

# Quality versus Quantity - The Composition Effect of Corporate Taxation on Foreign Direct Investment<sup>1</sup>

by

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## **Abstract**

This paper studies corporate taxation in a model where foreign investment of firms may affect the profitability of the investor firm's domestic activities. In this framework, corporate taxes distort the quality, not just the quantity of foreign direct investment flows. Moreover, the effect of taxes on capital flows is ambiguous in our model, i.e. capital does not necessarily flow from high tax countries to low tax countries. We show that high-tax countries may see their tax revenues decrease in response to inbound foreign direct investment. The opportunity of profit-shifting aggravates these effects.

**JEL Codes:** H25, F23

**Keywords:** Corporate Taxation, Foreign Direct Investment

# 1 Introduction

Standard models of tax effects on international investment assume that investing abroad has no direct impact on the profitability of domestic activities of the investing firm. However, there is extensive empirical evidence that investing abroad, be it greenfield investment or mergers and acquisition (m&a), strongly influences the profitability, productivity, employment etc. of the investor firm. In this paper, we present a simple model which allows for such feedback effects of foreign direct investment on domestic activity. We find that in the presence of feedback effects, corporate taxes have a distorting effect on the quality of foreign direct investment. Thus, instead of concentrating on the quantitative aspect of cross-border investment, as it is usually done in the literature, we focus on the qualitative side. We call this the composition effect of corporate taxation on foreign direct investment.

The literature on multinational firms points out that synergies between different firms of a multinational group and complementarities of their assets are an important factor for the formation and the existence of these groups.<sup>1</sup> We define synergies as an increase in profits for the whole group caused by border-crossing or national investment. A multinational group will realize an investment project, i.e. building a new plant or acquiring an existing plant, if the after tax profit change for the whole group is at least as high as the profit of the alternative investment project. The firm is indifferent about where these profits are generated, in the headquarter or in the new production plant. But, from a national tax policy perspective, the distribution of profits across subsidiaries of the multinational firm located in different countries is of key importance. It is the purpose of this paper to analyze the effect of taxes on cross-border investment when the profit change is not restricted to occur in the country of the initial investment.

For purpose of illustration, consider some examples. There are three possible scenarios for the effect of the investment transaction on the distribution of profits within the multinational group. Firstly, the acquisition may not affect the profit generated by the parent company in its country of residence, as it is usually assumed in standard models of international investment. In this case, the mar-

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<sup>1</sup>See e.g. the introduction to the theory of multinational firms in Markusen (2002), chapter 1.

ginal investment project has a return equal to the opportunity cost of investment. Secondly, the transaction may reduce the profits of the parent company. This may happen, for instance, if headquarter management resources have to be devoted to the new subsidiary and cannot be replaced without costs. In this case, the project will only be undertaken if it increases the profitability of the subsidiary beyond the opportunity cost of investment. Thirdly, the investment project may increase the profits of the parent company. A possible reason would be that the parent company gets access to technical knowledge or new markets provided by the subsidiary. In this case, the marginal investment project may imply that profits in the subsidiary are very low or even negative.

Recent evidence shows that investment abroad has a significant impact on all types of performance indicators of the parent company, independent of whether investment takes the form of greenfield projects or m&a. Desai, Foley & Hines (2005a) find that investment abroad increases the aggregate domestic investment activity by US multinationals. Desai, Foley & Hines (2005b) use firm-level data of US multinationals and show that foreign investment in plant, property and equipment (PPE) is associated with higher domestic PPE investment. Similarly, Egger & Pfaffermayer (2003) find that foreign investment increases domestic investment in tangible assets and does not decrease investment in intangibles. Castellani & Barba Navaretti (2004) and Jaeckle (2006) show that going abroad increases domestic productivity and competitiveness. In addition, there are several empirical studies, surveyed by Andrade, Mitchell & Stafford (2001), analyzing the effects of m&a on the investor firm's performance. There is empirical evidence that m&a create efficiency gains which seem to be distributed asymmetrically, though, as Schoar (2002) and McGuckin & Nguyen (1995) report. While recently acquired firms experience productivity improvements, the investor firm's plants suffer productivity losses, making the net change for the investor firm essentially zero.

Our main argument is the following. If investment abroad has some effect on the performance of the investor company in the domestic country, then the marginal return generated in the foreign location does not need to be equal to the return of the alternative investment project. For example, if domestic profits increase, then the marginal foreign investment may even yield negative returns. The reason is that the investment decision depends on the overall (after-tax) return for the whole

multinational group of firms. Taxes change these investment incentives. But, in contrast to the standard model, higher taxes may attract investment in the case where the marginal return in a country is negative. Therefore, a tax reform changes both the quantity and the quality of investment flows. This is what we call the composition effect of corporate taxation on cross-border investment.

It is interesting to ask whether the basic predictions and policy recommendations generated by the standard capital mobility model carry over to a world where taxes change the quality of investment. The main difference to the standard model is the prediction on the direction of aggregate capital flows as well as the normative interpretation of these flows. Firstly, while the standard model predicts that capital flows from high tax countries to low tax countries, our model implies that we may also observe the opposite. Secondly, the standard model argues that countries benefit from attracting additional investment whereas our model points out that countries may also be negatively affected by capital inflows. A third standard result is that tax competition leads to tax rates which are inefficiently low for the economy as a whole. In our model, this result is confirmed, but for reasons which differ from those of the standard framework.

