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TRANSFER PRICING AND ENFORCEMENT POLICY IN OLIGOPOLISTIC MARKETS

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Abstract

In this paper we set up a symmetric two-country model with trade costs and international ownership to study the transfer pricing decisions by two multinationals operating in markets with Cournot competition. We let governments choose both the corporate profit tax rate and the level of enforcement of the “arm’s length” principle and we examine how enforcement policies affect the tax competition game. Furthermore, we analyze in what direction economic integration, in terms of a reduction in trade costs and/or a larger international ownership of multinationals, influences the symmetric equilibrium level of the two policy instruments. We show that increased economic integration may lead to *higher* equilibrium tax rates, and that, as governments increase the level of enforcement, equilibrium tax rates *increase* as well. Moreover, we find that, when the two MNEs are not fully owned by domestic residents, trade liberalization *decreases* the equilibrium enforcement policy, while increased international ownership *increases* the level of enforcement.

Keywords: Multinational Enterprises; Transfer Pricing; Tax Competition; Enforcement Policy; Economic Integration.

JEL Classification: H87; F02; F15; F23.

1 Introduction

Nowadays a large share of international trade occurs within multinational enterprises (hereafter MNEs) and manipulation of the transfer prices they use for their internal transactions can shift a huge amount of taxable profits between countries. In fact, the empirical evidence almost unambiguously suggests that MNEs are able to reduce their worldwide tax payments by shifting profits from highly taxed to more lightly taxed jurisdictions.¹ Most of the empirical work has been concerned with profit shifting from the United States to low-tax countries or tax havens and it has relied mainly on statistical relationships between country tax rates and affiliate profitabilities or tax liabilities.² Clausing (2003) is a notable exception in that she analyzes U.S. data on intrafirm transfer prices to understand in what direction and to what extent these prices differ from those charged in outside markets. Her estimates indicate that a tax rate 1 percent lower in the country of destination (origin) is associated with intrafirm export (import) prices 1.8 percent lower (2 percent higher) relative to non-intrafirm goods.

Present international tax rules attempt to moderate, at least to some extent, these tax arbitrage activities through the principle that internal transactions within MNEs should be valued at their “arm’s length” price, i.e. the price that would be paid by unrelated parties for similar transactions (OECD, 1995). The same concern can be found in the U.S. regulations on transfer pricing, whose main objectives are to “ensure that taxpayers clearly reflect income attributable to controlled transactions, and to prevent the avoidance of taxes with respect to such transactions” (U.S. Department of the Treasury, 1994, p.34990). However, even if tax authorities of OECD countries are usually supposed to follow the standard guidelines for transfer pricing, Bartelsman and Beetsma (2003) show that profit shifting opportunities for MNEs do exist among OECD countries (including the U.S.) as well, and they also provide evidence that the degree of enforcement of the “arm’s length” principle differs among countries. Table 1 summarizes the information about transfer pricing (TP) enforcement policies for the countries involved in their empirical analysis.³

¹See Hines (1999) for a comprehensive survey of the empirical literature about tax-motivated transfer pricing and profit shifting by MNEs.

²See, e.g., Jenkins and Wright (1975), Grubert and Mutti (1991), Harris et al. (1993), Grubert, Goodspeed and Swenson (1993), Hines and Rice (1994).

³Most countries have *explicit TP* rules, while a smaller group of countries uses *formal TP documentation* rules, meaning that tax authorities simply recommend taxpayers to maintain written documentation to confirm that the amounts charged in intrafirm transactions are consistent with the “arm’s length” principle. And yet an even smaller set of countries imposes *TP specific penalties*. Numbers indicate month and year of introduction of different TP related policies.

Country	Explicit TP rules	Formal TP documentation rules	TP specific penalties
Australia	07/83	09/95	07/83
Austria	-	-	-
Belgium	07/99	07/99	-
Canada	-	01/99	01/99
Denmark	01/99	01/99	-
Finland	01/31	-	-
France	09/85	04/96	04/96
Germany	02/83	-	-
Italy	12/86	-	-
Japan	04/86	-	-
Netherlands	-	-	-
Portugal	-	-	-
Spain	01/96	-	-
Sweden	-	-	-
United Kingdom	07/99	07/99	07/99
United States	01/28	01/94	01/94

Source: Ernst and Young (2000), cited in Bartelsman and Beetsma (2003, p.2230) and Peralta et al. (2003, p.3).

Table 1: Formal enforcement of transfer pricing rules by country

The purpose of this paper is to think about international taxation of MNEs and enforcement of the “arm’s length” principle in a world where economic integration proceeds at a very rapid pace and the relevance of MNEs is undoubtedly rising if we think that about 33 percent of world trade was intrafirm already in 1993 (Markusen, 2002). Our work is related to the literature which studies transfer pricing and tax competition in the presence of MNEs. For instance, Elitzur and Mintz (1996) model the trade-off for a MNE between the minimization of its worldwide tax payments and the incentives provided to the managing partner of the foreign subsidiary, finding that corporate taxes are *too high* from a global perspective. Hauffer and Schjelderup (2000) develop a tax competition model with investment and transfer pricing decisions by a MNE operating in two small countries, showing that the optimal policy is to accept some distortions of the investment decision (i.e. an incomplete deduction for the cost of capital) in order to reduce the incentive to shift profits out of the country. Mansori and Weichenrieder (2001) and Raimondos-Møller and Scharf (2002) study competition in transfer pricing regulations between two governments; in both models, the non-cooperative outcome implies an excessive taxation of the MNE, resulting from a partial double

taxation of its profits. However, none of these papers explicitly accounts for the impact that the degree of enforcement of the “arm’s length” principle may have on the corporate profit tax rate set by the government, nor they analyze the effects of trade costs and of the ownership structure of the MNEs on the two policy instruments and on the product market equilibrium.

In such a sense, the analysis that we carry out is closer to Kind, Midelfart Knarvik, and Schjelderup (2001, 2002, 2004), and also relies on the contribution by Peralta, Wauthy, and van Ypersele (2003). In particular, Kind et al. (2002) study the effects of economic integration on equilibrium taxes by developing a symmetric two-country model in the presence of two MNEs, whose location is given, and where the corporate tax base is partly foreign owned. The MNEs compete on the quantities in the two markets and are assumed to incur some costs (for example, by hiring of lawyers and accountants) in order to conceal transfer price manipulation. These costs are represented by an *exogenous* parameter and they are *tax-deductible*, in the sense that tax authorities may not even know that they are related to transfer pricing. In their paper, trade liberalization (i.e. a decrease in trade costs) reduces equilibrium taxes if the MNEs are owned by residents of a third country, but increases them if the MNEs are owned by home-country residents. Furthermore, increased international ownership implies higher equilibrium tax rates. Differently, Peralta et al. (2003) set up a model where two *almost* symmetric countries compete both for the location of a single MNE and for the taxation of its profits. The MNE acts as a monopolist in each market and is required to follow the “arm’s length” principle. The two governments can decide between being strict or lenient on this requirement: such an “enforcement” policy is costless and essentially determined by government’s reputation. As a result, transfer price manipulation implies a *non tax-deductible* cost for the MNE, and each government faces a trade-off between the advantage of attracting the MNE and the fiscal cost of hosting it, since the same tax rate must apply to domestic firms as well. Specifically, it is shown that a country can decide not to enforce the transfer pricing rule in order to attract the MNE, while setting high profit taxes on domestic firms. The other country, in turn, does not enjoy the benefits from the location of the MNE, but taxes its profits.

In our paper we set up a symmetric two-country model with trade costs and international ownership. We focus on the transfer pricing decisions by two MNEs operating in oligopolistic markets characterized by Cournot competition and we abstract from their location choices. We endow the government of each country with two policy instruments: the corporate profit tax rate and the transfer pricing enforcement policy. The latter identifies the government’s efforts in forcing the

MNE to adhere to the “arm’s length” principle. The choice of such a policy is *endogenous*, reflecting government’s attitude toward MNEs. This implies that transfer price manipulation is costly and that these costs are *non tax-deductible* by the MNEs. To account for the possible interaction between the two policies and to analyze the effects of increased economic integration on both of them, we consider a three-stage game where governments have to choose first the level of enforcement of the “arm’s length” principle and then the corporate profit tax rate. Finally, in the last stage, the headquarters of the MNEs set transfer prices to their foreign subsidiaries and compete on the quantities in the two markets. In such a setting, we show that increased economic integration may lead to *higher* equilibrium tax rates, and that, as governments increase the level of enforcement to discourage transfer pricing, equilibrium tax rates *increase* as well. Moreover, we find that there are two opposite effects of increased economic integration on the enforcement policy when the two MNEs are not fully owned by domestic residents: while trade liberalization *decreases* the equilibrium enforcement policy, increased international ownership implies a *higher* level of enforcement.

The rest of the paper is organized as follows. In Section 2, we outline the model. Section 3 illustrates the transfer pricing and quantity decisions by the MNEs when faced with the two policy instruments. In Sections 4 and 5, we derive the symmetric equilibrium tax rate and transfer pricing enforcement policy levels. Furthermore, we analyze and discuss the effects of increased economic integration on the two policy instruments. In Section 6, we summarize our main results and we conclude.

2 The model

We consider a partial equilibrium model with two countries, i and j , which are identical in all respects, and two identical horizontally integrated MNEs. The location choices of the MNEs are exogenously given and are such that multinational enterprise MNE_i (resp., MNE_j) has headquarters in country i (j) and a foreign subsidiary in country j (i).

