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Strategies of international fiscal competition for foreign direct investment in a model with impure public inputs

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STRATEGIES OF INTERNATIONAL FISCAL COMPETITION FOR FOREIGN DIRECT INVESTMENT IN A MODEL WITH IMPURE PUBLIC INPUTS

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Abstract

This paper concentrates on international fiscal competition for internationally mobile direct investment. We differentiate between multinational enterprises whose direct investments are internationally mobile and domestic enterprises whose investment activities are limited to their country of residence. In a model with impure public inputs we analyse strategies of tax competition and examine the effects of competition by government expenditures for public inputs under the assumption that preferences for public inputs are different for each type of firms.

Key words: public inputs, public expenditures, congestion, capital taxation, tax competition, fiscal competition, foreign direct investment, multinational enterprises.

JEL: H25, H32, H41.

1. Introduction

Tax competition for internationally mobile capital has been an issue in the academic debate for several decades, beginning with the well-known study by Hamada (1966).[1] The ongoing removal of formal barriers to cross-border capital transfers as well as technological innovations facilitating and enforcing capital transfers also inspired political discussions, in particular at the supranational level, on potentially harmful effects of international tax competition (e.g. Ruding Committee (ed.) 1992). During the 1990ies, however, the focus of the political debate was gradually shifting away from competition within regular taxation schemes, which has come to be regarded as beneficial in the meantime (European Commission (ed.) 2001). Now "unfair" tax competition, i.e. tax privileges which are granted by single countries exclusively to investors from abroad and do not require "real" economic activity, attracts most attention and fosters growing political concerns. Whereas general tax cuts are welcomed to tame "Leviathan"-type governments (Brennan/Buchanan 1977), the extensive use of preferential tax regimes gave rise to concrete political counter-measures especially within the European Union (European Commission (ed.) 1997) and the OECD (OECD (ed.) 1998).

Although a similar shift of the center of gravity can be observed in the more recent theoretical work on tax competition (e.g. Weichenrieder 1996; Keen 1998; Janeba/Smart 2001), there is still a vivid interest in "fair" tax competition for mobile capital, i.e. general reductions of capital taxes. According to the line of reasoning of the first contributions on problems of capital taxation in open economies, tax competition is induced by high mobility of the factor capital which can escape national taxation by migrating to low- or no-tax-countries (e.g. Gordon 1986). Literature questioning the assumption of a generally high international capital

[1] For an overview see Giovannini (1990).

mobility is scant (e.g. Feldstein/Horioka 1980; Gordon/Bovenberg 1996; Koch/Schulze 1998).

Tax competition models often depart from the assumption of mobile and immobile factors in the economy. Countries compete for mobile capital by adjusting the capital tax rate downwards. Only few authors consider a strategy of discriminatory taxation, i.e. different tax rates for tax bases with differing mobility: Janeba (1997) for instance discusses a strategy which privileges mobile capital versus immobile labor.

The premise of high capital mobility mostly refers to portfolio capital only or does not differentiate between direct and portfolio investment. Many contributions use models which do not discern different kinds of investment (e.g. Bucovetsky 1991). Studies analysing tax competition for real investment usually rest on the assumption of a representative firm with mobile real investment. The model of Koch/Schulze (1998) incorporates a mobile tax base (new investment capital) and an immobile tax base (already installed capital) but does not distinguish between different types of firms. Here, heterogeneity of capital merely results from the fact that investment is made at different points in time.

Differing mobility within the enterprise sector undertaking (foreign) direct investment usually is neglected. Few exceptions in the literature differentiate between multinational enterprises (MNE) with international investment activities and domestically-oriented national enterprises (DE) (e.g. Nachtkamp/Schneider 1980; Osmundsen/Hagen/Schjelderup 1998). Ganghof (1999) indicates the possibility of discriminatory taxation of mobile multinational enterprises and immobile non-incorporated business, but does not explore systematically the effects of such a tax competition strategy.

A growing number of authors integrates the expenditure side of public budgets into pure tax competition models and explores welfare effects of tax competition with respect to the provision of public goods. Early work focussed on the supply of public consumption goods

for individuals respectively private households. The standard result is that due to horizontal fiscal externalities, the capital tax rate and the level of public consumption goods at the national level are inefficiently low (Wilson 1986; Zodrow/Mieszkowski 1986; Wildasin 1989; Bucovetsky/Wilson 1991). Here government expenditures are conceived as the dependent variable which is influenced by the tax instrument used as competition parameter.

Expenditures for public goods as an alternative strategic parameter in international fiscal competition received far less attention so far. According to Keen/Marchand (1997) public inputs for mobile firms are overprovided, whereas the supply of public consumption goods for immobile private households is inefficiently low; an expectation with had been formulated very early by Oates (1972). However, expenditure competition requires the existence of sectors or factors with differing degrees of mobility: Matsumoto (2000) shows that in a scenario in which private households and firms are equally mobile the structure of public goods and inputs remains unchanged; due to tax competition and resulting budgetary constraints both the public inputs for firms and the public consumption goods for households are underprovided.

Two shortcomings can be identified in the selection of tax competition literature summarized above. First of all, no consideration is given to the possibility of differing or conflicting interests and preferences for public inputs within the enterprise sector. All authors assume a single public input for which all firms have identical preferences.

Secondly, public goods often are modelled as pure, i.e. as goods which are characterized by non-excludability and non-rivalry in consumption. Under this assumption, Sinn (1997) shows that tax competition can force jurisdictions to reduce capital taxes to zero as user costs are zero due to non-rivalry in use: The consequence necessarily is that – if taxes on immobile factors are not available – the state's supply of public goods will be driven down to zero as it is impossible to raise the tax revenues needed to finance these public goods.