The most important implications of the analysis are the following. Firstly, our model contributes to explaining why empirical studies seem to find it difficult to establish a negative relationship between aggregate inbound FDI flows and corporate tax levels. Secondly, tax and other policies which aim at attracting foreign investment may have to pay more attention on the qualitative dimension of inbound foreign direct investment.

Apart from the studies mentioned above, the present paper is related to two strands of literature. Firstly, there is the vast literature on the multinational firm, as surveyed by Markusen (2002), and their investment behavior (greenfield investment and m&a). A second strand of literature deals with the taxation of multinational firms and double taxation agreements (Janeba (1995), Mintz & Tulkens (1996)), capital mobility and tax competition (for a recent survey see e.g. Fuest, Huber & Mintz (2005)). Devereux & Hubbard (2003) derive welfare effects of taxes on foreign source income of multinational enterprises. There is a broad empirical literature on the impact of taxes on cross-border capital flows, which is surveyed by Hines (1999) and Devereux (2006).

The rest of the paper is set up as follows. In section 2, we present the model. Section 3 discusses some extensions. Section 4 concludes.

## 2 The model

In this section, the model setup is presented (2.1) before we derive tax effects on investment projects with different profitability distributions (2.2). Then tax effects on an aggregate scale are considered (2.3). We ask for the optimal tax policy strategy (2.4) and consider the effects of tax coordination in a framework with two identical countries (2.5).

### 2.1 Setup

The world consists of a large number of countries exporting and importing foreign direct investment. For notational simplicity, we normalize the number of countries to two. We refer to these as domestic and foreign. In the domestic (foreign) country, there is a representative household endowed with savings  $S$  ( $S^*$ ). Henceforth, the asterisk denotes the location in the foreign country. There are many identical firms which have some ongoing home production. In addition, they consider investment projects in the foreign (domestic) country. Cross-border investment has two effects. Firstly, the project generates profit income in the foreign (domestic) investment location itself, denoted by  $\delta^*$  ( $\delta$ ), i.e.  $\delta^*$  is the profit of an investment project located in the foreign country but owned by a domestic firm. Secondly, the profit of the domestic (foreign) investor firm generated in its country of residence changes by  $\Delta$  ( $\Delta^*$ ).<sup>2</sup>

Each domestic firm  $i$  randomly draws a project and then decides whether or not realize it. The project is characterized by a pair  $(\Delta_i, \delta_i^*)$  of profit changes at the investor's and the investment location.  $\Delta, \delta^*$  are two jointly distributed variables  $(\Delta, \delta^*) \in \mathbb{R}^2$ . For simplicity, we assume that the two variables are uniformly distributed over the intervals  $\Delta \in \{\Delta^-, \Delta^+\}$  and  $\delta^* \in \{\delta^{*-}, \delta^{*+}\}$ . Equivalently,

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<sup>2</sup>In the following, we will use the terms profit and profit changes equivalently. The term profit is more adequate if new production facilities are established, whereas profit change is more exact if existing production plants are modified, i.e. in the course of an acquisition or merger.

each foreign firm draws a pair of  $(\Delta_j^*, \delta_j)$  with  $\Delta^* \in \{\Delta^{*-}, \Delta^{*+}\}$  and  $\delta \in \{\delta^-, \delta^+\}$ . Each investment project requires one unit of capital which can be purchased at a price of  $r$  in the world capital market.

Standard models virtually always assume that  $\Delta$  ( $\Delta^*$ ) is equal to zero. It is the main novelty of this model to allow for profit level changes in the investor firm, i.e. we consider positive, negative or zero values of  $\Delta$  ( $\Delta^*$ ). In other words, the investment project may effectively increase or decrease profits of the parent company, or it may not affect them at all. If  $\Delta, \Delta^* < 0$ , the transaction reduces the profits of the parent company. A possible reason would be that, due to an acquisition, some headquarter management resources have to be devoted to dealing with the subsidiary, so that they are no longer available for the activities of the parent company in the country of residence.  $\Delta, \Delta^* > 0$ , i.e. an increase in profits of the parent company, may occur, for instance, if the subsidiary owns technical knowledge or offers market access which is beneficial to the parent company.

Thus, in the absence of taxes, the profits of an outbound or an inbound project are:

$$\begin{aligned} \text{outbound:} & \quad \Delta + \delta^* \\ \text{inbound:} & \quad \Delta^* + \delta \end{aligned} \tag{1}$$

Denote by  $\delta^{*c}$  and  $\delta^c$  the marginal projects for a given  $\Delta$  and  $\Delta^*$ , which satisfy  $\Delta + \delta^{*c} = r$  for outbound investment and  $\Delta^* + \delta^c = r$  for inbound investment.