The production process within each MNE is divided into production of intermediate and final goods implying, respectively, marginal costs c^I and c^F . Without loss of generality, we postulate that all intermediates are produced at the headquarters and final production takes place locally, meaning that part of the production of intermediates is further processed by the parent company and then sold in the domestic market, while the rest is exported to the foreign subsidiary for final processing and sale abroad. Furthermore, we normalize to zero both marginal

production costs so that $c^I = c^F = 0$. In our setting, the marginal cost of the exporting division, c^I , plays the role of the “arm’s length” price recommended by the OECD for the pricing of intrafirm transactions. As shall become clear below, the key to our argument is that while both countries are supposed to follow the “arm’s length” principle, they can endogenously choose the corresponding level of enforcement.

The foreign subsidiary of, say, MNE_i is charged a transfer price, q_i , for each unit of the intermediate good that it buys from its headquarters. Since $c^I = 0$, the transfer price is higher (lower) than the “arm’s length” price if $q_i > 0$ ($q_i < 0$). Moreover, the subsidiary has also to pay a per-unit trade cost, $\tau \geq 0$, which may reflect different types of barriers to international trade (e.g., transport costs and differing product standards), but does not include any kind of revenue generating tariffs imposed by the two governments.

The products of the MNEs are *perfect substitutes* in demand in both markets. That is, the two MNEs produce homogeneous goods and face the same inverse demand function

$$p_i = 1 - x_{ii} - x_{ji}, \quad (1)$$

where p_i is the price to consumers in country i , while x_{ii} and x_{ji} denote, respectively, quantities supplied by MNE_i ’s parent company and MNE_j ’s subsidiary in country i .

We let π_{ii} and π_{ij} denote before-tax profits for MNE_i ’s parent company and foreign subsidiary, where the first subscript indicates the headquarters’ location and the second the country where profits are derived. Given our specifications, domestic and foreign before-tax profits for MNE_i can be expressed as

$$\pi_{ii} = p_i x_{ii} + q_i x_{ij}, \quad (2)$$

$$\pi_{ij} = (p_j - \tau - q_i) x_{ij}. \quad (3)$$

We assume that international corporate taxation follows the “source” principle, meaning that each country imposes a tax on the profits generated within its borders.⁴ Furthermore, we postulate that tax authorities cannot directly observe

⁴This assumption is consistent with the actual behavior of most OECD countries. Indeed, the “source” country typically has a first right to tax the profits of all firms operating within its borders. Then, some “residence” countries exempt the foreign profits of their subsidiaries from domestic tax, in which case the “source” principle applies directly. Alternatively, “residence” countries can use the tax credit method of double taxation relief. Even in this case, the “source” principle often effectively remains in operation because foreign profits are taxed only upon repatriation, which can be deferred by the MNE. See, e.g., Keen (1993).

the production cost of the parent company, so that the transfer price may be manipulated in response to tax differentials to shift profits from one country to the other.

To limit this profit shifting incentive and to formalize the evidence by Bartelsman and Beetsma (2003), we argue that governments are concerned about transfer pricing and want to enforce the “arm’s length” principle. Hence, the government of, say, country i chooses a level of enforcement, δ_i , at a cost $C_i(\delta_i) = \frac{d}{2}\delta_i^2$, $d > 0$, and requires MNE_i to charge a transfer price equal to the marginal production cost of the exporting parent company.⁵ As a consequence, transfer price manipulation entails some non tax-deductible costs, since the MNE needs to hire financial experts (e.g., lawyers and accountants) to show that the transfer price charged is consistent with the “arm’s length” principle.⁶ These costs are increasing in the difference between q_i and c^I , in the level of enforcement chosen by the government, and in the amount of intrafirm exports. In particular, we let the “manipulation cost” function take the following form

$$MC_i(\delta_i, q_i - c^I, x_{ij}) = \delta_i q_i^2 x_{ij},$$

so that overinvoicing and underinvoicing are equally expensive for MNE_i . Note that if MNE_i charges a transfer price $q_i = c^I = 0$, its manipulation costs are equal to zero. Therefore, MNE_i ’s objective function can be written as

$$\Pi_i = (1 - t_i)\pi_{ii} + (1 - t_j)\pi_{ij} - \delta_i q_i^2 x_{ij}, \quad (4)$$

where t_i and t_j denote, respectively, the corporate profit tax rate imposed by country i and country j .

Turning to the objective function of the government, we denote by $\alpha \in [0, 1]$ the share of each MNE that is owned by domestic residents, while the residual $(1 - \alpha)$ is owned by residents of a third country, so that welfare in country i can be expressed as⁷

$$W_i = CS_i + T_i + \alpha\Pi_i - C_i(\delta_i),$$

⁵Following Kant (1988), the endogenous choice of the enforcement policy can be interpreted as a change in government’s attitude toward MNEs, e.g. due to a change in the government in either country or to a study and policy review by an existing government.

⁶The non tax-deductibility assumption is in line with Peralta et al. (2003). Instead, Kind et al. (2002) treat such “concealment costs” as tax-deductible.

⁷The parameter α can also be interpreted as the weight that each government puts on profits when it maximizes national welfare. If, say, $\alpha < 1$ and the MNEs in both countries are fully owned by domestic residents, the government values consumer surplus, tax revenue and the cost of the enforcement policy more than producer surplus.

where $CS_i = \frac{1}{2}(x_{ii} + x_{ji})^2$ represents consumer surplus and tax revenue is given by $T_i = t_i(\pi_{ii} + \pi_{ji})$. To show the different effects on welfare of the two policies and of the ownership structure of the MNEs, the objective function can be rearranged as follows

$$W_i = CS_i + \underbrace{\alpha(\pi_{ii} + \pi_{ij})}_{(I)} - \underbrace{\alpha t_j \pi_{ij}}_{(II)} + \underbrace{t_i \pi_{ji} + (1 - \alpha)t_i \pi_{ii}}_{(III)} - \underbrace{\left(\alpha \delta_i q_i^2 x_{ij} + \frac{d}{2} \delta_i^2\right)}_{(IV)} \quad (5)$$

where

- (I) the *profit ownership* effect shows that welfare is increasing in MNE_i 's before-tax profits and in the share of these profits accruing to domestic residents;
- (II) the *foreign tax exporting* effect indicates that country j has the ability to tax foreign profits of MNE_i (by taxing its subsidiary), thereby reducing the amount available to country i residents; this effect decreases welfare and is stronger the larger is the share of MNE_i owned by domestic residents;
- (III) the *home tax exporting* effect increases welfare, since country i is able to shift the burden of taxation onto foreigners by taxing both MNE_j 's foreign subsidiary and the share of MNE_i 's parent company profits which accrue to third-country residents;
- (IV) the *enforcement policy* effect shows that the costs in terms of welfare of such a policy are increasing in the share of MNE_i owned by domestic residents.

Given this scenario, we consider a three-stage game characterized by the following sequence of decisions:

- at the first stage, the two governments simultaneously set their level of enforcement of the “arm’s length” principle, $\delta_i, \delta_j \in [0, \infty)$;
- at the second stage, the two governments simultaneously choose their corporate profit tax rates, $t_i, t_j \in [0, 1]$;
- at the third stage, the headquarters of the MNEs set the transfer prices to their foreign subsidiaries and compete on the quantities in the two markets.

3 Transfer pricing and quantity decisions

We solve our three-stage game by backward induction. In the third stage, MNE_i maximizes its objective function (4) with respect to its home sales, exports and

transfer price (x_{ii} , x_{ij} and q_i), taking the quantities supplied and the transfer price charged by MNE_j , the tax rates and the enforcement policies of both countries as given.

3.1 Equilibrium transfer price and profit shifting incentive

Using equations (1), (2) and (3), the equilibrium transfer price can be found by differentiating (4) with respect to q_i , which gives

$$q_i(t_i, t_j, \delta_i) = \frac{t_j - t_i}{2\delta_i}. \quad (6)$$

Note that the equilibrium transfer price only depends upon the tax rates set by the two governments and the enforcement policy of the domestic country.

Equation (6) illustrates the *profit shifting* incentive to manipulate the transfer price. If, say, $t_i > t_j$, MNE_i is induced to underinvoice its exports ($q_i < 0$) and shift profits to country j . Similarly, an incentive for overinvoicing ($q_i > 0$) and profit shifting into country i arises when $t_i < t_j$. On the contrary, if both countries levy the same corporate profit tax rate ($t_i = t_j$), no profit shifting motive exists and MNE_i optimally sets its transfer price equal to the “arm’s length” price, i.e. $q_i^* = c^I = 0$.⁸ Anyway, this profit shifting incentive is limited by country i ’s enforcement policy, δ_i . Intuitively, this policy should act in the same direction as the tax policy. Indeed, if country i is the high-tax country, MNE_i is induced to charge a negative transfer price, thereby shifting profits into country j . Hence, country i should set a higher enforcement level, as opposed to the case where it is the low-tax country, to keep as low as possible the negative effect which transfer pricing may have on the profits declared by MNE_i ’s parent company.

To further investigate this argument, we derive the effects on the equilibrium transfer price of a marginal change in the tax rates set by the two governments and in country i ’s enforcement policy

$$\frac{\partial q_i}{\partial t_i} = -\frac{\partial q_i}{\partial t_j} = -\frac{1}{2\delta_i} < 0, \quad (7)$$

$$\frac{\partial q_i}{\partial \delta_i} = \frac{t_i - t_j}{2\delta_i^2}. \quad (8)$$

Equation (7) shows that, as long as $\delta_i \neq 0$, a marginal increase in t_i induces MNE_i to lower its transfer price and shift profits out of country i . But the reduction in q_i is lower the larger is the level of δ_i . On the contrary, a marginal increase in t_j

⁸Here and in what follows, we denote by an asterisk the value of the variables when the two countries levy the same tax rate ($t_i = t_j$).

determines an increase in q_i and MNE_i is willing to shift profits into country i . But the rise in q_i is larger the lower is the level of δ_i . Both situations suggest that the enforcement policy of country i should work in the same direction as its tax policy in order to keep more profits within its borders.