The result might be different, however, if rivalries in consumption exist. Bjorvatn/Schjelderup (2002) introduce a rival public good into a model of capital tax competition. They show that an increasing number of firms attracted by lower capital taxes causes congestion, which may induce a country to increase rather than to decrease the capital tax rate to make firms leave the country. The public good assumed here (the authors use the environment as an example), however, impacts on the utility of individual consumers but is no specific public input for the enterprise sector influencing investment decisions.

That many public inputs cannot be regarded as pure public but in reality are characterized by rivalries due to congestion problems is a topic discussed in the public goods literature for the last 30 years (Borcherding/Deacon 1972; Bergstrom/Goodman 1973). Tausch (1998) points out the importance of congestible public inputs in tax competition for mobile capital. The role of rival public inputs as a parameter in international fiscal competition for direct investment still has to be explored, however.

This paper tries to fill an existing theoretical gap by taking into account some of the deficits sketched above. Our analysis explicitly considers interdependencies between the revenue and the expenditure side of the public budget. Both sides of the public budget have an impact on the attractiveness of locations for real investment which opens several options for strategies of international fiscal competition: Fiscal competition can include tax and/or expenditure competition. The use of expenditures as a competition parameter is contingent on the existence of different public goods and different preferences for these goods. We focus on tax and expenditure competition for the special case of different public inputs and conflicting preferences for these public inputs within the enterprise sector. That preferences for public inputs are non-identical is the consequence of differing international mobility of real investment of different kinds of firms. Additionally, we assume rivalry in the use of public inputs.

The paper provides a simple model of international fiscal competition incorporating two different types of firms with conflicting preferences for governmental expenditure policies. We use this model to analyse three different strategies of international fiscal competition with taxes or public expenditures for rival public inputs. The paper addresses two central points: Firstly, we try to answer the question whether international fiscal competition for foreign direct investment can be successful in the long run. The second question is whether international fiscal competition leads to international convergence or divergence concerning level and structure of public inputs and national enterprise tax systems. Our aim is to qualify the "convergence hypothesis" put forward in some of the latest contributions in the field of international capital tax competition (e.g. Pluemper/Schulze 1999). This convergence hypothesis has replaced the simple "race to the bottom hypothesis" (Sinn 1997) predicting that in the long run capital taxation will disappear completely. Instead the convergence hypothesis expects that international capital mobility makes capital tax systems move towards similar or identical structures so that in the long run no country can maintain tax rates above the international average.

2. Strategies of international fiscal competition for mobile direct investment

2.1 A simple model of international fiscal competition

The analysis undertaken is based on a two-country model where each country j (j = f(oreign), d(omestic)) can use tax instruments as well as government expenditures for public inputs for the enterprise sector as strategic parameters in fiscal competition.

In each country the enterprise sector consists of two firms h (h = MNE, DE): A profit-maximizing MNE with mobile direct investment and a profit-maximizing DE whose real

investment is internationally immobile. MNEs' decisions on the international allocation of their direct investment follow net profits.

For simplification we assume constant return on capital. Without governmental activities each firm h's profits Π_h^j on the capital stock K_h^j are:

(1) $\Pi_h^j = r_h^j K_h^j$

Without governmental activities the profit rate r_h^j for each firm h is assumed to be identical:

(2) $r^j = r_{MNE}^j = r_{DE}^j$, with $r^j > 0$

Furthermore the profit rate for each country j in the absence of governmental activities is assumed to be identical:

(3) $r^d = r^f$

Company taxation consists – as assumed in the majority of the tax competition literature (Koch/Schulze 1998) – of a proportional capital tax t^j on the capital stock K_h^j of each firm h, i.e. we use a property tax, not a tax on capital income. Total national capital tax revenues T^j which by assumption are the only source to finance public inputs are:[2]

(4) $T^j = t^j K^j$, with $K^j = K_{MNE}^j + K_{DE}^j, t^j > 0$

Each country's supply of public inputs is a function of T^j.

Company taxation follows the source principle, i.e. firms are subject to capital taxation in the country in which their capital stock is invested. This assumption reflects the international practice of corporate income taxation quite realistically (Koch/Schulze 1998; Haufler 2001).

Each country j provides two public inputs X_i^j (i = 1, 2). We use a wide concept of public inputs which comprises "soft" infrastructure (e.g. education) as well as core infrastructure (e.g. traffic and facilities) (Richter/Seitz/Wiegard 1996). Each country supplies a certain total capacity of each public input which firms can use free of charge. Therefore firms' direct marginal costs of use are zero.

For the provision of each public input the state incurs costs C_i^j which are assumed to be a linear function of the public input X_i^j, so that the cost function for X_i^j can be written as:

$$(5)\quad C_i^j(X_i^j) = \alpha_i^j X_i^j, \text{ with } \alpha_i^j > 0$$

Whereas the older literature classifies these inputs as pure public, more recently it has been acknowledged that in fact many publicly provided goods can be used collectively and non-excludability is given, but if a certain number of users or a certain intensity of use is exceeded rivalries in use and congestion or congestion[3] costs are incurred (Holcombe/Sobel 1995; Reiter/Weichenrieder 1997).[4] It is plausible to assume that public inputs in particular are characterized by crowding problems. Due to partial rivalries in use caused by an increasing

[2] Using this assumption, we stick to the typical approach of simple tax competition models where governments have only one tax instrument, the capital tax, at their disposal.
[3] The terms crowding and congestion are used synonymously in this paper.
[4] Public in this paper does not refer to inputs which are actually supplied by the state regardless of their characteristics, but to inputs which are characterized by non-excludability and at least a certain degree of non-rivalry in use. For a clarifying overview on the interpretations of the term public which can be found in the literature see Colombier/Pickhardt (1999).

capital stock invested in a country j these public inputs must be conceived as impurely public.[5]

With a given total capacity of a public input X_i^j and a given total volume of real investment K^j in country j the degree of support the public input yields for the firms is:

$$(6)\quad x_i^j = \frac{X_i^j}{K^j}$$

x_i^j is identical for each unit of real capital and can be termed „service level" (Reiter/Weichenrieder 1998). Increasing real investment causes crowding and therefore reduces the service level.