Now, taxes are introduced. In our model, profits are subject to corporate income taxes. By assumption, foreign source income is exempt from domestic tax, i.e. we assume that international investment income is taxed according to the exemption system. Projects are realized if posttax-profits, aggregated over the domestic and the foreign location and net of the cost of capital, are nonnegative. For outbound investment, this requires  $\Delta(1 - \tau) + \delta^*(1 - \tau^*) - r \geq 0$ , for inbound investment  $\Delta^*(1 - \tau^*) + \delta(1 - \tau) - r \geq 0$ , where  $\tau$  is the domestic corporate tax rate,  $\tau^*$  is the corporate tax rate of the foreign country. Again,  $\delta^{*c}$  and  $\delta^c$  denote

the marginal projects for given  $\Delta$  and  $\Delta^*$  and satisfy:

$$\begin{aligned} \text{outbound:} \quad \delta^{*c} &= \frac{r}{1-\tau^*} - \Delta \left( \frac{1-\tau}{1-\tau^*} \right) \\ \text{inbound:} \quad \delta^c &= \frac{r}{1-\tau} - \Delta^* \left( \frac{1-\tau^*}{1-\tau} \right) \end{aligned} \quad (2)$$

Projects with  $\delta^* < \delta^{*c}$  ( $\delta < \delta^c$ ) are not realized. The right hand side of (2) may be interpreted as the cost of capital of foreign direct investment. The first term is increasing in the interest rate and the corporate tax rate of the country where the investment is located. This effect is well known from standard models dealing with tax effects on international investment. The second term on the right hand side of (2) is in the focus of this paper. It reflects that the new foreign investment project may affect the ongoing activity of the multinational firm in its country of residence. If  $\Delta, \Delta^* > 0$ , the second term reduces the cost of capital. The reason is that foreign investment increases the profits of the parent company. Accordingly,  $\Delta, \Delta^* < 0$  implies that foreign investment reduces domestic profits, so that the minimum foreign profit required to make the project worthwhile increases.

## 2.2 Tax effects on different types of investment projects

Equation (2) shows that taxes may distort investment. In the standard model, with  $\Delta, \Delta^* = 0$ , the implications are clearcut. For  $\tau > 0$ , it follows  $\delta^{*c} > r$ , i.e. the return of the marginal unit of capital invested abroad is lower than the marginal return in the absence of taxes. In contrast, if we allow for  $\Delta, \Delta^* \neq 0$ , the picture may change. For large and positive  $\Delta, \Delta^*$ , the minimum required project returns at the investment location  $\delta^{*c}, \delta^c$  may become negative. This has important consequences for the effect of corporate taxation on investment. A marginal increase of the domestic corporate tax rate has the following effect on outbound and inbound investment.

$$\frac{\partial \delta^{*c}}{\partial \tau} = \frac{\Delta}{1-\tau^*} \quad \text{and} \quad \frac{\partial \delta^c}{\partial \tau} = \frac{r}{(1-\tau)^2} - \frac{1-\tau^*}{(1-\tau)^2} \Delta^* = \frac{\delta^c}{1-\tau} \quad (3)$$

Similarly, we can derive

$$\frac{\partial \delta^{*c}}{\partial \tau^*} = \frac{r}{(1 - \tau^*)^2} - \Delta \frac{1 - \tau}{(1 - \tau^*)^2} = \frac{\delta^{*c}}{1 - \tau^*} \quad \text{and} \quad \frac{\partial \delta^c}{\partial \tau^*} = \frac{\Delta^*}{1 - \tau} \quad (4)$$

These expressions can be interpreted as follows. Positive values mean that a tax rate increase raises the required profit of the foreign investment project. In this case, higher taxes deter investment. Accordingly, negative values represent cases where higher taxes increase investment.

Consider first the standard case with  $\Delta, \Delta^* = 0$ . In this case, domestic corporate taxes do not affect outbound investment of domestic firms ( $\frac{\partial \delta^{*c}}{\partial \tau} = \frac{\partial \delta^c}{\partial \tau^*} = 0$ ). Taxes levied by the country where the investment is located have the expected negative effect on inbound investment ( $\frac{\partial \delta^c}{\partial \tau} = \frac{r}{(1-\tau)^2}$ ,  $\frac{\partial \delta^{*c}}{\partial \tau^*} = \frac{r}{(1-\tau^*)^2}$ ). What happens if we allow foreign investment to affect the profits of the parent company in its country of residence, i.e.  $\Delta, \Delta^* \neq 0$ ? If these profit changes are positive and sufficiently large, the marginal profit change at the investment location ( $\delta^{*c}, \delta^c$ ) may become negative. In this case, the effect of corporate taxes is reversed:  $\frac{\partial \delta^{*c}}{\partial \tau^*}, \frac{\partial \delta^c}{\partial \tau} < 0$ . In other words, higher domestic tax rates increase inbound investment. The other interesting effect is that corporate taxes in the investor firm's country may deter outbound investment. This occurs if the profit change at the parent company location is positive:  $\frac{\partial \delta^c}{\partial \tau^*} = \frac{\Delta^*}{1-\tau} > 0$ ,  $\frac{\partial \delta^{*c}}{\partial \tau} = \frac{\Delta}{1-\tau^*} > 0$ .

These results can be summarized as

**Proposition 1** *If the effect of foreign investment on profits generated in the parent company's country of residence is positive ( $\Delta, \Delta^* > 0$ ) and sufficiently large, an increase in domestic taxes (1) attracts additional inbound investment from the foreign country and (2) deters outbound investment into the foreign country.*

Figure 1 illustrates the effects of corporate taxation on investment decisions in our model, seen from the perspective of a high-tax country, i.e. assuming that  $\tau > \tau^*$ .