Equation (8) confirms the last statement. If country i is the low-tax country, $\partial q_i/\partial \delta_i < 0$ and MNE_i is induced to overinvoice its exports to country j . Then, a marginal increase in δ_i implies a reduction in q_i so that MNE_i is able to shift a lower amount of profits into country i . Hence, δ_i should be set as low as possible. On the other hand, if country i is the high-tax country, $\partial q_i/\partial \delta_i > 0$ and MNE_i is induced to underinvoice its exports to country j . In this case, country i should set δ_i as high as possible because the higher δ_i , the more close to zero is q_i and the smaller the amount of profits that MNE_i is willing to declare in country j .

3.2 Equilibrium home sales and exports

Differentiating (4) with respect to x_{ii} and x_{ij} , we obtain the following first-order conditions

$$\frac{\partial \Pi_i}{\partial x_{ii}} = 1 - 2x_{ii} - x_{ji} = 0, \quad (9)$$

$$\frac{\partial \Pi_i}{\partial x_{ij}} = (1 - t_i)q_i + (1 - t_j)(1 - 2x_{ij} - x_{jj} - \tau - q_i) - \delta_i q_i^2 = 0, \quad (10)$$

which, together with the symmetric expressions for MNE_j , implicitly define the *best response* functions of the two MNEs to a change in the quantities supplied on the two markets. Note that quantities are *strategic substitutes* ($\partial x_{ii}/\partial x_{ji} < 0$ and $\partial x_{jj}/\partial x_{ij} < 0$).

Solving (9) and (10) simultaneously for the two MNEs and using the equilibrium transfer price (6), equilibrium home sales and exports by MNE_i and MNE_j are given, respectively, by

$$\text{home sales} : x_{ii} = \frac{1 + \tau}{3} - \frac{(t_j - t_i)^2}{12\delta_j(1 - t_i)}, \quad x_{jj} = \frac{1 + \tau}{3} - \frac{(t_j - t_i)^2}{12\delta_i(1 - t_j)}, \quad (11)$$

$$\text{exports} : \underbrace{x_{ij} = \frac{1 - 2\tau}{3} + \frac{(t_j - t_i)^2}{6\delta_i(1 - t_j)}}_{MNE_i}, \quad \underbrace{x_{ji} = \frac{1 - 2\tau}{3} + \frac{(t_j - t_i)^2}{6\delta_j(1 - t_i)}}_{MNE_j}. \quad (12)$$

In particular, if the two countries levy the same corporate profit tax rate ($t_i = t_j$), equilibrium quantities reduce to

$$x_{ii}^* = x_{jj}^* = \frac{1 + \tau}{3}, \quad x_{ij}^* = x_{ji}^* = \frac{1 - 2\tau}{3}. \quad (13)$$

Moreover, the two MNEs are induced to set the same transfer price $q_i^* = q_j^* = 0$, so that their symmetric equilibrium before-tax profits become

$$\pi_{ii}^* = \pi_{jj}^* = \frac{(1 + \tau)^2}{9}, \quad \pi_{ij}^* = \pi_{ji}^* = \frac{(1 - 2\tau)^2}{9}. \quad (14)$$

Equation (13) suggests that $\tau \geq \frac{1}{2}$ implies negative exports for both MNEs. Hence, in order to have international trade, we need to assume that trade costs $\tau \in [0, \frac{1}{2})$. Furthermore, differentiation of (11) and (12) shows that trade liberalization (i.e. a decrease in trade costs) leads to a reduction in domestic sales and to an increase in exports by the two MNEs, thus to more competition in both markets.

3.2.1 Export incentive and enforcement policy

Equations (11) and (12) suggest that home sales by the two MNEs are affected by the enforcement policy of the other country, but they are independent of the domestic enforcement policy. On the contrary, exports only depend upon the latter. Namely, differentiating (11) and (12) with respect to δ_i , we find that, as long as $t_i \neq t_j$

$$\underbrace{\frac{\partial x_{ii}}{\partial \delta_i} = \frac{\partial x_{ji}}{\partial \delta_i} = 0}_{\text{country } i\text{'s market}}, \quad \underbrace{\frac{\partial x_{ij}}{\partial \delta_i} < 0, \frac{\partial x_{jj}}{\partial \delta_i} > 0}_{\text{country } j\text{'s market}}$$

which imply that a marginal increase in δ_i has no impact on home sales by MNE_i , but leads to a decrease in its exports to country j . At the same time, it induces MNE_j to increase its home sales in country j , leaving unaffected its exports to country i . In other words, country i 's enforcement policy affects the quantities sold in country j 's market through its negative effect on exports by MNE_i .

To account for this observation, we first need to consider the *export* incentive faced by MNE_i . Indeed, when $t_i \neq t_j$, the ability of MNE_i to manipulate the transfer price increases its marginal profit of exports. Substituting for the equilibrium transfer price (6), the first-order condition (10) can be rewritten as

$$\frac{\partial \Pi_i}{\partial x_{ij}} = (1 - t_i) \left(\frac{t_j - t_i}{2\delta_i} \right) + (1 - t_j) \left[1 - 2x_{ij} - x_{jj} - \tau - \left(\frac{t_j - t_i}{2\delta_i} \right) \right] - \frac{(t_j - t_i)^2}{4\delta_i}. \quad (15)$$

If MNE_i does not manipulate the transfer price and sets $q_i^* = 0$, (10) implies that $1 - 2x_{ij}^* - x_{jj}^* - \tau = 0$. Then, inserting this expression into (15), we obtain

$$\frac{\partial \Pi_i}{\partial x_{ij}} = \frac{(t_j - t_i)^2}{4\delta_i} > 0.$$

This means that MNE_i is induced to increase x_{ij} until the marginal profit of export is equal to zero, from which it follows that $x_{ij} > x_{ij}^*$.

But it is also evident that such an export incentive is lower the higher is the level of country i 's enforcement policy, and we know that the profit shifting incentive is decreasing in δ_i as well. Thus, an increase in country i 's enforcement policy leads MNE_i to decrease its exports to country j because of the negative effect it has on both of these incentives.

Finally, to explain why MNE_j 's home sales are increasing in country i 's enforcement policy, we need to consider what happens in country j 's market. Since the two competing MNEs set their quantities simultaneously, MNE_j cannot observe MNE_i 's actual behavior before setting its own quantity, but it can anticipate it by observing the enforcement policy level which has been previously chosen by country i . Therefore, if δ_i increases, MNE_j can anticipate that MNE_i will reduce its exports (x_{ij}) to country j and, since quantities are strategic substitutes, its optimal response will be to increase its home sales (x_{jj}).

3.2.2 Strategic effect of corporate profit tax rates

In order to investigate how a change in country i 's tax rate, t_i , affects home sales and exports by the two MNEs, we derive the following expressions

$$\frac{\partial x_{ii}}{\partial t_i} = \frac{(t_j - t_i)(2 - t_i - t_j)}{12\delta_j(1 - t_i)^2}, \quad \frac{\partial x_{ij}}{\partial t_i} = \frac{t_i - t_j}{3\delta_i(1 - t_j)}, \quad (16)$$

$$\underbrace{\frac{\partial x_{ji}}{\partial t_i} = \frac{(t_i - t_j)(2 - t_i - t_j)}{6\delta_j(1 - t_i)^2}}_{\text{country } i\text{'s market}}, \quad \underbrace{\frac{\partial x_{jj}}{\partial t_i} = \frac{t_j - t_i}{6\delta_i(1 - t_j)}}_{\text{country } j\text{'s market}}, \quad (17)$$

from which it is evident that, as long as $\delta_i, \delta_j \neq 0$ and $t_i, t_j \neq 1$, their sign only depends on the difference between t_i and t_j .

In particular, if $t_i = t_j$, home sales and exports by the two MNEs are independent of the actual tax rates. Thus, a marginal increase in one of the tax rates starting from a symmetric equilibrium will not have any effect on supplied quantities. This will prove a useful property when deriving the equilibrium tax rate at the second stage.

Suppose now that $t_i \neq t_j$. We observe from (16) that, as long as $t_i < t_j$, a marginal increase in country i 's tax rate induces MNE_i to increase its home sales and reduce its exports to country j ($\partial x_{ii}/\partial t_i > 0$ and $\partial x_{ij}/\partial t_i < 0$). Furthermore, equation (17) suggests that MNE_j will respond to the marginal increase in t_i by raising its home sales and decreasing its exports to country i ($\partial x_{jj}/\partial t_i > 0$ and $\partial x_{ji}/\partial t_i < 0$). To account for these effects, we must recall that the two MNEs compete on the quantities knowing the tax rates which have been previously set by the two countries and that quantities are strategic substitutes. That is, we

need to consider the *strategic effect* of tax rates on supplied quantities. Indeed, when $t_i < t_j$, MNE_i is willing to overinvoice its exports and shift profits to country i , where the parent company resides. But a marginal increase in t_i will lower both the gain from manipulating the transfer price (profit shifting incentive) and the marginal profit of exports (export incentive), so that it will be optimal for MNE_i to decrease its exports to country j and increase its domestic sales. Furthermore, given that tax rates are set before quantity competition, MNE_j can anticipate the choices by MNE_i and, since quantities are strategic substitutes, its optimal response will be increase its home sales and decrease its exports to country i . Equivalently, we can use the fact that a marginal increase in t_i will have a negative impact on the profit shifting and export incentives for MNE_j .