Using equations (5) and (6), the costs for the provision of a certain service level of x_i^j can be written as:

$$(7)\quad C_i^j(x_i^j) = \alpha_i^j x_i^j K^j$$

Public inputs in our model increase the productivity of the private production factors. The extent of the positive productivity effect $\lambda_{h,i}^j$ of each public input depends on the respective service level x_i^j, so that:[6]

$$(8)\quad \lambda_{h,i}^j = \lambda_{h,i}^j(x_i^j) = \varphi_{h,i} x_i^j - \frac{\upsilon}{2} x_i^{j2},\ \text{with}\ \varphi_{h,i}, \upsilon > 0,\ \lambda_{h,i}^j > 1\ \text{for some}\ x_i^j \Rightarrow$$

[5] Reiter/Weichenrieder (1997) speak of quasi public goods. In contrast to club goods, users cannot be excluded (Reiter/Weichenrieder 1998).

Furthermore, one of the crucial extensions of our model compared to the existing literature is that it assumes that the positive productivity effect of each public input differs for DE and MNE: For the MNE X_1^j has a lower productivity effect in comparison with X_2^j ($\lambda^j_{MNE,1} < \lambda^j_{MNE,2}$), the opposite is true for the DE ($\lambda^j_{DE,1} > \lambda^j_{DE,2}$). In (7) the different producivity effects of each public input are introduced by $\varphi_{h,i}$ ($\varphi_{MNE,1} < \varphi_{DE,1}$ and $\varphi_{MNE,2} > \varphi_{DE,2}$). The positive productivity effects $\lambda^j_{h,i}$ of both public inputs increase the gross profit rate of real investment in country j for each firm h, so that the gross profit rate $r_h^{g,j}$ for each firm h corresponds to:[7]

(9) $r_h^{g,j} = r_h^{g,j}(x_i^j) = \sum_i \lambda_{h,i}^j (x_i^j) r^j$

Each firm's gross profits $\Pi_h^{g,j}$, taking into account the productivity effects $\lambda^j_{h,i}$, are:

(10) $\Pi_h^{g,j} = \Pi_h^{g,j}(x_i^j) = r_h^{g,j}(x_i^j) K_h^j = \sum_i \lambda_{h,i}^j (x_i^j)\, r^j K_h^j$

After taxation, net profits $\Pi_h^{n,j}$ are:

(11) $\Pi_h^{n,j} = \Pi_h^{g,j} - t^j K_h^j$, respectively $\Pi_h^{n,j}(x_i^j; t^j) = (\sum_i \lambda_{h,i}^j (x_i^j)\, r^j - t^j) K_h^j$

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[6] $\lambda^j_{h,i} > 1 \Rightarrow \varphi_{h,i} > \sqrt{2\upsilon}$; $\frac{\varphi_{h,i}}{\upsilon} - \sqrt{\frac{\varphi^2_{h,i} - 2\upsilon}{\upsilon^2}} < x_i^j < \frac{\varphi_{h,i}}{\upsilon} + \sqrt{\frac{\varphi^2_{h,i} - 2v}{\upsilon^2}}$

[7] For simplification we assume that the public inputs are independent of each other.

The net profit rate $r_h^{n,j}$ for each firm h is:

(12) $r_h^{n,j} = r_h^{g,j} - t^j$, respectively $r_h^{n,j}(x_i^j; t^j) = \sum_i \lambda_{h,i}^j(x_i^j)\, r^j - t^j$

A profit-maximizing MNE prefers a foreign to a domestic direct investment if:

(13) $r_{MNE}^{n,d} < r_{DE}^{n,f}$, respectively $r_{MNE}^{g,d} - t^d < r_{MNE}^{g,f} - t^f$

Due to the differing productivity effects $\lambda_{h,i}^j$ of each public input X_i^j on the different kinds of firms ($\lambda_{MNE,1}^j < \lambda_{MNE,2}^j$; $\lambda_{DE,1}^j > \lambda_{DE,2}^j$) DE and MNE demand different service levels of the two public inputs. MNE prefer a comparatively low service level of X_1^j and a comparatively high service level of X_2^j: According to the terminology of Stiglitz they are low demanders with respect to X_1^j and high demanders with respect to X_2^j (Stiglitz 2000). DE on the other hand are high demanders of X_1^j and low demanders of X_2^j.

An example for X_1^j is education. Whereas the DE solely depends on the domestic labor supply and therefore on a relatively high level of education in its country of residence, the internationally involved MNE can hire employees abroad. With regard to X_2^j, e.g. transport and communication infrastructure, the MNE is a high demander as this infrastructure is indispensable for the international exchange of goods, factors and information. Thus, due to the international orientation of its activities, the MNE needs a higher service level x_2^j than the DE. Hence the demand curve $D_{MNE,1}^j(x_1^j)$ is situated to the left of $D_{DE,1}^j(x_1^j)$, whereas $D_{MNE,2}^j(x_2^j)$ is located to its right.