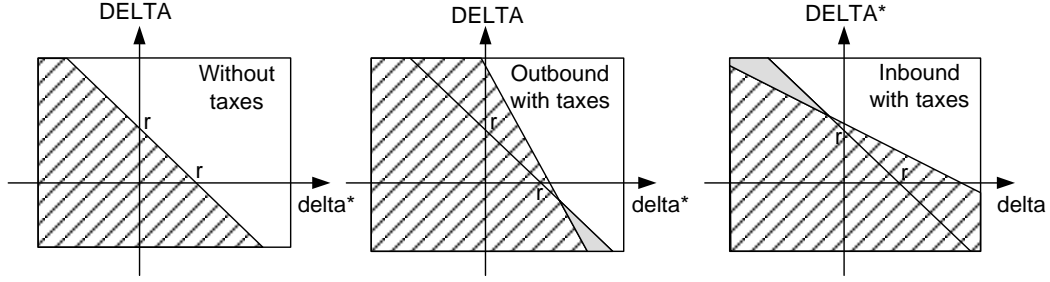


Figure 1: Tax effects on international investment.

The lines that separate the hatched area from the blank one show the locus of marginal investment as a function of different values for  $\Delta$  and  $\delta^*$ , or  $\Delta^*$  and  $\delta$ , respectively. Consider first the case without taxes, depicted on the left hand side of the figure and presented for outbound investment. At the margin,  $\delta^{*c} = r$ , if  $\Delta = 0$ , and  $\Delta = r$ , if  $\delta^{*c} = 0$ . The slope of the curve is given by  $\frac{d\Delta}{d\delta^{*c}} = -1$ . All transactions above the line will be realized whereas possible investment projects in the shaded area are rejected. The equivalent can be shown for inbound investment.

The graphs in the center and on the right hand side of figure 1 illustrate the space of feasible investment in the presence of taxes. Note that if both tax rates  $\tau$  and  $\tau^*$  are equal the no-tax line is simple shifted upwards in parallel. For  $\tau > \tau^*$ , though, the points of intersection with the x- and the y-axis are shifted according to equation (2). The slope of the marginal outbound curve (center graph) becomes steeper ( $\frac{d\Delta}{d\delta^{*c}} = -\frac{1-\tau^*}{1-\tau} < -1$ ). Corporate taxes now have two effects: The first is that projects are not realized any more in the low-tax country that would have been in the absence of taxes (hatched area above the no-tax-line). But, in addition, some projects are now realized that would not have been without taxes (shaded area beneath the no-tax-line). These projects are characterized by high positive profit changes in the foreign (low-tax) country and negative profit changes in the domestic high-tax country. Similar results can be derived for inbound investment, shown on the right hand side. Here, the slope of the marginal inbound curve is flatter ( $\frac{d\Delta^*}{d\delta^c} = -\frac{1-\tau}{1-\tau^*} > -1$ ). The hatched area between the no-tax line and new investment frontier depicts the standard tax effect on investment: there are projects which would have been realized in the absence of taxes but are deterred by domestic corporate taxation. However, there are also projects that would not have been realized in the absence of taxes (shaded area).

### 2.3 Aggregate tax effects

So far, we have analyzed tax effects on different types of marginal investment projects. How do taxes affect aggregate investment flows? In this subsection, we discuss the implications of the composition effect for aggregate capital flows between countries. Consider first the effect of a change in the tax rate  $\tau$  on domestic investment. Aggregate domestic investment is equal to the number of projects that foreign investors realize in the domestic country:

$$K^d = \int_{\Delta^{*-}}^{\Delta^{*+}} \int_{\delta^c}^{\delta^+} d\delta d\Delta^* \quad (5)$$

At a given interest rate in the world capital market, a marginal increase in the domestic corporate tax rate has the following effect:

$$\frac{\partial K^d}{\partial \tau} = - \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\partial \delta^c}{\partial \tau} d\Delta^* = - \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\delta^c}{1 - \tau} d\Delta^* \quad (6)$$

Increasing tax rates reduces domestic investment if the expression  $\int_{\Delta^{*-}}^{\Delta^{*+}} \delta^c$ , which can be interpreted as the mean marginal profit generated by foreign investment, becomes negative. However, if it is negative, an increase in domestic taxes increases domestic investment. If it is zero the aggregate capital stock remains constant. In the standard model, the mean marginal profit change is necessarily positive because projects with a negative  $\delta$  are not realized.

The possibility that higher taxes may attract additional investment is due to the fact that the value of losses is higher with high tax rates. That means if projects with negative marginal profits dominate, an increase in the corporate tax rate increases the value of these projects and leads to an increase in total investment. Thus, we can state

**Proposition 2** *At a given interest rate in the world capital market, an increase in the domestic corporate tax rate decreases the domestic capital stock if the mean profit of the marginal foreign investment projects abroad is positive. If the mean marginal investment abroad generates a negative profit in the foreign location, a rising corporate tax rate increases the domestic capital stock.*

Of course, inbound investment is not an objective by itself, but it is generally assumed that it provides benefits to the economy, e.g. a larger domestic corporate tax base. What are the effects of tax revenue in the presence of averse tax effects on investment? Tax revenue is given by

$$T = \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} \tau \Delta d\delta^* d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \int_{\delta^c}^{\delta^+} \tau \delta d\delta d\Delta^* \quad (7)$$