On the contrary, if $t_i > t_j$, a marginal increase in country i 's tax rate will have the opposite effects on supplied quantities. Namely, MNE_i will be induced to decrease its home sales and to increase its exports to country j ($\partial x_{ii}/\partial t_i < 0$ and $\partial x_{ij}/\partial t_i > 0$), while MNE_j will reduce its home sales and increase its exports to country i ($\partial x_{jj}/\partial t_i < 0$ and $\partial x_{ji}/\partial t_i > 0$). In this case, we know that MNE_i is willing to underinvoice its exports and shift profits to country j , where the foreign subsidiary resides. Hence, a marginal increase in t_i will increase even further its profit shifting and export incentives, so that MNE_i will behave more aggressively in country j and less aggressively in country i . As before, since MNE_j can anticipate MNE_i 's behavior by observing tax rates, its best response will be to lower its home sales and to raise its exports to country i , or equivalently we can think of the positive impact of a marginal increase in t_i on profit shifting and export incentives for MNE_j .

4 Tax competition

At the second stage, each government sets its corporate profit tax rate in order to maximize national welfare, taking the tax rate of the other country and both enforcement policies as given. Namely, country i 's government maximizes its welfare function (5) with respect to t_i , taking country j 's tax rate (t_j) as well as δ_i and δ_j as given. The corresponding first-order condition is given by

$$\begin{aligned} \frac{\partial W_i}{\partial t_i} &= \frac{\partial CS_i}{\partial t_i} + \alpha \left(\frac{\partial \pi_{ii}}{\partial t_i} + \frac{\partial \pi_{ij}}{\partial t_i} \right) - \alpha t_j \frac{\partial \pi_{ij}}{\partial t_i} + \pi_{ji} + t_i \frac{\partial \pi_{ji}}{\partial t_i} + (1 - \alpha) \pi_{ii} \\ &+ (1 - \alpha) t_i \frac{\partial \pi_{ii}}{\partial t_i} - \alpha \left(\delta_i q_i^2 \frac{\partial x_{ij}}{\partial t_i} + 2 \delta_i q_i x_{ij} \frac{\partial q_i}{\partial t_i} \right) = 0, \end{aligned}$$

where

$$\begin{aligned}
\frac{\partial CS_i}{\partial t_i} &= (x_{ii} + x_{ji}) \left(\frac{\partial x_{ii}}{\partial t_i} + \frac{\partial x_{ji}}{\partial t_i} \right), \\
\frac{\partial \pi_{ii}}{\partial t_i} &= (1 - 2x_{ii} - x_{ji}) \frac{\partial x_{ii}}{\partial t_i} - x_{ii} \frac{\partial x_{ji}}{\partial t_i} + q_i \frac{\partial x_{ij}}{\partial t_i} + x_{ij} \frac{\partial q_i}{\partial t_i}, \\
\frac{\partial \pi_{ij}}{\partial t_i} &= (1 - 2x_{ij} - x_{jj} - \tau - q_i) \frac{\partial x_{ij}}{\partial t_i} - x_{ij} \left(\frac{\partial x_{jj}}{\partial t_i} + \frac{\partial q_i}{\partial t_i} \right), \\
\frac{\partial \pi_{ji}}{\partial t_i} &= (1 - 2x_{ji} - x_{ii} - \tau - q_j) \frac{\partial x_{ji}}{\partial t_i} - x_{ji} \left(\frac{\partial x_{ii}}{\partial t_i} + \frac{\partial q_j}{\partial t_i} \right),
\end{aligned}$$

and we can rearrange it to show that the total effect of country i 's tax rate on national welfare can be decomposed into three different effects

$$\begin{aligned}
\frac{\partial W_i}{\partial t_i} &= \underbrace{\pi_{ji} + (1 - \alpha) \pi_{ii}}_{(Direct)} + \underbrace{[(1 - \alpha) t_i + \alpha (t_j - 2\delta_i q_i)] x_{ij} \frac{\partial q_i}{\partial t_i} - t_i x_{ji} \frac{\partial q_j}{\partial t_i}}_{(TP)} \\
&+ \{x_{ii} + (1 - t_i) x_{ji} + (1 - 2x_{ii} - x_{ji}) [\alpha + (1 - \alpha) t_i]\} \frac{\partial x_{ii}}{\partial t_i} \\
&+ [\alpha (1 - t_j) (1 - 2x_{ij} - x_{jj} - \tau) + (1 - \alpha) q_i t_i + \alpha q_i (t_j - \delta_i q_i)] \frac{\partial x_{ij}}{\partial t_i} \\
&+ [x_{ji} + (1 - \alpha) (1 - t_i) x_{ii} + t_i (1 - 2x_{ji} - x_{ii} - \tau - q_j)] \frac{\partial x_{ji}}{\partial t_i} \\
&- \alpha (1 - t_j) x_{ij} \frac{\partial x_{jj}}{\partial t_i} = 0, \tag{18}
\end{aligned}$$

where (*Direct*) and (*TP*) denote, respectively, the *direct* effect on tax revenue (for constant transfer price and supplied quantities) and the *profit shifting* effect through transfer pricing, while the remaining terms represent the *strategic* effect on supplied quantities which we have identified in Section 3.

In *any* symmetric equilibrium in tax rates ($t_i = t_j$), we know from (6) that it is optimal for the two MNEs not to manipulate the transfer price by setting $q_i^* = q_j^* = 0$. Furthermore, we have shown in Section 3 that home sales and exports are independent of the actual tax rates if $t_i = t_j$. This means that the strategic effect is equal to zero so that country i 's tax rate affects national welfare only through the other two effects.⁹ Hence, imposing symmetry on the first-order condition and defining $t^* \equiv t_i = t_j$ in any symmetric equilibrium in tax rates, (18)

⁹Similarly, it can be shown that a marginal change in the tax rates from a symmetric equilibrium will not influence consumer surplus, the profit ownership effect (*I*) and the enforcement policy effect (*IV*).

reduces to

$$\frac{\partial W_i}{\partial t_i} = \underbrace{\pi_{ji}^* + (1 - \alpha) \pi_{ii}^*}_{(Direct)} + t^* \underbrace{\left(x_{ij}^* \frac{\partial q_i}{\partial t_i} - x_{ji}^* \frac{\partial q_j}{\partial t_i} \right)}_{(TP)} = 0, \quad (19)$$

and we can substitute for (7), (13), (14) and $\partial q_j / \partial t_i = 1/2\delta_j$ to derive the *symmetric equilibrium* tax rate.

Proposition 1 *The symmetric equilibrium tax rate is equal to*

$$t^*(\delta_i, \delta_j, \alpha, \tau) = \frac{2\delta_i\delta_j \left[5\tau^2 - 2\tau + 2 - \alpha(1 + \tau)^2 \right]}{3(\delta_i + \delta_j)(1 - 2\tau)} \quad (20)$$

and depends on the level of enforcement of the “arm’s length” principle by the two countries (δ_i and δ_j), on the ownership structure of the MNEs (α) and on trade costs (τ).

Given our assumptions, t^* turns out to be nonnegative as long as $\delta_i, \delta_j \neq 0$.¹⁰

The symmetric solution to the government’s problem allows us to analyze the effects that the enforcement policies may have on the corporate tax policy. In particular, differentiating (20) with respect to δ_i and δ_j , we obtain

$$\frac{\partial t^*}{\partial \delta_i} > 0, \quad \frac{\partial t^*}{\partial \delta_j} > 0, \quad (21)$$

so that we can state

Proposition 2 *An increase in the level of enforcement of the “arm’s length” principle by one of the two countries (or by both of them) increases the symmetric equilibrium tax rate.*

Therefore, if we believe that OECD countries have become more concerned about profit shifting opportunities by MNEs due to the substantial growth in foreign direct investments and intrafirm trade which has characterized the last two decades (Markusen, 2002), and if we take into account the empirical prediction that profit shifting should decrease with the level of enforcement of the country (Bartelsman and Beetsma, 2003), our model suggests that, as governments increase the level of enforcement of the “arm’s length” principle to discourage transfer pricing by the domestic MNE, the equilibrium tax rate will increase as well.

¹⁰See Appendix A1.

4.1 Effects of economic integration

In our model “economic integration” may be interpreted either as *trade liberalization* or as an increasing *international ownership* of the two MNEs. While the former is represented by a decrease in trade costs (τ), the latter is captured by a decrease in the share of the domestic MNE which is owned by domestic residents (α) and by a corresponding increase in the ownership by foreigners.

We first consider the effect of a change in the ownership structure of the MNEs. Differentiating (20) with respect to α , we find that

$$\frac{\partial t^*}{\partial \alpha} < 0,$$

which allows us to state

Proposition 3 *An increase in the share of international ownership of the MNEs, i.e. a lower α , increases the symmetric equilibrium tax rate.*

Intuitively, the higher is the share of the domestic MNE which is owned by residents of a third country, the stronger is the incentive for the government to raise the tax rate, thereby shifting more of the tax burden onto foreigners.¹¹

We now analyze the effects of trade liberalization on t^* . To begin, we discuss the two extreme cases where MNE_i is fully owned either by domestic residents ($\alpha = 1$) or by residents of a third country ($\alpha = 0$).