Each firm's demand curves $D^{j}_{h,i}(x^{j}_{i})$ can be derived from gross profits $\Pi^{g,j}_{h}$ which include the additional profits firm h receives from the use of public input X^{j}_{i}. Marginal profits with respect to the service level x^{j}_{i} are equal to:

$$(14)\quad M\Pi^{g,j}_{h,i} = \frac{\partial \prod^{g,j}_{h,i}(x^{j}_{i})}{\partial x^{j}_{i}} = \frac{\partial \lambda^{j}_{h,i}(x^{j}_{i})}{\partial x^{j}_{i}} r^{j} K^{j}_{h} = (\varphi_{h,i} - \upsilon\, x^{j}_{i})\, r^{j} K^{j}_{h},$$

$$\text{with } \frac{\partial \Pi^{g,j}_{h,i}(x^{j}_{i})}{\partial x^{j}_{i}} > 0 \text{ for some } x^{j}_{i} \Rightarrow [8],\ \frac{\partial^{2} \Pi^{g,j}_{h,i}(x^{j}_{i})}{\partial x^{j2}_{i}} = -\upsilon\, r^{j} K^{j}_{h} < 0$$

Under the assumption that in the initial situation each firm h in country j owns half of the capital stock K^{j} invested in j, K^{j}_{h} is equal to $K^{j}/2$. The demand function $D^{j}_{h,i}(x^{j}_{i})$ of firm h for the service level of x^{j}_{i} therefore is:

$$(15)\quad D^{j}_{h,i}(x^{j}_{i}) = (\varphi_{h,i} - \upsilon\, x^{j}_{i})\, r^{j} \frac{K^{j}}{2}$$

In (15) $\varphi_{h,i}$ determines the position of firm h's demand curve. Consequently, $\varphi_{MNE,1} < \varphi_{DE,1}$ and $\varphi_{MNE,2} > \varphi_{DE,2}$ reflect the different preferences for each public input (for x^{j}_{1} the MNE is a low, the DE a high demander; for x^{j}_{2} the MNE is a high, the DE a low demander).

In figure 1 the resulting (hypothetical) demand curves show the marginal profits with respect to the service level x^{j}_{1} for each type of firms respectively their marginal willingness to pay resulting from additional profits by using a certain service level.

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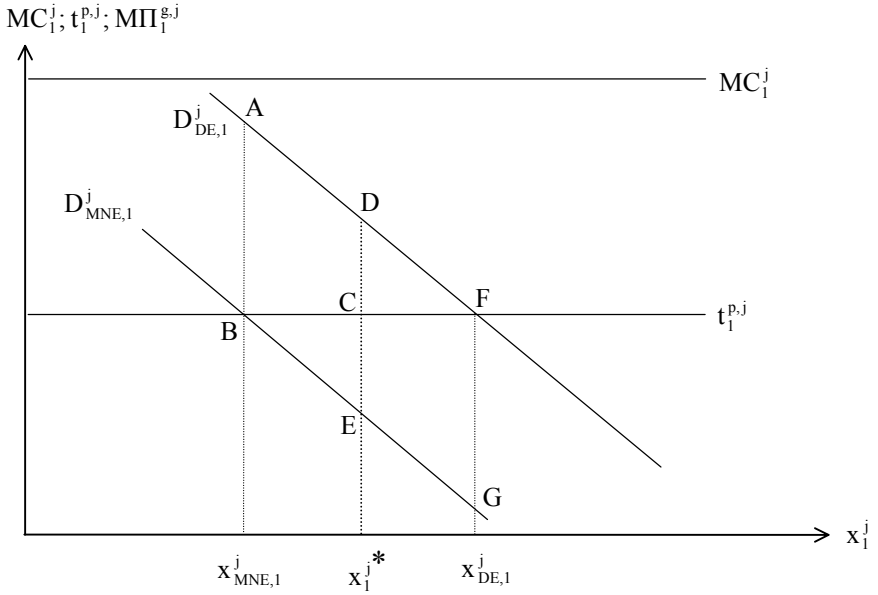
[8] $M\Pi^{g,j}_{h,i} > 0 \Rightarrow 0 < x^{j}_{i} < \frac{\varphi_{h,i}}{\upsilon}$; compare with footnote 6: $\frac{\varphi_{h,i}}{\upsilon} - \sqrt{\frac{\varphi^{2}_{h,i} - 2\upsilon}{\upsilon^{2}}} < \frac{\varphi_{h,i}}{\upsilon} < \frac{\varphi_{h,i}}{\upsilon} + \sqrt{\frac{\varphi^{2}_{h,i} - 2\upsilon}{\upsilon^{2}}}$ Hence, if the restriction of footnote 6 is valid, then there would be always some x^{j}_{i} for which $M\Pi^{g,j}_{h,i} > 0$.

Figure 1: Public provision of input X_1^j with differing preferences within the enterprise sector



Marginal costs MC_i^j of an increase of x_i^j are constant. They can be related to the capital stock K_h^j to allot the financial burden of the provision of X_i^j to the firms. The tax price $t_i^{p,j}$ reflects the share of one unit of real capital in the total financial burden respectively the (indirect) marginal costs of the provision of X_i^j (by paying capital taxes) for each firm. From the perspective of the state the tax price can be calculated as follows. Starting from the aforementioned assumption that public inputs are exclusively financed by company tax revenues T^j, the government's budget restriction is:

$$(16)\quad T^j = \sum_i C_i^j(x_i^j)$$

From equations (16), (4) and (7) follows:

$$(17)\quad t^j K^j = \sum_i (\alpha_i^j x_i^j K^j), \text{ or } t^j = \sum_i (\alpha_i^j x_i^j)$$

Each firm's total tax payments T_h^j are:

(18) $T_h^j = t^j K_h^j$

From (17) and (18) follows:

(19) $T_h^j = \sum_i (\alpha_i^j x_i^j) K_h^j$

The (hypothetical) tax price $t_i^{p,j}$ therefore is:

(20) $t_i^{p,j} = \frac{\partial T_h^j}{\partial x_i^j} = \alpha_i^j K_h^j$

If, as assumed above, both firms own half of the country's capital stock K^j each, the tax price for each firm is equal to $\alpha_i^j K^j/2$.