In the standard model, the effect of a small increase of the corporate tax rate on the tax base is negative because higher tax rates reduce the capital stock. In our model, the effect is given by

$$\frac{\partial T}{\partial \tau} = \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} \Delta d\delta^* d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \int_{\delta^c}^{\delta^+} \delta d\delta d\Delta^* - \int_{\Delta^-}^{\Delta^+} \frac{\tau \Delta^2}{1 - \tau^*} d\Delta - \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\tau \delta^{c2}}{1 - \tau} d\Delta^* \quad (8)$$

where we have used eq. (3). Thus, although a higher tax may increase or decrease the capotal stock, the effect of a higher tax rate on the tax base is unambiguously negative. The first two terms on the right hand side are the revenue increasing effects of increasing the tax rate with a given tax base. The third term in round brackets is the tax rate effect on the tax base. We state

**Proposition 3** *An increase in the domestic tax rate unambiguously reduces the domestic tax base, irrespective of whether the tax effect on the aggregate capital stock is positive or negative.*

The unambiguously negative effect of a tax increase on the domestic tax base is due to the composition effect of corporate taxation. The tax increase encourages investment projects which produce losses and discourages profitable projects. As a result, the effect on overall investment quantity is ambiguous but the tax base unambiguously declines.

Which countries, high- or low-tax ones, should we expect to experience this kind of averse tax effects on investment? The second derivative of (6) yields

$$\frac{\partial^2 K^d}{\partial \tau^2} = -2 \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\delta^c}{(1 - \tau)^2} d\Delta^* \quad (9)$$

where we have used  $\frac{\partial \delta^c}{\partial \tau} = \frac{\delta^c}{1-\tau}$ . The strength and the sign of the effect also depends on the mean marginal profit change in the investment location. Therefore, we cannot conclude that high-tax countries are more likely to experience averse tax effects on their capital stock than low-tax countries.<sup>3</sup>

But, high-tax countries are more prone to averse effects of investment on tax revenue as the following analysis shows. If negative  $\delta$  are feasible then additional inbound investment can actually decrease tax revenue. What is the probability that one additional unit of investment decreases tax revenue? The number of projects with negative profit changes is given by

$$N^- = \int_{\Delta^{*-}}^{\frac{r}{1-\tau^*}} \int_{\delta^c}^0 d\delta d\Delta^* \quad (10)$$

since for  $\Delta^* = \frac{r}{1-\tau^*}$  the marginal profit change  $\delta^c$  is equal to zero. The number of projects with positive profit changes is

$$N^+ = \int_{\Delta^{*-}}^{\frac{r}{1-\tau^*}} \int_0^{\delta^+} d\delta d\Delta^* + \int_{\frac{r}{1-\tau^*}}^{\Delta^+} \int_{\delta^c}^{\delta^+} d\delta d\Delta^* \quad (11)$$

Now, it is straightforward to show that  $N^-$  increases and  $N^+$  decreases in  $\tau$ :

$$\frac{\partial N^-}{\partial \tau} = \int_{\Delta^{*-}}^{\frac{r}{1-\tau^*}} \frac{\delta^c}{1-\tau} d\Delta^* < 0 \quad \text{and} \quad \frac{\partial N^+}{\partial \tau} = \int_{\frac{r}{1-\tau^*}}^{\Delta^+} \frac{\delta^c}{1-\tau} d\Delta^* > 0 \quad (12)$$

Thus, we can summarize

**Proposition 4** *High-tax countries have a higher probability  $\frac{N^-}{N^-+N^+}$  of seeing their tax revenue decrease in response to inbound investment.*

This effect of investment on tax revenue is one of the empirically testable implications of our model. If our model actually explains part of real world investment flows then we should observe that high-tax countries have less gain from inbound investment in terms of tax revenue than low-tax countries.

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<sup>3</sup>This result is due to specific features of our model. In a different model, where investor firms can choose between different countries as production locations, high-tax countries are more likely to attract projects with negative marginal profit changes and therefore to face averse investment effects.

## 2.4 Optimal tax policy

In this section we derive the optimal tax policy of an individual country which takes the interest rate in the world market as given and maximizes the welfare of the representative household. The welfare of the domestic household ( $W$ ) is assumed to depend on private consumption  $C$  and publicly provided goods  $G$ :  $W = U(C) + H(G)$ . Private consumption is given by the private return to investment.  $G$  is financed by corporate tax revenues only. With  $U(C) = C$ , welfare is given by

$$\begin{aligned}
 W = & r(S - K^d) + \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} [\Delta(1 - \tau) + \delta^*(1 - \tau^*)] d\delta^* d\Delta \quad (13) \\
 & + H \left[ \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} \tau \Delta d\delta^* d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \int_{\delta^c}^{\delta^+} \tau \delta d\delta d\Delta^* \right]
 \end{aligned}$$