With **full domestic ownership** ($\alpha = 1$), evaluating the first order-condition (19) at the symmetric equilibrium in tax rates gives

$$\frac{\partial W_i}{\partial t_i} = \underbrace{\pi_{ji}^*}_{(Direct)} + t^* \underbrace{\left(x_{ij}^* \frac{\partial q_i}{\partial t_i} - x_{ji}^* \frac{\partial q_j}{\partial t_i} \right)}_{(TP)} = 0.$$

In particular, the *direct* effect of an increase in t_i is positive, since a higher tax rate (for constant transfer price) allows country i to tax more heavily the profits of MNE_j 's foreign subsidiary (π_{ji}^*). On the contrary, the *profit shifting* effect through transfer pricing has a negative impact on welfare: on the one hand, a higher t_i leads MNE_i to underinvoice its exports to the subsidiary in country j ($\partial q_i / \partial t_i < 0$), thus increasing π_{ij}^* and allowing country j to export more of its tax

¹¹This result is consistent with Huizinga and Nielsen (1997) who show that if economic integration means that a larger part of the corporate tax falls on foreigners, an incentive for tax exportation arises leading to a higher corporate tax rate. Their model, however, does not consider transfer pricing by MNEs.

burden to residents in country i ; on the other hand, a higher t_i induces MNE_j to overinvoice its exports to the subsidiary in country i ($\partial q_j / \partial t_i > 0$), thereby decreasing π_{ji}^* and reducing the scope for country i to tax foreigners.

Substituting for the symmetric equilibrium values of π_{ji}^* , x_{ij}^* , and x_{ji}^* , and using (7), we obtain

$$\frac{\partial W_i}{\partial t_i} = \underbrace{\frac{(1-2\tau)^2}{9}}_{(Direct)} - t^* \underbrace{\frac{(\delta_i + \delta_j)(1-2\tau)}{6\delta_i\delta_j}}_{(TP)} = 0. \quad (22)$$

The first term in (22) represents the positive effect on welfare of raising t_i when trade costs τ decrease: trade liberalization increases the profits of MNE_j 's subsidiary, so that more of the domestic tax burden can be exported to foreigners. At the same time, there is a negative effect which corresponds to the second term in (22): a decrease in trade costs (for constant enforcement policies) leads to more profit shifting through transfer pricing, thus implying a tax base loss for country i . It is then straightforward to derive the symmetric equilibrium tax rate in the case of full domestic ownership, which is given by

$$t^*(\delta_i, \delta_j, 1, \tau) = \frac{2\delta_i\delta_j(1-2\tau)}{3(\delta_i + \delta_j)},$$

and we can easily show that a decrease in trade costs will determine an *increase* in t^* , meaning that the positive direct effect on tax revenue dominates the negative profit shifting effect.¹²

With **full third-country ownership** ($\alpha = 0$), evaluating the first order-condition (19) at the symmetric equilibrium in tax rates gives

$$\frac{\partial W_i}{\partial t_i} = \underbrace{\pi_{ji}^* + \pi_{ii}^*}_{(Direct)} + t^* \underbrace{\left(x_{ij}^* \frac{\partial q_i}{\partial t_i} - x_{ji}^* \frac{\partial q_j}{\partial t_i} \right)}_{(TP)} = 0.$$

As before, country i faces a trade-off between the incentive to shift taxes onto foreigners and a potential loss of tax revenue from profit shifting through transfer pricing. In this case, the positive direct effect of raising t_i affects equilibrium

¹²Ludema and Wooton (2000) obtain a similar result in that economic integration, in terms of a decrease in trade costs, may lead to higher equilibrium tax rates. Specifically, they use an economic geography model to study how tax competition may affect the location of manufacturing workers. Such a result is confirmed also by Baldwin and Krugman (2004), who show that, by introducing agglomeration externalities into a standard tax competition model, greater economic integration may determine a “race to the top” in tax rates.

profits of both MNE_j 's subsidiary and MNE_i 's parent company, which entirely accrue to foreigners. Hence, we could argue that country i should set t_i as high as possible (i.e. equal to 1). But such a tax rate cannot be optimal since it would induce the two MNEs to manipulate the transfer price in order to shift profits out of country i . Using equations (7), (13) and (14), the first-order condition becomes

$$\frac{\partial W_i}{\partial t_i} = \underbrace{\frac{(1-2\tau)^2}{9} + \frac{(1+\tau)^2}{9}}_{(Direct)} - t^* \underbrace{\frac{(\delta_i + \delta_j)(1-2\tau)}{6\delta_i\delta_j}}_{(TP)} = 0.$$

As in the case of full domestic ownership, if t_i increases, trade liberalization leads to a larger amount of profit shifting through transfer pricing. Here, however, the impact of trade liberalization on the direct effect turns out to be positive just for low values of trade costs.¹³ Therefore, if the two MNEs are fully owned by third-country residents, the symmetric equilibrium tax rate is given by

$$t^*(\delta_i, \delta_j, 0, \tau) = \frac{2\delta_i\delta_j(5\tau^2 - 2\tau + 2)}{3(\delta_i + \delta_j)(1-2\tau)},$$

and we can easily show that a decrease in trade costs *decreases* t^* , meaning that the direct effect on tax revenue is not positive enough to override the negative transfer pricing effect.

To account for the relationship between t^* and τ for values of $\alpha \in (0, 1)$, we differentiate (20) with respect to τ and we obtain the following expression

$$\frac{\partial t^*}{\partial \tau} = \frac{4\delta_i\delta_j[1 + 5\tau - 5\tau^2 - \alpha(1+\tau)(2-\tau)]}{3(\delta_i + \delta_j)(1-2\tau)^2},$$

whose sign only depends on the term in square brackets. In particular, we can easily prove that, for $\alpha \leq 0.5$, the symmetric equilibrium tax rate monotonically decreases as a consequence of trade liberalization. Anyway, for $\alpha > 0.5$, a decrease in τ may lead to an increase in t^* as long as trade costs are sufficiently low, thereby implying a non-monotonic relationship between t^* and τ .

In the following Proposition, we summarize our findings about the effects of trade liberalization on the symmetric equilibrium tax rate.

Proposition 4 *The effects of trade liberalization on the symmetric equilibrium tax rate depend on the ownership structure of the MNEs.*

(i) *If the two MNEs are fully owned by domestic residents ($\alpha = 1$), a decrease in*

¹³See Appendix A1.

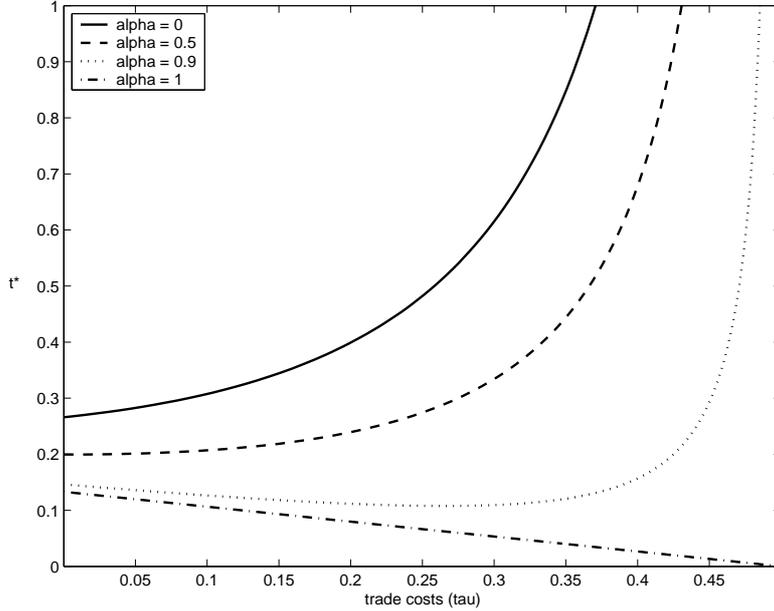


Figure 1: Effects of τ on t^* for $\delta_i = \delta_j$ and different values of α

trade costs increases t^* .

(i) If the two MNEs are fully owned by third-country residents ($\alpha = 0$), a decrease in trade costs decreases t^* .

(iii) If the ownership structure of the two MNEs is such that $\alpha < 0.5$, that is third-country residents hold the majority of shares, a decrease in trade costs monotonically decreases t^* .

(iv) If the ownership structure of the two MNEs is such that $\alpha \geq 0.5$, that is domestic residents hold the majority of shares, a decrease in trade costs increases t^* when trade costs are sufficiently low, i.e. for $\tau \in [0, \hat{\tau}]$. Otherwise, i.e. for $\tau \in (\hat{\tau}, \frac{1}{2})$, a decrease in trade costs decreases t^* .