Equation (17) implies that at the initial tax rate t^j each additional unit of real capital moving into country j yields exactly the additional tax revenue which is needed to finance the increase of the public input's total capacity necessary to hold constant a given initial service level.

Figure 1 shows the basic features of our simple model. In the initial situation without fiscal competition X_1^j (education) can be used at a uniform service level x_1^{j*} by each type of firms. The intersection of a firm's hypothetical demand curve and the tax price curve yields the service level which is efficient from the firm's point of view. x_1^{j*} exceeds the service level which is efficient for the MNE ($x_{MNE,1}^j$) and falls short of the service level which is efficient

for the DE ($x^{j}_{DE,1}$). Thus, already the initial situation is inefficient for both firms as the service level is too high for the MNE and too low for the DE.

Starting from the initial service level x_1^{j*}, a variation of the capital tax rate and a corresponding variation of the service level of X_1^j has two effects on both types of firms. First, the change in the service level yields a positive or negative productivity effect which increases or decreases the productivity factor $\lambda^{j}_{h,1}$ and therefore $r_h^{g,j}$. Second, a counteracting cost effect occurs due to the change of firm h's total tax payment, with a corresponding effect on $r_h^{n,j}$. Which one of these two effects dominates depends on whether a firm is a high or a low demander of X_1^j. If, for example, X_1^j is reduced as consequence of a tax rate reduction, the cost effect dominates for the low demander because the cost reduction overcompensates the negative productivity effect (this is true, of course, only if x_1^j does not fall short of $x^{j}_{MNE,1}$).

x_1^{j*} is optimal, however, from an overall point of view, based on the Kaldor-Hicks-criterion. All service levels to the right (to the left) of x_1^{j*} yield a net gain for the high (low) demander which is smaller than the net loss for the low (high) demander. This can de demonstrated graphically by comparing the respective distance between the demand curves and the tax price curve. Only at x_1^{j*} DC is equal to CE. A service level above (below) x_1^{j*} would reduce overall welfare as the net gains of the high (low) demander would be insufficient to cover the (hypothetical) compensation for the low (high) demander. Thus, overall welfare is maximized at x_1^{j*}.

Symmetric inefficiencies occur with regard to X_2^j (transport and communication infrastructure) which is also uniformly provided. Here the MNE as high demander prefers a higher, the DE as low demander prefers a lower service level than provided in fact.

These inefficiencies are due to the non-excludability of the users so that the service level which can be used by the individual types of firms cannot be differentiated according to their (hypothetical) marginal willingness to pay. Even if each firm could be provided technically with the optimal service level, the problem of revealing preferences and therefore marginal willingness to pay can hardly be overcome.

2.2 Different strategies of international fiscal competition

Two scenarios of international fiscal competition, which in the following analysis by assumption is initiated by the foreign country, are examined in this section: First, the strategy of a general reduction of the foreign tax rate. And second, a strategy of discrimination which is analyzed in two variants: A strategy of tax discrimination fixing differing tax rates for MNE and DE, and a strategy of discrimination via the provision of public inputs varying the structure of the supply of public inputs.

It is assumed that firms are fully informed about tax systems and the structure and the level of public inputs in the home country and abroad. There are no barriers to international direct investment, and the states have commitment power: They can credibly commit themselves to variations in tax systems and public expenditures (Janeba 2000). The starting point is in each case a situation where the domestic net profit rate $r_{MNE}^{n,d}$ is equal to the foreign net profit rate $r_{MNE}^{n,f}$ so that there is no incentive for international movements of real capital.

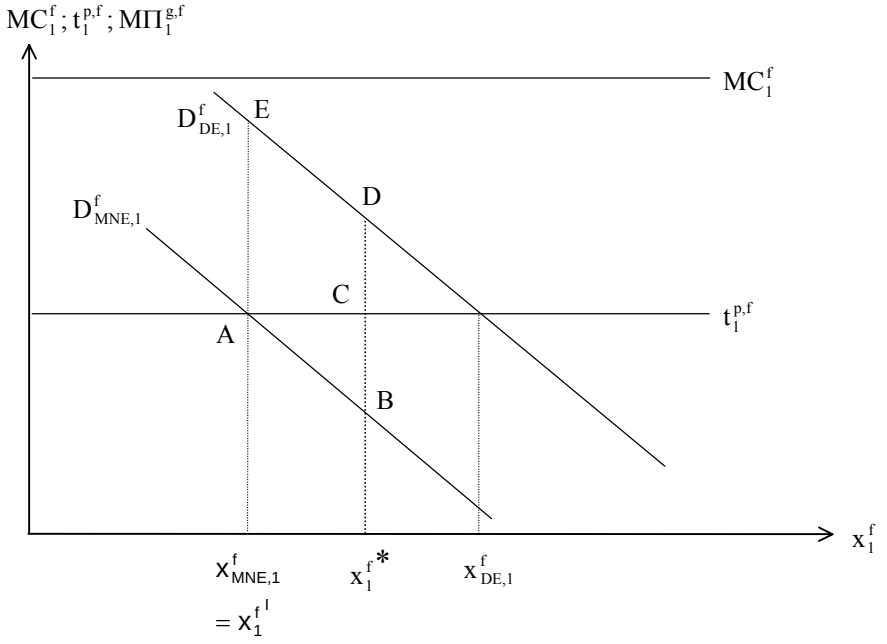
2.2.1 General reduction of the capital tax rate