Optimal tax policy is given at the point where the additional welfare of a marginal increase in the domestic corporate tax rate  $\tau$  is zero:

$$\begin{aligned}
 \frac{\partial W}{\partial \tau} = & 0 = (H' - 1) \left( \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} [\Delta] d\delta^* d\Delta \right) + H' \left[ \int_{\Delta^{*-}}^{\Delta^{*+}} \int_{\delta^c}^{\delta^+} \delta d\delta d\Delta^* \right] \\
 & - H' \tau \left[ \int_{\Delta^-}^{\Delta^+} \frac{\Delta^2}{1 - \tau^*} d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\delta^{c2}}{1 - \tau} d\Delta^* \right] \quad (14)
 \end{aligned}$$

The optimal tax policy involves the following tradeoff: The first term on the right hand side of (14) reflects that a higher tax rate shifts income from the domestic household to the government, which increases welfare if the marginal utility from public consumption exceeds the marginal utility of private consumption  $H' - 1 > 0$ . The second term reflects that, for a given tax base, higher tax rates raise more revenue from taxing foreign owned firms.<sup>4</sup> This effect is unambiguously positive. The third term is unambiguously negative if the tax rate is positive and reflects that a tax rate increase reduces the tax base.<sup>5</sup>

<sup>4</sup>This effect is well-known from the literature, see e.g. Huizinga & Nielsen (1997) or Fuest (2005). It may imply that  $H' \geq 1$  which we rule out by assumption.

<sup>5</sup>In principle it is possible to implement a neutral tax system which only taxes pure profits, i.e. profits that exceed the net cost of capital  $r$ . However, in order to keep our model comparable to those in the literature, we do not allow for this kind of first-best solution.

## 2.5 Tax Coordination

A standard result in the literature states that corporate taxation, and hence public goods provision, is inefficiently low under tax competition, so that there is a potential for welfare enhancing tax coordination. In this subsection, we ask whether or not this result also holds in the presence of feedback effects on domestic activity of investing firms. We focus on the case of symmetric countries and consider the welfare effects of a coordinated marginal increase in the corporate tax rates of both countries, departing from a symmetric equilibrium without coordination. The welfare effect is given by  $dW = \frac{\partial W}{\partial \tau} d\tau + \frac{\partial W}{\partial \tau^*} d\tau^* + \frac{\partial W}{\partial r} dr$ . With  $\tau$  optimally chosen, i.e.  $\frac{\partial W}{\partial \tau} = 0$ , and  $\tau = \tau^*$  it follows:

$$\frac{dW}{d\tau} = \frac{\partial W}{\partial \tau^*} + \frac{\partial W}{\partial r} \frac{dr}{d\tau} \quad (15)$$

$\frac{\partial W}{\partial \tau^*}$  and  $\frac{\partial W}{\partial r}$  can be derived from (13). The derivation is given in the appendix. The expression  $\frac{dr}{d\tau}$  follows from the capital market equilibrium  $S = K^d$  which is characterized by a fixed world capital supply. The appendix demonstrates that

$$\frac{dr}{d\tau} = -\frac{r}{1-\tau} \quad (16)$$

After some rearrangements, equation (15) can be expressed as

$$\frac{dW}{d\tau} = (H' - 1) \left( \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} [\delta^*] d\delta^* d\Delta \right) + H' \left[ \int_{\Delta^-}^{\Delta^+} \frac{\tau}{1-\tau^*} \Delta^2 d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\tau}{1-\tau} \delta^{c2} d\Delta^* \right] \quad (17)$$

The right hand side of (17) is unambiguously positive if  $H' - 1 > 0$ , i.e. if there is an underprovision of public goods in the equilibrium under tax competition. In our model, this is not necessarily the case, due to the fact that the corporate tax partly falls on foreign profits. We may thus state

**Proposition 5** *If public goods are underprovided under tax competition, a coordinated increase in the corporate tax rates is welfare-enhancing.*

### 3 Extensions

In this section, we briefly discuss the question of optimal repatriation taxes and then show that the opportunity of profit shifting aggravates the effects that we derived in the previous section.

#### 3.1 Optimal repatriation taxes

How do optimal repatriation taxes look like in our model? The structure of the model implies that the alternative to investing abroad for the domestic investor firm is not to invest. This means that there is need for the repatriation tax to equalize the national (or the global) return to investment, as it is the case in standard repatriation tax models like Feldstein & Hartman (1979). Thus, repatriation taxes simply redistribute income from the domestic investor to the government budget. This can be desirable when public goods underprovision or the maximization of tax revenue is considered. But, if national income is maximized optimal repatriation taxes are zero on the marginal investment project. This may imply the adoption of a system where foreign source income is exempt from tax or a cross-border cash-flow tax system. In Becker & Fuest (2007a) we discuss these issues for foreign investment projects for which the alternative is either not to invest at all or a domestic investment project. In addition, we show that there are substantial differences between greenfield investment projects and mergers and acquisitions. We conclude that, in the presence of both types of capital flows, there is no unique system of repatriation system that leads to an optimal allocation of capital (or ownership).

#### 3.2 Profit shifting

So far we assumed that firms consider projects with some given profit changes in the investor firm location and the investment location. But, as it is stressed by a large number of papers<sup>6</sup>, profit distributions can be manipulated by means of transfer pricing or by using intra-firm debt contracts. In this subsection we

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<sup>6</sup>Among these, see e.g. Grubert & Mutti (1991), Hines & Rice (1994), Bartelsmann & Beetsma (2003) as well as Weichenrieder (2006).

consider a simple model of cross-border investment which suggests that the above derived effects are even stronger when profit shifting is allowed for.