Proof See Appendix A1. \square

Figure 1 illustrates the relationship between trade costs and the symmetric equilibrium tax rate for different values of α in the case where the two countries choose the same level of enforcement policy ($\delta_i = \delta_j = 0.4$), while Figure 2 depicts this relationship in the case of asymmetric enforcement policies ($\delta_i = 0.4$, $\delta_j = 0.3$). A comparison of the two figures confirms the comparative statics effects previously discussed. First, a higher enforcement policy by one of the two countries increases t^* for any possible value of α . In fact, all the values of t^* in Figure 1, in

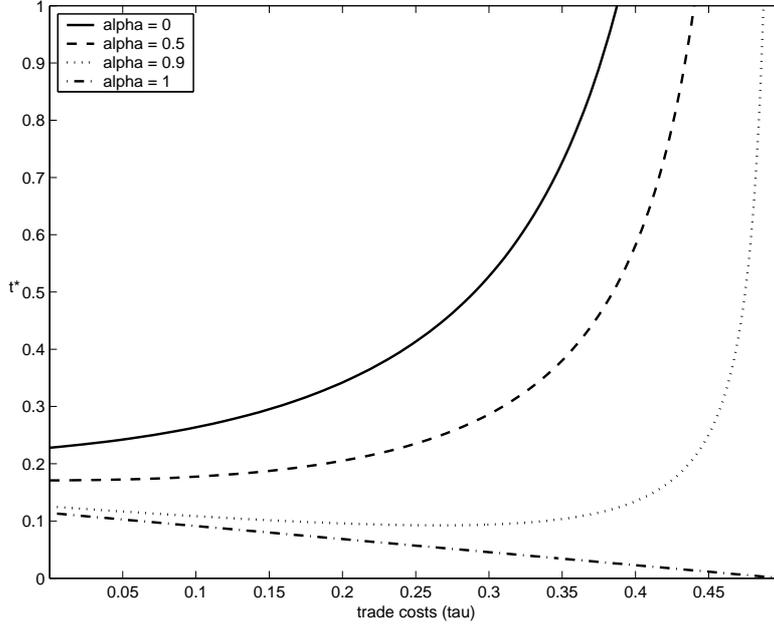


Figure 2: Effects of τ on t^* for $\delta_i \neq \delta_j$ and different values of α

which we have used $\delta_j = 0.4$, are higher than the corresponding values in Figure 2, where $\delta_j = 0.3$. Secondly, both for symmetric and for asymmetric enforcement policies, the level of t^* increases with the share of the two MNEs which is owned by residents of a third country. Furthermore, Figures 1 and 2 confirm that the effects of trade liberalization on t^* depend on the ownership structure of the MNEs. The upward-sloping curve for $\alpha = 0$ shows that t^* decreases with trade costs when the two MNEs are entirely owned by residents of a third country, while the downward-sloping curve for $\alpha = 1$ reflects the fact that a decrease in τ increases t^* when the two MNEs are fully owned by domestic residents. Finally, note that for $\alpha = 0.9$, a decrease in τ reduces t^* if trade costs are initially high, but t^* slightly rises again if trade costs become sufficiently low. Such a non-monotonic relationship between t^* and τ for values of $\alpha > 0.5$ can be explained as follows. For $\tau = 1/2$, there is no international trade, thus no profit shifting by the two MNEs, and the symmetric equilibrium tax rate is equal to $t^*(\delta_i, \delta_j, 1, 1/2) = 0$. Then, if a small share of both MNEs is owned by residents of a third country, any positive tax rate represents a pure tax on foreigners and t^* should be set as high as possible. In the neighborhood of $\tau = 1/2$, the benefit of a high tax rate dominates the loss of tax base, since profit shifting is negligible. Anyway, as τ falls, the tax base becomes more sensitive to tax changes as the scope for transfer pricing increases, so that it

is optimal to decrease t^* . On the contrary, for lower values of domestic ownership (e.g. $\alpha = 0.5$), we observe that t^* monotonically decreases with trade costs.

5 Enforcement policy competition

At the first stage, each government sets its level of enforcement of the “arm’s length” principle in order to maximize national welfare, taking the enforcement policy of the other country as given. Substituting for the symmetric equilibrium values of transfer price, home sales, exports, before-tax profits and corporate tax rate, which we have obtained in the previous two stages, the government’s objective function (5) can be rewritten as

$$W_i^* = CS_i^* + \underbrace{\alpha(\pi_{ii}^* + \pi_{ij}^*)}_{(I)} - \underbrace{\alpha t^* \pi_{ij}^*}_{(II)} + \underbrace{t^* \pi_{ji}^* + (1 - \alpha)t^* \pi_{ii}^*}_{(III)} - \underbrace{\left(\alpha \delta_i q_i^{*2} x_{ij}^* + \frac{d}{2} \delta_i^2\right)}_{(IV)},$$

which, using equations (13), (14) and (20), reduces to

$$W_i^* = \frac{1}{18}(2 - \tau)^2 + \frac{(5\tau^2 - 2\tau + 2)[\alpha + (1 - \alpha)t^*]}{9} - \frac{d}{2}\delta_i^2,$$

so that the first-order condition for the government’s maximization problem is given by

$$\frac{\partial W_i^*}{\partial \delta_i} = \frac{(1 - \alpha)(5\tau^2 - 2\tau + 2)}{9} \frac{\partial t^*}{\partial \delta_i} - d\delta_i = 0. \quad (23)$$

When choosing the level of its transfer pricing enforcement policy, country i must balance the positive impact on national welfare of increasing δ_i , which is captured by the indirect effect on the level of the equilibrium tax rate ($\partial t^*/\partial \delta_i > 0$), against a negative and direct effect, which is reflected by the cost of implementing δ_i . In particular, the positive effect of increasing δ_i turns out to be increasing in trade costs τ , for any ownership structure $\alpha \in [0, 1)$, and decreasing in domestic ownership α , $\forall \tau \in [0, \frac{1}{2})$, while the negative effect does not vary with these two parameters.

By solving $\partial W_i^*/\partial \delta_i = 0$ and $\partial W_j^*/\partial \delta_j = 0$ simultaneously for the two countries, we can show that there exists a *symmetric equilibrium* in transfer pricing enforcement policies, $\delta^* \equiv \delta_i = \delta_j$, which can be characterized as follows¹⁴

Proposition 5 *There exists a symmetric equilibrium level of enforcement of the “arm’s length” principle, which is equal to*

$$\delta^*(\alpha, \tau) = \frac{(1 - \alpha)(5\tau^2 - 2\tau + 2) \left[5\tau^2 - 2\tau + 2 - \alpha(1 + \tau)^2 \right]}{54d(1 - 2\tau)} \quad (24)$$

¹⁴See Appendix A2.

and depends on the ownership structure of the MNEs (α) and on trade costs (τ).

We can immediately observe that $\delta^*(1, \tau) = 0$, which allows us to state

Proposition 6 *If the two MNEs are fully owned by domestic residents ($\alpha = 1$), the two countries will find it optimal to set their enforcement policies equal to zero, i.e. not to enforce the “arm’s length” principle.*

Indeed, with full domestic ownership, the costs in terms of national welfare to enforce the “arm’s length” principle are maximal and any positive level of δ_i will uniquely have a negative impact due to its implementation cost.

On the contrary, if the two MNEs are fully owned by residents of a third country ($\alpha = 0$), the two countries optimally choose a strictly positive level of enforcement, which is given by

$$\delta^*(0, \tau) = \frac{(5\tau^2 - 2\tau + 2)^2}{54d(1 - 2\tau)},$$

and the effect of a change in trade costs is captured by

$$\frac{\partial \delta^*(0, \tau)}{\partial \tau} = \frac{\tau(4 - 5\tau)(5\tau^2 - 2\tau + 2)}{9d(1 - 2\tau)^2} > 0.$$

The latter implies that trade liberalization decreases the symmetric equilibrium enforcement policy, or equivalently, it reduces the positive effect of increasing δ_i , without affecting its implementation cost. Therefore, with full foreign ownership of the two MNEs, the equilibrium enforcement policy *decreases* with trade costs.

To show that the positive effect of increasing δ_i is decreasing in α , we derive an explicit expression for the impact of increased international ownership (i.e. a lower α) on the equilibrium enforcement policy

$$\frac{\partial \delta^*}{\partial \alpha} = -\frac{(5\tau^2 - 2\tau + 2) [5\tau^2 - 2\tau + 2 + (1 + \tau^2)(1 - 2\alpha)]}{54d(1 - 2\tau)},$$

which turns out to be negative for all possible values of $\alpha \in [0, 1]$ and $\tau \in [0, \frac{1}{2}]$.¹⁵ This implies that an increased economic integration in terms of a larger international ownership of the two MNEs *increases* the equilibrium level of enforcement. Equivalently, this means that δ^* decreases if the domestic ownership share of the two MNEs increases, thereby confirming our previous result that, for $\alpha = 1$, the two countries optimally decide not to enforce the “arm’s length” principle.

Figure 3 illustrates the relationship between trade costs and the equilibrium enforcement policy for different values of α and $d = 1/3$. To explain the asymptotic

¹⁵See Appendix A2.

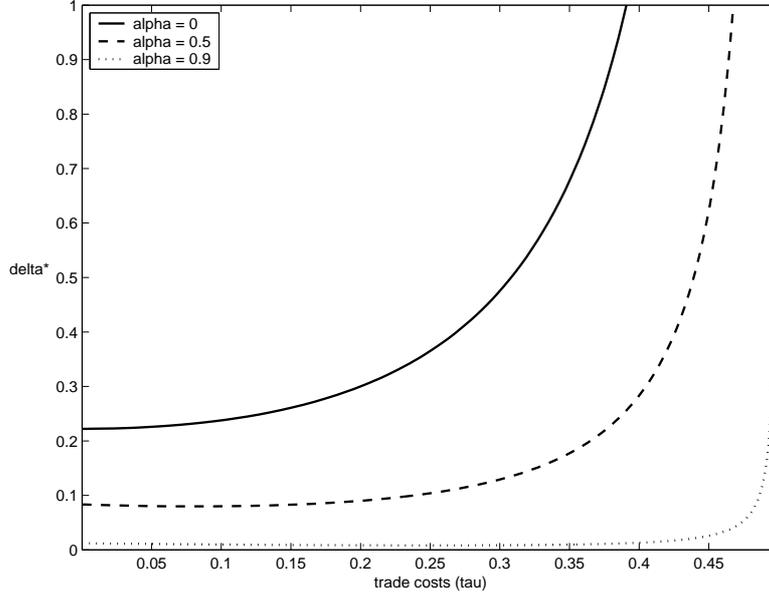


Figure 3: Effects of τ on δ^* for different values of α

behavior of δ^* for high values of τ , note that $\lim_{\tau \rightarrow 1/2} \delta^*(\alpha, \tau) = \infty$. We also know that the level of δ^* is positively related to trade costs when the two MNEs are fully owned by residents of a third country. Figure 3 confirms this positive relationship between δ^* and τ for different ownership structures as well, namely for any possible value of $\alpha \in [0, 1)$.