The first strategy to be analyzed is a general reduction of the capital tax rate by the foreign country. As direct consequence foreign tax revenues T^j shrink so that the supply of the public inputs has to be reduced and the service levels decline. By assumption the total capacity of both public inputs is reduced to the same extent (i.e. the foreign country dispenses with a

discriminatory expenditure policy as analyzed in 2.2.2). Figures 2 and 3 show the effects of a tax rate reduction abroad on the service levels x_1^f and x_2^f and the effects on the foreign net profit rate $r_{MNE}^{n,f}$.

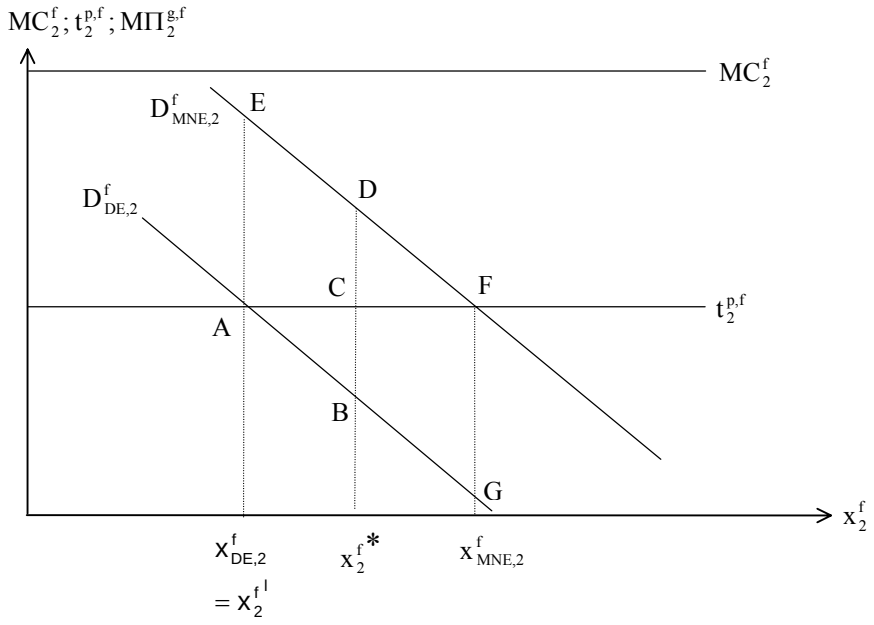
If – as assumed in figure 2 – the service level does not fall below of $x_1^{f\,I}$, the negative productivity effect from the reduction of the service level is overcompensated by the positive cost effect due to the tax rate reduction from the perspective of the MNE. At $x_1^{f\,I}$, for example, the initial overprovision of the MNE with education is removed; it can use an efficient service level. The effect on $r_{MNE}^{n,f}$ is positive; it is represented by ABC in figure 2. The DE on the other hand – as high demander for education – incurs losses (ACDE) as the initial underprovision with education is aggravated. Overall welfare is reduced by the difference of the two areas: ACDE exceeds ABC.

Figure 2: Reduction of the foreign tax rate – public input X_1^f (education)



Contrary effects can be observed for X_2^f for which the MNE is high demander (see figure 3). If the service level drops, e.g. to $x_2^{f\,I}$, the MNE's underprovision with transport and communication infrastructure intensifies. The negative productivity effect exceeds the positive cost effect for the MNE, whereas $r_{DE}^{n,f}$ increases. The positive profit effect for the DE is equal to ABC, the negative profit effect for the MNE is represented by ACDE. Again, ABC is smaller than ACDE so that a reduction in overall welfare can be observed.

Figure 3: Reduction of the foreign tax rate – public input X_2^f (transport and communication infrastructure)



In sum, the reduction of the foreign tax rate has counteracting profit effects for the MNE. The size of these two counteracting effects determines whether $r_{MNE}^{n,f}$ finally remains constant, grows relative to $r_{MNE}^{n,d}$ or even drops below it after the tax rate reduction. The final effect depends on the slope of the corresponding demand curves and on the relation between the demand curves of each type of firms. If $r_{MNE}^{n,f}$ rises so that MNE shift real investment the

service levels can be held constant: The additional real investment raises foreign revenues which finance the necessary expansion of both public inputs. In the example demonstrated above – with symmetrical structure and slope of the demand curves for both public inputs – $r^{n,f}_{MNE}$ falls below $r^{n,d}_{MNE}$ as ACDE (figure 3) is larger than ABC (figure 2). The consequence of the foreign tax rate reduction is an outflow of real investment. Obviously, under the assumptions made general tax cuts cannot attract real investment from abroad.

2.2.2 Discrimination strategies

In our context discrimination strategies imply a different treatment of mobile and immobile types of firms. States can discriminate by discriminatory taxation or by use of a discriminatory expenditure policy. This section examines both the effects of tax discrimination and of a discrimination concerning the supply of public inputs.

