regional tax coordination but also shows that these gains are lower than the gains from worldwide coordination.

Haufler and Wooton (2001) focus on regional tax coordination in a model where countries compete for direct investment of an internationally mobile firm. They consider a world of three countries. Two of them may form a union and coordinate taxes. It turns out that there are two types of gains from regional tax coordination. Firstly, if the investment would be located in the union under tax competition, tax coordination within the union allows the country where the investment is located to extract higher rents from the firm. Secondly, tax coordination yields a benefit by internalizing fiscal externalities within the union. Interestingly, it is unclear whether regional tax coordination increases or decreases tax rates in this model.

## **IV. Conclusions**

The interaction of corporate income taxes and international capital flows suggests that the source-based capital taxes potentially result in quite significant distortions in the allocation of capital at the international level. Much economic analysis has viewed that capital taxes will disappear if real capital is perfectly mobile at the international level. However, given that this view assumes that economies are small and there are no impediments to the free flow of capital, reality would suggest that competition for real capital is less extreme than what typical economic models would suggest. There are good reasons for countries to tax mobile capital if governments can “export” taxes paid by non-residents. Competitiveness may make it more difficult for countries to tax income earned by foreigners but there is virtually no economic study that would suggest that real capital is perfectly mobile.<sup>25</sup>

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<sup>25</sup> Of course, limited capital mobility does not necessarily imply that capital taxes survive, as is shown by Gordon and Bovenberg (1996).

Instead, the problems with corporate taxation are much deeper than what would be suggested by models with perfect mobility of real capital. One issue is that taxable profits are highly mobile, leading to the “tax base flight” fiscal externality dominating other fiscal externalities in this case. Governments have been trying to protect their tax bases by imposing restrictions that lead to an erosion of profits as well as reducing statutory tax rates. The other issue is that it is increasingly difficult to impose a tax on income earned in a jurisdiction by a growing multinational sector in a more integrated global economy. New technology and financial transactions makes it more problematical to define profits earned in one country alone. Governments have been increasing their reliance on profit-based measures of transfer prices since these can rely more on allocation methods for global profits of multinationals rather than transaction-based rules. Nonetheless, administrative practices will require considerable co-operation amongst governments if they are to maintain the corporate income tax.

## References

- Altshuler R. and S. Newlon (1993), “The effects of U.S. tax policy on the income repatriation patterns of U.S. multinational corporations”, in *Studies in International Taxation*, edited by A. Giovannini, R. G. Hubbard, and J. Slemrod, National Bureau of Economic Research, University of Chicago Press, Chicago.
- Bond, E. W. and L. Samuelson (1989), Strategic Behaviour and the Rules for International Taxation of Capital, *Economic Journal* 99, 1099-1111.
- Bucovetsky, S. (1991), Asymmetric Tax Competition, *Journal of Urban Economics* 167-181.
- Bucovetsky, S. and J. D. Wilson, 1991, Tax competition with two tax instruments, *Regional Science and Urban Economics* 21, 333-350.
- Brückner, M. (2000), Strategic Delegation and International Capital Tax Competition, Manuscript, University of Bonn.
- Edwards, J. and M. Keen (1996). Tax Competition and Leviathan. *European Economic Review* 40, 113-134.
- Davies, R. B. (1999), The OECD Model Tax Treaty: Tax Competition and Two-Way Capital Flows, Mimeo, University of Oregon.
- De Pater, J. A. and G.M. Myers (1994), Strategic Capital Tax Competition, *Journal of Urban Economics* 36, 66-78.
- Dutton, John (1982), The optimal taxation of international investment income: A comment, *Quarterly Journal of Economics* 97, 373-380.
- Eggert, W. and A. Haufler (1998), When do small countries win tax wars?, *Public Finance Review* 26, 327-361.
- Eggert, W. and B. Genser (2001), Is Tax Harmonization Useful? *International Tax and Public Finance* 8, 511-527.
- Elitzur, R. and J. Mintz (1996), Transfer pricing rules and corporate tax competition, *Journal of Public Economics* 60, 401-422.
- Frey, B. and R. Eichenberger (1996), To harmonize or to compete? That's not the question, *Journal of Public Economics* 60, 335-349.
- Feldstein, M. and D. Hartman (1979), The optimal taxation of foreign source investment income, *Quarterly Journal of Economics* 93, 613-624.

Fuest, C. (2000): The Political Economy of Tax Coordination as a Bargaining Game between Bureaucrats and Politicians, *Public Choice* 103, 357-382.

Fuest, C. and T. Hemmelgarn (2003), Corporate Tax Policy, Foreign Firm Ownership and Thin Capitalization, Working Paper, University of Cologne.

Fuest, C. and B. Huber (1999): Tax Coordination and Unemployment, *International Tax and Public Finance* 6, 7-26.