To conclude, our findings can be summarized as

Proposition 7 *There are two opposite effects of increased economic integration on the symmetric equilibrium level of enforcement of the “arm’s length” principle.*

(i) *Trade liberalization, i.e. a decrease in τ , for given ownership structure of the two MNEs and with the exception of full domestic ownership, decreases δ^* .*

(ii) *A higher international ownership of the two MNEs, i.e. a lower α , for given trade costs, increases δ^* .*

6 Concluding remarks

In this paper we have examined and discussed the outcome of a three-stage game where the governments of two symmetric countries set corporate profit tax rates and the level of enforcement of the “arm’s length” principle in order to maximize national welfare, taking into consideration the strategic choices of two MNEs com-

peting on the quantities in the two markets. Our purpose has been to study how enforcement policies affect the tax competition game between the two governments and to understand in what direction economic integration, described as a reduction in trade costs and/or a larger international ownership of MNEs, influences the symmetric equilibrium levels of the two policy instruments.

In line with Kind et al. (2002), we have found that increased international ownership of MNEs unambiguously leads to *higher* symmetric equilibrium tax rates (Proposition 3), while the effects of trade liberalization depend on the ownership structure of the two MNEs (Proposition 4).

- If the two MNEs are fully owned by residents of a third country, lower trade costs *decrease* the equilibrium tax rate.
- If the two MNEs are entirely owned by domestic residents, a decrease in trade costs *increases* the equilibrium tax rate.
- If the two MNEs are partly owned by foreigners and partly by domestic residents, with the latter holding the majority of shares, trade liberalization *increases* the equilibrium tax rate for sufficiently low levels of trade costs.

Therefore, in our model increased economic integration may lead to *higher* equilibrium tax rates. This conclusion contrasts with the conventional result that, due to a tighter economic integration, tax competition between countries should imply a downward pressure on tax rates.¹⁶

Our model also predicts that, as governments increase the level of enforcement of the “arm’s length” principle to discourage transfer pricing, the equilibrium tax rate *increases* as well (Proposition 2). In particular, in the case of free trade and with full domestic ownership, that is for $\tau = 0$ and $\alpha = 1$, the equilibrium tax rate depends solely on the enforcement policy levels set by the two countries.

Turning to the symmetric equilibrium enforcement policy, we have shown that there are two *opposite* effects of increased economic integration on its level when the two MNEs are not fully owned by domestic residents (Proposition 7).

- On the one hand, trade liberalization *decreases* the equilibrium enforcement policy.
- On the other hand, an increase in the international ownership of the MNEs *increases* the equilibrium enforcement policy.

¹⁶See, e.g., Wilson (1999) for a survey of the tax competition literature.

Furthermore, if the two MNEs are fully owned by domestic residents, the symmetric equilibrium enforcement policy level is equal to zero, implying that it is optimal for both countries not to enforce the “arm’s length” principle (Proposition 6). In such a situation, indeed, any positive level of enforcement will uniquely have a negative impact on national welfare, due to the cost of implementing it.

To sum up, the results we have obtained may be interpreted in the light of two different views of economic integration. Namely, if we look at economic integration just as a matter of higher international ownership of MNEs, our model suggests that, for a given level of trade costs, both the symmetric equilibrium tax rate and enforcement policy should increase. But if we consider economic integration only in terms of trade liberalization, the opposite result holds true, as long as the two MNEs are partly owned by domestic residents and partly by foreigners, with the latter holding the majority of shares.

7 Appendices

A1: Tax competition

Symmetric equilibrium tax rate

To show that the symmetric equilibrium tax rate $t^*(\delta_i, \delta_j, \alpha, \tau)$ is nonnegative for all possible values of $\alpha \in [0, 1]$ and $\tau \in [0, \frac{1}{2})$ as long as $\delta_i, \delta_j \neq 0$, we need to check the sign of the following expression

$$f(\alpha, \tau) \equiv 5\tau^2 - 2\tau + 2 - \alpha(1 + \tau)^2,$$

which is strictly decreasing in α , since $\partial f(\alpha, \tau) / \partial \alpha = -(1 + \tau)^2 < 0, \forall \tau$. Then, we can restrict our attention to the maximum value which α can take, i.e. $\alpha = 1$, which gives

$$f(1, \tau) = (2\tau - 1)^2 > 0, \quad \forall \tau \in \left[0, \frac{1}{2}\right).$$

Therefore, since $f(1, \tau) > 0, \forall \tau$, and $f(\alpha, \tau)$ is strictly decreasing in α , we can conclude that $f(\alpha, \tau) > 0$ for all $\alpha \in [0, 1]$, implying that $t^*(\delta_i, \delta_j, \alpha, \tau)$ is non-negative for all possible values of α and τ .

Effects of trade liberalization: direct vs TP effect

In the case of full domestic ownership ($\alpha = 1$), the direct and the TP effects are given, respectively, by

$$f(\tau) = \frac{(1 - 2\tau)^2}{9}$$

and

$$g(\tau) = -\frac{t^*(\delta_i + \delta_j)(1 - 2\tau)}{6\delta_i\delta_j}.$$

Differentiating $f(\tau)$ with respect to τ , we find that

$$f'(\tau) > 0 \Leftrightarrow \tau > \frac{1}{2}.$$

Hence, $f'(\tau) < 0$, $\forall \tau \in [0, \frac{1}{2})$, meaning that the impact of trade liberalization on the direct effect is positive. On the contrary, differentiating $g(\tau)$ with respect to τ , we find that $g'(\tau) < 0$, $\forall \tau \in [0, \frac{1}{2})$, and this implies that the impact of trade liberalization on the TP effect is negative.

In the case of full third-country ownership ($\alpha = 0$), the TP effect is the same as above, while the direct effect is given by

$$h(\tau) = \frac{(1 - 2\tau)^2}{9} + \frac{(1 + \tau)^2}{9}.$$

Differentiating $h(\tau)$ with respect to τ , we find that

$$h'(\tau) > 0 \Leftrightarrow \tau > \frac{1}{5}.$$

Hence, for $\tau \in [0, \frac{1}{5})$, $h'(\tau) < 0$, meaning that the impact of trade liberalization on the direct effect is positive just for sufficiently low values of trade costs. Indeed, $h'(\tau) > 0$ for $\tau \in (\frac{1}{5}, \frac{1}{2})$, implying that for higher values of trade costs trade liberalization has a negative impact on the direct effect as well.

Proof of Proposition 4

(i) In the case of full domestic ownership ($\alpha = 1$), the effect of a change in trade costs on the symmetric equilibrium tax rate is captured by

$$\frac{\partial t^*(\delta_i, \delta_j, 1, \tau)}{\partial \tau} = -\frac{4\delta_i\delta_j}{3(\delta_i + \delta_j)} < 0,$$

which allows us to conclude that a decrease in τ increases t^* .

(ii) In the case of full third-country ownership ($\alpha = 0$), the effect of a change in trade costs on the symmetric equilibrium tax rate is given by

$$\frac{\partial t^*(\delta_i, \delta_j, 0, \tau)}{\partial \tau} = \frac{4\delta_i\delta_j(1 + 5\tau - 5\tau^2)}{3(\delta_i + \delta_j)(1 - 2\tau)^2} > 0,$$

implying that a decrease in τ decreases t^* .

(iii) and (iv) The sign of $\partial t^*/\partial \tau$ for values of $\alpha \in (0, 1)$ only depends on the sign of the following expression

$$g(\alpha, \tau) \equiv 1 + 5\tau - 5\tau^2 - \alpha(1 + \tau)(2 - \tau).$$

In particular, $g(\alpha, \tau) > 0$ for all values of τ satisfying

$$(5 - \alpha)\tau^2 - (5 - \alpha)\tau + 2\alpha - 1 < 0,$$

that is for all $\tau \in (\hat{\tau}, \tilde{\tau})$, where

$$\hat{\tau} = \frac{1}{2} - \frac{3\sqrt{(5 - \alpha)(1 - \alpha)}}{2(5 - \alpha)}$$

and

$$\tilde{\tau} = \frac{1}{2} + \frac{3\sqrt{(5 - \alpha)(1 - \alpha)}}{2(5 - \alpha)}.$$

Since $\alpha \in [0, 1]$, we can easily check that $\tilde{\tau} \geq \frac{1}{2}$. Moreover, $\hat{\tau} > 0$ as long as $\alpha > \frac{1}{2}$. Therefore, given our assumption about trade costs, we can conclude that

- for $\alpha \leq \frac{1}{2}$, $\hat{\tau} \leq 0$ and $\tilde{\tau} \geq \frac{1}{2}$, implying that $g(\alpha, \tau) > 0$ for all $\tau \in [0, \frac{1}{2}]$; this means that $\partial t^*/\partial \tau > 0$, i.e. trade liberalization leads to a decrease in the symmetric equilibrium tax rate;
- for $\alpha > \frac{1}{2}$, $\hat{\tau} > 0$ and $\tilde{\tau} \geq \frac{1}{2}$; this implies that $g(\alpha, \tau)$ and $\partial t^*/\partial \tau$ are positive for $\tau \in (\hat{\tau}, \frac{1}{2})$, but they are negative for $\tau \in [0, \hat{\tau}]$; thus, if third-country residents hold the majority of shares in the MNEs, the relationship between τ and t^* is non-monotonic; namely, trade liberalization increases the symmetric equilibrium tax rate for sufficiently low values of τ .