Assume that firms can shift an amount  $A$  from one jurisdiction to the other. Shifting has a cost of  $\gamma(a)$  with  $\gamma', \gamma'' > 0$ . The after-tax profit of an outbound investment project<sup>7</sup> is then given by

$$(\Delta - A)(1 - \tau) + (\delta^* + A)(1 - \tau^*) - \gamma(A) - r \geq 0 \quad (19)$$

The firm chooses  $A$  as to maximize its after tax profits. The optimal amount of shifted profit is then implied by  $\tau - \tau^* = \gamma'$ , and therefore unrelated to the distribution of profit changes among firm locations.<sup>8</sup> The marginal project  $\delta^{*c}$  for a given  $\Delta$  is given by

$$\delta^{*c} = \frac{r}{1 - \tau^*} - \Delta \left( \frac{1 - \tau}{1 - \tau^*} \right) - \frac{\Gamma}{1 - \tau^*} \quad (20)$$

where  $\Gamma = (\tau - \tau^*)A - \gamma(A)$  is the gain from profit shifting. For inbound investment, we get, equivalently:

$$\delta^c = \frac{r}{1 - \tau} - \Delta^* \left( \frac{1 - \tau^*}{1 - \tau} \right) - \frac{\Gamma^*}{1 - \tau} \quad (21)$$

with  $\Gamma^* = (\tau - \tau^*)A^* - \gamma(A^*)$ . This implies that for every given  $\Delta, \Delta^*$  the  $\delta^{*c}, \delta^c$  are shifted downwards by the same amount (since shifting costs are assumed to be identical for all firms, and optimal shifting does not depend on  $\Delta$  or  $\delta$ ). Figure 2 shows outbound and inbound investment in the presence of taxes, as in figure 1, and profit shifting.

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<sup>7</sup>Equivalently the after-tax profits of an inbound investment project is given by

$$(\Delta^* + A^*)(1 - \tau^*) + (\delta - A^*)(1 - \tau) - \gamma(A^*) - r \geq 0 \quad (18)$$

<sup>8</sup>This is the simplest way of modelling profit shifting. There are of course more sophisticated approaches, where the shifting cost depends on the profit level itself or the individual profit change distribution. However, a complete analysis of this topic is beyond the scope of this paper.

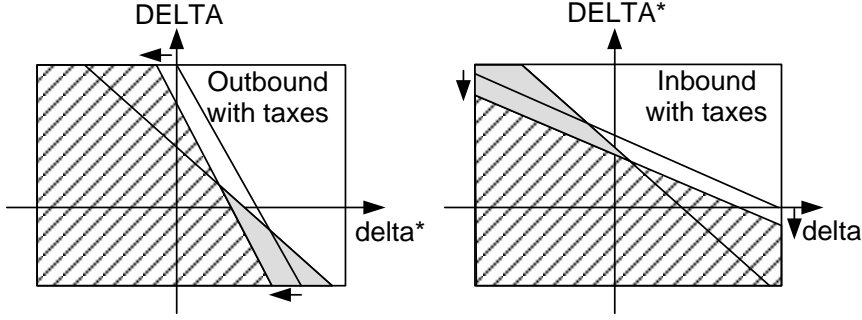


Figure 2: Tax effects with profit shifting

With profit shifting the line of marginal investment projects is shifted to the left (outbound) or to the bottom (inbound), respectively. The obvious effect is that the shaded area becomes larger, i.e. the number of projects grows that would not have been realized in the absence of taxes but are now feasible. This is true for outbound and inbound investment alike. We summarize this in

**Proposition 6** *The opportunity of shifting profits to the low-tax jurisdiction strengthens the qualitative dimension of investment. The composition effect becomes more important.*

Some implications of the above presented sketch are worth mentioning. Firstly, we implicitly assume that the interest rate stays constant. In the symmetric case,  $r$  adapts to the increased capital demand due to the shifting opportunity. Secondly, as the amount of profit shifting depends on the tax rate difference, countries with relatively high taxes are more affected by profit shifting than low-tax countries. Thus, in the presence of profit shifting high-tax countries are more likely to have a negative mean marginal profit change  $\int_{\Delta^*}^{\Delta^*+} \delta^c$  than low-tax countries. Thus, we can state that high-tax countries are more likely to experience averse quantity effects of investment in response to tax reforms, or - the other way around - that high-tax countries see their tax revenue decrease in response to higher inbound investment.

## 4 Discussion and concluding remarks

The main novelty of the above presented model is to relax the assumption that profits (or profit changes of existing plants) only occur at the investment location

itself. In this paper, we introduce investment projects that yield profit (changes) at the investment *and* the investor's location. The main implication is that the marginal profit level at the investment location does not need to be equal to the alternative investment return. In contrast, dependent on the profit change at the investor's location it can be higher or lower.

This has important consequences. If marginal profits are allowed being negative, then the tax effects can be reversed: High taxes attract more investment, low taxes deter investment. From 1990 to 2000, Germany increased its stock of foreign held capital by about 520% and performed much better in attracting foreign FDI than the UK (115%), France (205%), the US (180%) or Japan (410%).<sup>9</sup> The standard way of reading these figures is that Germany attracted FDI *despite* of its relatively high tax rates (before the tax reform in 2001, the corporate tax rates in Germany were between 52% and 58% and thus among the highest throughout the developed world). Our model provides an argument for a different interpretation: It could be that Germany attracted as much FDI *because* of its high tax rates.