Fuest, C. and B. Huber (2001a), Labour and Capital Income Taxation, Fiscal Competition, and the Distribution of Wealth, *Journal of Public Economics* 79, 71-91.

Fuest, C. and B. Huber (2001b): Tax Competition and Tax Coordination in a Median Voter Model, *Public Choice*, Vol. 107, S. 97-113

Fuest, C. and B. Huber (2002), Why capital income taxes survive in open economies: The role of multinational firms, *International Tax and Public Finance* 9, 553-566.

Gabrielsen, T. and G. Schjelderup (1999), Transfer Pricing and Ownership Structure, *Scandinavian Journal of Economics* 101, 673-688.

Gabszewicz, J.J. and T. van Ypersele (1996). Social Protection and Political Competition. *Journal of Public Economics* 61, 193-208.

Gordon, R. H. (1983), "An optimal taxation approach to fiscal federalism", *Quarterly Journal of Economics*, 98, 567-586.

Gordon, R. H. (1986), Taxation of Investment and Savings in a World Economy, *American Economic Review* 76, 1086-1102.

Gordon, R. H. (1992), Can Capital Income Taxes Survive in Open Economies?, *Journal of Finance* 47, 1159-1180.

Gordon, R. H. (1992), Taxation of capital income vs. labour income: an overview, in: S. Cnossen (ed.), *Taxing capital income in the European Union. Issues and options for reform*, Oxford University Press, 15-45.

Gordon, R.H. and L. A. Bovenberg, (1996), Why is Capital so Immobile Internationally? Possible Explanations and Implications for Capital Income Taxation, *American Economic Review* 86, 1057-1075.

Gordon, R. H. and H. Varian (1989), Taxation of Asset Income in the Presence of a World Securities market, *Journal of International Economics* 80, 361-375.

Grazzini, L. and T. van Ypersele (2003), Fiscal Coordination and Political Competition, *Journal of Public Economic Theory* 5, 305-325.

Gresik, T. A. (2001), The taxing task of taxing transnationals, *Journal of Economic Literature* 39, 800-838.

Haufler, A. (1997), Factor Taxation, Income Distribution and Capital Market Integration, *Scandinavian Journal of Economics* 99, 425-446.

Haufler; A. (2001), Taxation in a Global Economy, Cambridge University Press, Cambridge (U.K.).

Haufler, A. and G. Schjelderup (2000), Corporate tax systems and cross country profit shifting, *Oxford Economic Papers* 52, 306-325.

Haufler, A. and I. Wootton (1999), Country Size and Tax Competition for Foreign Direct Investment, *Journal of Public Economics* 71, 121-139.

Haufler, A. and I. Wooton (2001), Regional Tax Coordination and Foreign Direct Investment, CEPR Discussion paper No. 3063.

Helliwell, J. (2000), *Benefactor's Lecture*, C.D. Howe Institute, Toronto.

Hines, J. R. (1988), Taxation and U.S. Multinational Investment, in: L. Summers (ed.): *Tax Policy and the Economy*, MIT Press.

Horst, T. (1980), A note on the optimal taxation of foreign source investment income, *Quarterly Journal of Economics* 94, 793-798.

Huber, B. (1999), Tax Competition and Tax Coordination in an Optimum Income Tax Model, *Journal of Public Economics* 71, 441-458.

Huizinga, H. and S.B. Nielsen (1997), Capital income and profit taxation with foreign ownership of firms, *Journal of International Economics* 42, 149-165.

Janeba, E. (1995). "Corporate Income Tax Competition, Double Taxation Treaties, and Foreign Direct Investment." *Journal of Public Economics* 56, 311-326.

Janeba, E. (1996), Foreign direct investment under oligopoly: Profit shifting or profit capturing? *Journal of Public Economics* 60, 423-445.

Keen, M. (1993). The Welfare Economics of Tax Co-ordination in the European Community: A Survey. *Fiscal Studies* 14, 15-36.

Keen, M. and H. Piekola (1997), Simple rules for the optimal taxation of international capital income, *Scandinavian Journal of Economics* 99, 447-461.

Kehoe, P.J. (1989), Policy Co-operation among benevolent governments may be undesirable, *Review of Economic Studies* 56, 289-296.

Kennan, J. and R. Riezman (1988), Do big countries win tariff wars?, *International Economic Review* 29, 81-85.

Konan, D. E. (1997), Strategic taxation of the multinational enterprise: A new argument for double taxation, *Journal of Public Economics* 63, 301-309.

Konrad, K. and G. Schjelderup(1999), Fortress Building in Global Tax Competition, *Journal of Urban Economics* 46, 156-167.

Lee, K. (1997), Tax Competition with Imperfectly Mobile Capital, *Journal of Urban Economics* 42, 222-242.

Leechor, C. and J. Mintz (1993), On the taxation of multinational corporate investment when the deferral method is used by the capital exporting country, *Journal of Public Economics* 51, 75-96.