Tax discrimination

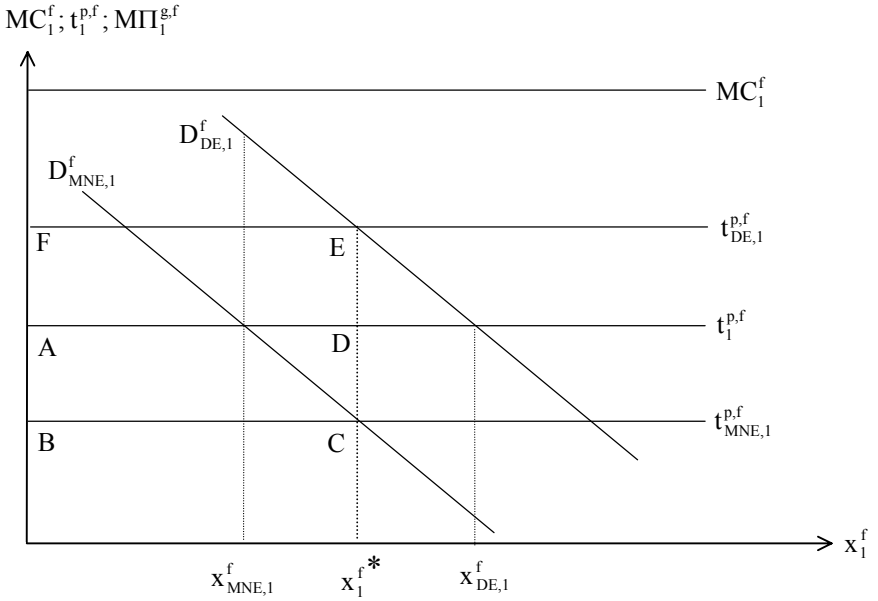
A strategy of tax discrimination assigns different tax rates to tax bases with differing international mobility (Janeba 1997). The initially uniform foreign capital tax rate t^f is differentiated in favor of the MNE whose real investment is internationally mobile, whereas the tax rate t^f_{DE} for the DE is increased, so that $t^f_{DE} > t^f > t^f_{MNE}$.[9] As a consequence the tax prices of both public inputs supplied abroad change: $t^{p,f}_{DE,1} > t^{p,f}_1 > t^{p,f}_{MNE,1}$ and $t^{p,f}_{DE,2} > t^{p,f}_2 > t^{p,f}_{MNE,2}$. Now the costs of the public input supply are allotted unequally to the different types of enterprises respectively to their capital stock. The increase of t^f_{DE} offsets the

[9] The pre-condition for a strategy of tax discrimination is that governments can distinguish between MNE and DE and can set different tax rates. Under the – certainly simplifying – assumption that MNE generally are incorporated firms subject to corporate taxation, whereas DE are unincorporated businesses whose business income is subject to personal income taxation, such a discrimination can be easily realized.

revenue losses due to the reduction of t^f_{MNE} so that total revenues and therefore the service levels of both public inputs can be held constant.

Figure 4 illustrates the effects of the tax discrimination strategy of the foreign country for the public input X^f_1. We assume a shift of both tax price curves which allows the achievement of an efficient service level x^f_1 for both types of firms. The MNE profits from a positive cost effect due to the reduction of the tax price (ABCD). From the perspective of the DE the initial underprovision with education disappears. The DE, however, has to bear higher costs (ADEF). The provision of education now is efficient for both types of firms, it follows the individual pay-as-you-use-principle. The cost effects, however, differ for the two firms: A part of the costs the MNE had to carry originally is shifted onto the DE. The effects of the tax discrimination strategy with regard to X^f_2 are different, as can be shown in figure 5.

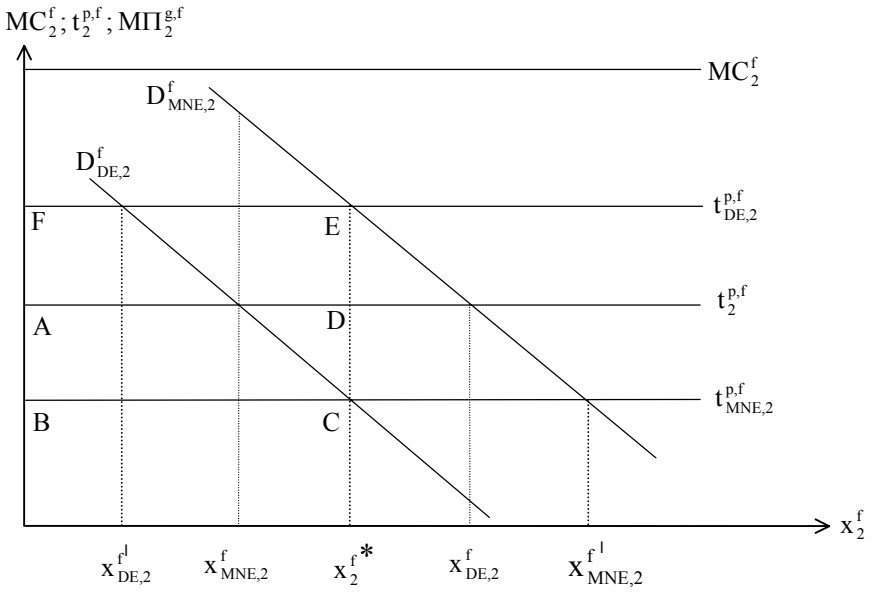
Figure 4: Tax discrimination strategy – public input X^f_1 (education)



Due to the decreasing tax price of transport and communication infrastructure for the MNE the service level which is efficient for the MNE rises to $x^{f\,l}_{MNE,2}$ so that the initial underprovision is enlarged. At the same time the MNE profits from a positive cost effect (ABCD). The overprovision of transport and communication infrastructure intensifies for the DE, and it is burdened with a part of the costs of the provision of the public inputs which the MNE had to carry formerly. This negative cost effect is represented by ADEF. Thus the individual pay-as-you-use-principle is violated for both types of firms by the tax discrimination strategy. Moreover, it implies a violation of the ability-to-pay-principle as different types of firms are subjected to differing capital tax rates.