Put differently, with negative marginal profits higher inbound investment may reduce the domestic tax base. Seen from this perspective, not every kind of inbound FDI is desirable. There are good kinds of inbound investment (those which increase production, employment and tax payments) and bad kinds (those which decrease activity and tax payments). To put it shortly: the quality of investment matters, not just the quantity. Thus, our model makes a first step to provide a rationale for the skepticism towards foreign inbound investment in the public debate.

Our model shows that more inbound investment can lead to smaller domestic tax bases. This may explain why inbound investment - especially in the form of m&a - is often regarded as not very attractive from the public point of view. But our model also shows that high taxes attract this kind of harmful investment projects. Thus, if our model captures some aspects of the real world, then tax policy makers should not promise *more* investment inflows in response to a possible tax cut but *different* investment inflows. In the extreme case, they should even promise *less* inbound investment.

Of course, our conclusions have to be seen in the light of the limitations of our analysis. Our model is highly stylized and abstracts from different aspects

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<sup>9</sup>Based on OECD data.

that may be important for tax policy purposes. For example, investment in our model has just effects on profit. We do not model labour and capital employment explicitly. Moreover, we abstract from all financial policy questions. Often, multinational enterprises have a broader range of financing options than purely national enterprises. Also, we might explicitly differentiate between greenfield investment and m&a as we do in Becker & Fuest (2007b). Finally, our model generates an empirically testable result which should be tested using real worlds FDI and tax data. We leave all this to future research.

## Appendix

This appendix derives the welfare effect of a coordinated increase in the corporate tax rates  $\tau$  and  $\tau^*$ . The derivatives with respect to  $\tau^*$  and  $r$  are

$$\frac{\partial W}{\partial \tau^*} = (H' - 1) \left( \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} [\delta^*] d\delta^* d\Delta \right) - H' \tau \left[ \int_{\Delta^-}^{\Delta^+} \frac{\Delta \delta^{*c}}{1 - \tau^*} d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\delta^c \Delta^*}{1 - \tau} d\Delta^* \right] \quad (22)$$

and

$$\frac{\partial W}{\partial r} = S - K^d - H' \tau \left[ \int_{\Delta^-}^{\Delta^+} \frac{\Delta}{1 - \tau^*} d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\delta^c}{1 - \tau} d\Delta^* \right] \quad (23)$$

where  $S = K^d$  in the symmetric case.

Capital market equilibrium is given at

$$S + S^* = K^d + K^{d*} = \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} d\delta^* d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \int_{\delta^c}^{\delta^+} d\delta d\Delta^* \quad (24)$$

By assumption, the world capital stock is fixed. A simultaneous change in the corporate tax rates  $\tau$  and  $\tau^*$  therefore leads to an adaptation of the capital goods price  $r$ :

$$\left( \int_{\Delta^-}^{\Delta^+} \frac{\partial \delta^{*c}}{\partial \tau} d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\partial \delta^c}{\partial \tau} d\Delta^* \right) d\tau = - \left( \int_{\Delta^-}^{\Delta^+} \frac{\partial \delta^{*c}}{\partial r} d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\partial \delta^c}{\partial r} d\Delta^* \right) dr \quad (25)$$

The tax effects in a symmetric equilibrium, with  $\tau = \tau^*$ , are given by  $\frac{\partial \delta^{*c}}{\partial \tau} = \frac{\partial \delta^c}{\partial \tau} = \frac{r}{(1-\tau)^2}$  and  $\frac{\partial \delta^{*c}}{\partial r} = \frac{\partial \delta^c}{\partial r} = \frac{1}{1-\tau}$ . It follows that

$$\frac{dr}{d\tau} = -\frac{\int_{\Delta^-}^{\Delta^+} \frac{r}{(1-\tau)^2} d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{r}{(1-\tau)^2} d\Delta^*}{\int_{\Delta^-}^{\Delta^+} \frac{1}{1-\tau} d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{1}{1-\tau} d\Delta^*} = -\frac{r}{1-\tau} \quad (26)$$

Now, recall equation (15) and replace the terms by (22) (23) and (26), and we get

$$\begin{aligned} dW = & (H' - 1) \left( \int_{\Delta^-}^{\Delta^+} \int_{\delta^{*c}}^{\delta^{*+}} \delta^* d\delta^* d\Delta \right) \\ & - H' \tau \left[ \int_{\Delta^-}^{\Delta^+} \frac{\Delta}{1-\tau^*} \left( \delta^{*c} - \frac{r}{1-\tau} \right) d\Delta + \int_{\Delta^{*-}}^{\Delta^{*+}} \frac{\delta^c}{1-\tau} \left( \Delta^* - \frac{r}{1-\tau} \right) d\Delta^* \right] \end{aligned} \quad (27)$$

With  $\tau = \tau^*$ , we can write  $\delta^{*c} - \frac{r}{1-\tau} = -\Delta$  and  $\Delta^* - \frac{r}{1-\tau} = -\delta^c$ . The above equation can be simplified to the equation given in the text.

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