Leite-Monteiro, M., M. Marchand and P. Pestieau (2003), Employment subsidy with capital mobility, *Journal of Public Economic Theory* 5, 327-344.

Lejour, A.M. and H.A. Verbon (1996). Capital Mobility, Wage Bargaining, and Social Insurance Policies in an Economic Union. *International Tax and Public Finance* 3, 495-513.

Levinsohn, J. and J. Slemrod (1993), Taxes, tariffs, and the global corporation, *Journal of Public Economics* 51, 97-116.

Mansori, K. S. and A. J. Weichenrieder (1999), Tax Competition and Transfer Pricing Disputes, Discussion Paper, University of Munich, October 1999, forthcoming in *Finanzarchiv*.

Mintz, J. M. and H. Tulkens (1986), "Commodity tax competition between member states of a federation: Equilibrium and efficiency", *Journal of Public Economics*, 29, 133-172.

Mintz, J. M. and H. Tulkens (1990), The OECD Convention: A “Model“ for Corporate Tax Harmonization?, in: R. Prud`homme (ed.): *Public Finance with Several Levels of Government/Finances Publiques avec Plusieurs Niveaux de Gouvernement*, Proceedings of the 46<sup>th</sup> Congress of the International Institute of Public Finance, Brussels, 298-314.

Mintz, J. M. and H. Tulkens (1996). Optimality Properties of Alternative Systems of Taxation of Foreign Capital Income. *Journal of Public Economics* 60, 373-399.

Mintz, J. and M. Smart (2001), Income Shifting, Investment and Tax Competition: Theory and Evidence from Provincial Taxation in Canada, CESifo Working Paper No. 554.

Musgrave, R. and P. Brewer (1963), Taxation of foreign investment income: An economic analysis, John Hopkins Press, Baltimore.

Musgrave, Peggy B. (1969), United States Taxation of Foreign Investment Income: Issues and Arguments, Cambridge.

Oakland, W. H. and Y. Xu (1996), Double Taxation and Tax Deduction: A Comparison, *International Tax and Public Finance* 3, 45-56.

Oates, W. E. and R. M. Schwab (1988), Economic Competition among Jurisdictions: Efficiency Enhancing or Distortion Inducing? *Journal of Public Economics* 35, 333-354.

OECD (1977), *Model Double Taxation Convention on Income and Capital*, Report of the OECD Committee on Fiscal Affairs, Paris.

Qian, Y. and G. Roland (1998), Federalism and the Soft Budget Constraint, *American Economic Review* 88, 1143-1162.

Richter, W. (1996), The provision of local public goods and factors in the presence of firm and household mobility, *Journal of Public Economics* 60, 73-93.

Richter, W. and K. Schneider (2001), Taxing mobile capital with labour market imperfections, *International Tax and Public Finance* 8, 245-262.

Sato, M. (2001), Tax Competition, rent seeking and fiscal decentralization, forthcoming in *European Economic Review*.

Sinn, H.-W. (1987), *Capital income taxation and resource allocation*, North Holland, Amsterdam.

Sinn, H.-W. (1988), US tax reform 1981 and 1986: impact on international capital markets and capital flows, *National Tax Journal* 41, 327-340.

Sinn, H.-W. (1990), “Taxation and the birth of foreign subsidiaries”, Discussion Paper No. 90-30, University of Munich.

Sinn, H.W. and A. Weichenrieder (1997), Foreign direct investment, political resentment and the privatization process in eastern Europe, *Economic Policy* 24, 179-210.

Sorensen, P. B. (2000), The Case for International Tax Coordination Revisited, *Economic Policy* 31, 492-461.

Sorensen, P.B. (2001), International Tax Coordination: Regionalism versus Globalism, CESifo Working Paper 483.

Weichenrieder, A. J., “Transfer pricing, double taxation, and the cost of capital”, *Scandinavian Journal of Economics*, 98, 445-452.

Wellisch, D. (2000), *Theory of Public Finance in a Federal State*, Cambridge.

Wen, J.F. (1997), Tax Holidays and the International Capital Market, *International Tax and Public Finance* 4, 129-148.

Wildasin, D. E. (1989). Interjurisdictional Capital Mobility: Fiscal Externality and a Corrective Subsidy. *Journal of Urban Economics* 25, 193-212.

Wilson, J.D. (1986), A theory of interregional tax competition, *Journal of Urban Economics* 19, 296-315.

Wilson, J.D. (1991), Tax Competition with Interregional Differences in Factor Endowments, *Regional Science and Urban Economics* 21, 423-451.

Wilson, J.D. (1999), Theories of Tax Competition, *National Tax Journal* 52, 269-304.

Zodrow, G. R. and P. Mieszkowski (1986). Pigou, Tiebout, Property Taxation, and the Underprovision of Local Public Goods. *Journal of Urban Economics* 19, 356-370.

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