A2: Enforcement policy competition

Existence of the symmetric equilibrium in enforcement policies

We first need to show that the objective function of country i (resp., country j) identified in Section 5 is concave in δ_i (resp., δ_j). This amounts to check the sign of the following second derivatives

$$\begin{aligned} \frac{\partial^2 W_i^*}{\partial \delta_i^2} &= -\frac{4(1 - \alpha)(5\tau^2 - 2\tau + 2) \left[5\tau^2 - 2\tau + 2 - \alpha(1 + \tau)^2 \right] \delta_j^2}{27(1 - 2\tau)(\delta_i + \delta_j)^3} - d, \\ \frac{\partial^2 W_j^*}{\partial \delta_j^2} &= -\frac{4(1 - \alpha)(5\tau^2 - 2\tau + 2) \left[5\tau^2 - 2\tau + 2 - \alpha(1 + \tau)^2 \right] \delta_i^2}{27(1 - 2\tau)(\delta_i + \delta_j)^3} - d. \end{aligned}$$

Since $d > 0$ by assumption and we have shown above that the term in square brackets, i.e. $f(\alpha, \tau)$, is always nonnegative, both derivatives turn out to be negative for all possible values of δ_i , δ_j , α and τ . Hence, the objective function of country i (resp., country j) is concave in its own argument.

Now the first-order conditions for the maximization problem of the two governments are given by

$$\begin{cases} \frac{(1-\alpha)(5\tau^2-2\tau+2)}{9} \frac{\partial t^*}{\partial \delta_i} - d\delta_i = 0 \\ \frac{(1-\alpha)(5\tau^2-2\tau+2)}{9} \frac{\partial t^*}{\partial \delta_j} - d\delta_j = 0 \end{cases}$$

where

$$\begin{aligned} \frac{\partial t^*}{\partial \delta_i} &= \frac{2\delta_j^2 \left[5\tau^2 - 2\tau + 2 - \alpha(1+\tau)^2 \right]}{3(\delta_i + \delta_j)^2(1-2\tau)}, \\ \frac{\partial t^*}{\partial \delta_j} &= \frac{2\delta_i^2 \left[5\tau^2 - 2\tau + 2 - \alpha(1+\tau)^2 \right]}{3(\delta_i + \delta_j)^2(1-2\tau)}. \end{aligned}$$

Then, substituting for $\partial t^*/\partial \delta_i$ and $\partial t^*/\partial \delta_j$ and rearranging, we get the following system

$$\begin{cases} \frac{2(1-\alpha)(5\tau^2-2\tau+2)[5\tau^2-2\tau+2-\alpha(1+\tau)^2]}{27d(1-2\tau)(\delta_i+\delta_j)^2} = \frac{\delta_i}{\delta_j^2} \\ \frac{2(1-\alpha)(5\tau^2-2\tau+2)[5\tau^2-2\tau+2-\alpha(1+\tau)^2]}{27d(1-2\tau)(\delta_i+\delta_j)^2} = \frac{\delta_j}{\delta_i^2} \end{cases}$$

which implies

$$\frac{\delta_i}{\delta_j^2} = \frac{\delta_j}{\delta_i^2},$$

so that

$$\delta_i^3 = \delta_j^3 \iff \delta_i = \delta_j,$$

i.e. there exists a symmetric equilibrium $\delta^* \equiv \delta_i = \delta_j$ in transfer pricing enforcement policies.

Effects of international ownership on δ^*

To show the negative relationship between the ownership structure parameter (α) and the equilibrium level of enforcement of the “arm’s length” principle, we need to show that the function

$$h(\alpha, \tau) \equiv 5\tau^2 - 2\tau + 2 + (1 + \tau^2)(1 - 2\alpha)$$

is positive for all admissible values of α and τ . This function turns out to be strictly decreasing in α , since $\partial h(\alpha, \tau)/\partial \alpha = -2\tau^2 - 2 < 0, \forall \tau$. Then, we can restrict our attention to the maximum value which α can take, i.e. $\alpha = 1$, which gives

$$h(1, \tau) = 4\tau^2 - 2\tau + 1 > 0, \quad \forall \tau \in \left[0, \frac{1}{2}\right).$$

Therefore, since $h(1, \tau) > 0$, $\forall \tau$, and $h(\alpha, \tau)$ is strictly decreasing in α , we can conclude that $h(\alpha, \tau) > 0$ for all $\alpha \in [0, 1]$, implying that $\partial \delta^* / \partial \alpha < 0$ for all possible values of α and τ .

References

- [1] Baldwin, R.E., and P. Krugman, 2004, Agglomeration, Integration and Tax Harmonisation, *European Economic Review* 48, 1-23.
- [2] Bartelsman, E.J., and R.M.W.J. Beetsma, 2003, Why Pay More? Corporate Tax Avoidance through Transfer Pricing in OECD Countries, *Journal of Public Economics* 87 (9-10), 2225-2252.
- [3] Clausing, K.A., 2003, Tax-Motivated Transfer Pricing and US Intrafirm Trade Prices, *Journal of Public Economics* 87 (9-10), 2207-2223.
- [4] Elitzur, R., and J. Mintz, 1996, Transfer Pricing Rules and Corporate Tax Competition, *Journal of Public Economics* 60, 401-422.
- [5] Ernst and Young, 2000, *Transfer Pricing at-a-Glance Guide* (Ernst and Young, Rotterdam).
- [6] Grubert, H., T. Goodspeed, and D. Swenson, 1993, Explaining the Low Taxable Income of Foreign-Controlled Companies in the United States, in: A. Giovannini, G. Hubbard, and J.Slemrod, eds., *Studies in International Taxation* (University of Chicago Press, Chicago), 237-270.
- [7] Grubert, H., and J. Mutti, 1991, Taxes, Tariffs and Transfer Pricing in Multinational Corporate Decision Making, *Review of Economics and Statistics* 73 (2), 285-293.
- [8] Harris, D., R. Morck, J. Slemrod, and B. Yeung, 1993, Income Shifting in U.S. Multinational Corporations, in: A. Giovannini, G. Hubbard, and J.Slemrod, eds., *Studies in International Taxation* (University of Chicago Press, Chicago), 277-302.
- [9] Haufler, A., and G. Schjelderup, 2000, Corporate Tax Systems and Cross Country Profit Shifting, *Oxford Economic Papers* 52, 306-325.
- [10] Hines, J.R., 1997, Tax Policy and the Activities of Multinational Corporations, in: A.J. Auerbach, ed., *Fiscal Policy: Lessons from Economic Research* (MIT Press, Cambridge, MA), 401-445.

- [11] Hines, J.R., 1999, Lessons from Behavioral Responses to International Taxation, *National Tax Journal* 52 (2), 305-322.
- [12] Hines, J.R. and E.M. Rice, 1994, Fiscal Paradise: Foreign Tax Havens and American Business, *Quarterly Journal of Economics* 109 (1), 149-182.
- [13] Huizinga, H., and S.B. Nielsen, 1997, Capital Income and Profit Taxation with Foreign Ownership of Firms, *Journal of International Economics* 72, 91-123.
- [14] Jenkins, G.P., and B.D. Wright, 1975, Taxation of Income of Multinational Corporations: the Case of the US Petroleum Industry, *Review of Economics and Statistics* 57 (1), 1-11.
- [15] Kant, C., 1988, Endogenous Transfer Pricing and the Effects of Uncertain Regulation, *Journal of International Economics* 24, 147-157.
- [16] Keen, M., 1993, The Welfare Economics of Tax Co-Ordination in the European Community: A Survey, *Fiscal Studies* 14, 15-36.
- [17] Kind, H.J., K.H. Midelfart Knarvik, and G. Schjelderup, 2001, Corporate Taxation, Multinational Enterprises and Economic Integration, CEPR Discussion Paper No. 2753.
- [18] Kind, H.J., K.H. Midelfart Knarvik, and G. Schjelderup, 2002, Why Corporate Taxes May Rise: the Case of Trade Liberalization and Foreign Ownership, CEPR Discussion Paper No. 3383.
- [19] Kind, H.J., K.H. Midelfart Knarvik, and G. Schjelderup, 2004, Trade and Multinationals: the Effect of Economic Integration on Taxation and Tax Revenue, CEPR Discussion Paper No. 4312.
- [20] Ludema, R.D., and I. Wooton, 2000, Economic Geography and the Fiscal Effects of Regional Integration, *Journal of International Economics* 52, 331-357.
- [21] Mansori, K.S., and A.J. Weichenrieder, 2001, Tax Competition and Transfer Pricing Disputes, *FinanzArchiv* 58 (1), 1-11.
- [22] Markusen, J.R., 2002, *Multinational Firms and the Theory of International Trade* (MIT Press, Cambridge, MA).
- [23] OECD, 1995, *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations* (Paris).

- [24] Peralta, S., X. Wauthy, and T. van Ypersele, 2003, Should Countries Control International Profit Shifting?, CORE Discussion Paper 2003/72.
- [25] Raimondos-Møller, P., and K. Scharf, 2002, Transfer Pricing Rules and Competing Governments, *Oxford Economic Papers* 54, 230-246.
- [26] U.S. Department of the Treasury, 1994, Intercompany Transfer Pricing Regulations under Section 482: Final Regulations, *Federal Register* 59 (130), 34971-35033.
- [27] Wilson, J.D., 1999, Theories of Tax Competition, *National Tax Journal* 52, 269-304.