The capital tax rate discrimination and the resulting cost reduction for the MNE definitely raises $r^{n,j}_{MNE}$, the consequence is an influx of real investment into the foreign country. In contrast to the scenario of general capital tax cuts the additional real investment cannot fully finance the necessary expansion of the capacity of the public inputs. As compensatory further increases of t^{f}_{DE} are limited in scope this strategy encounters restrictions in the long run.

Figure 5: Tax discrimination strategy – public input X^{f}_{2} (transport and communication infrastructure)



Discrimination in the provision of public inputs

As an alternative to tax rate discrimination the foreign country can choose a discrimination strategy with regard to the supply of public inputs. It will then expand the capacity of X_2^f for which the MNE is a high demander; this expansion is financed by a decrease in the supply of X_1^f for which the MNE is a low demander. This strategy holds the tax price curve constant; it restructures public expenditures for the two different public inputs. The effects of this expenditure discrimination strategy are shown in figures 2 and 3.

In figure 2 it is assumed that the service level of X_1^f is reduced to $x_1^{f\,I}$ which is efficient with regard to the preferences of the MNE. The positive profit effect for the MNE corresponds to ABC. For the DE the original underprovision of education, however, is intensified; it has to bear losses (ACDE). Analogously to the strategy of a general tax rate reduction examined above, there is an overall welfare loss.

Figure 3 illustrates the positive profit effect for the MNE by an increase of the service level to $x_{MNE,2}^f$ (CDF). Here the overprovision rises for the DE; it is represented by BCFG. Whereas the overall effect is positive for the MNE, the DE is confronted with a negative profit effect and a corresponding enlargement of the initial inefficiencies. There is an overall welfare loss as ACDE > ABC (figure 2) and CBGF > CDF (figure 3).

As in the tax rate discrimination scenario, an expenditure discrimination strategy induces a rise of $r_{MNE}^{n,f}$ and a shift of real investment to the foreign country. The inflow of foreign capital intensifies the use of the public inputs but at the same time increases the tax base and therefore fully finances the necessary expansion of the capacity of both public inputs. Thus, in the short run this strategy is the most successful of the three competition strategies discussed in this section. In the long run, however, also the strategy of expenditure discrimination has

limits as it cannot be carried further as soon as the service levels which are efficient for the MNE are realized.

2.3 Consequences of different strategies of fiscal competition for tax systems and expenditure structures

If the foreign country succeeds in increasing $r^{n,f}_{MNE}$ real investment from country d is attracted until net profit rates are equalized by an adjustment of r^j due to the changes in capital intensities in both countries. The outflow of real investment reduces country d's tax base and therefore its total tax revenues so that it has to cut expenditures for public inputs. Due to the reduction in real investment K^d, however, the intensity of use of both inputs is reduced and service levels remain unchanged.

The next round of international fiscal competition is determined by the reaction of country d to the outflow of K^d. The final effects on tax and/or expenditure structures of both countries differ for the three strategies presented above. They are now discussed for a scenario where country d reacts by applying an identical strategy of fiscal competition, if it reacts at all.

In our model, a general reduction of the foreign country's tax rate t^f causes a decrease of $r^{n,f}_{MNE}$ and therefore an outflow of direct investment. Country d experiences an inflow of real investment which – by increasing T^d – finances the necessary expansion of the total capacity of both public inputs. The consequence are (contrary to the convergence hypothesis) diverging tax rates and also diverging levels of public inputs.

A strategy of tax rate discrimination results in the formation of dual enterprise tax systems: DE are more heavily taxed and contribute to a higher share to the financing of public inputs. As $r^{n,f}_{MNE}$ exceeds $r^{n,d}_{MNE}$ real investment will flow to country f. If country d reacts with a symmetric strategy an international convergence of these dual enterprise tax systems can be

expected. The hypothesis of growing inefficiencies in the provision of public inputs also in this case can only be partially confirmed: Whereas X_1^j is efficiently provided for both types of firms, the initial inefficiencies become larger for both firms with regard to X_2^j. The structure and the total capacities of public inputs remain unchanged in both countries.

A strategy of expenditure discrimination leads to an international convergence of the national structures of public inputs if applied by both countries. Within both countries the consequence is a dualism in the provision of public inputs because the public input supply is restructured according to the preferences of the MNE. The service level the MNE can use after this restructuring is efficient. From the perspective of the DE, however, the initial inefficiencies are intensified for both public inputs. This strategy has no effects on national company tax systems.

3. Conclusions

The analysis undertaken above leads to several results. First it has to be pointed out that the strategy of fiscal competition chosen is decisive for the development of national tax and expenditure structures. Therefore the simple convergence hypotheses as well as the simple inefficiency hypothesis have to be modified. Second it is important to note that every strategy considered encounters restrictions: General tax cuts are no successful instruments in international fiscal competition, taking into account their negative effect on the provision of public inputs. Countries applying a strategy of tax rate discrimination also can run into problems to finance a level of public inputs which is desirable for MNE. Also the attempt to shift the tax burden further on DE or on other immobile tax bases has its limits and may encounter political resistance. Most promising in the short run is the strategy of expenditure discrimination, which, however, can only be applied to a point where the input structure is efficient from the perspective of the MNE. Therefore, enduring fiscal competition in the long

run might – due to the limited scope of discrimination strategies – amount to the use of mixed strategies: The result might be tax alleviations for MNE and an international convergence of public inputs and the taxation of enterprises.

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