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LIBERALIZATION AND
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ABSTRACT

Why Corporate Taxes May Rise: The Case of Trade Liberalization and Foreign Ownership*

Almost all the literature on tax competition in the presence of multinationals (MNCs) and profit shifting ignores trade costs. This Paper studies how economic integration, in terms of reduced trade costs and internationalization of ownership, affects tax competition and equilibrium corporate taxes. We find that equilibrium taxes increase subsequent to a reduction of trade costs if MNCs are owned by home country residents and also subsequent to increased internationalisation of ownership.

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1 Introduction

A prominent feature of what is often referred to as globalization is the strong growth of foreign direct investment (FDI) throughout the world with surges in annual growth rates of 25 and 32 percent in the late 80s and 90s. This trend has been accompanied by a rise in trade between affiliates of multinationals located in different countries to the extent that about 33 percent of world trade was intra-firm trade in 1993 (Markusen (2002, ch1)).

The rising importance of multinationals and intra-firm trade in the world economy has at least three implications for the corporate tax base: (1) profits incurred in a given country may not be received by domestic residents; (2) a larger share of corporate income in any given country will stem from activities by affiliates of foreign multinationals; (3) the corporate tax base becomes more sensitive to international differences in tax rates. The first point indicates that globalization entails more international ownership of firms. The second and third points, contrary to popular belief, do not necessarily pertain to the choices made by multinationals as to where they undertake FDI, but to the fact that the sheer volume of intra-firm trade allows multinationals to shift profits to low tax countries by under- or overinvoicing intra-firm transactions. Empirical evidence on the importance of income shifting and transfer pricing is well documented (see e.g. Weichenrieder (1996), Hines (1999), and Gresik (2001)). The problem posed by profit shifting for the fiscal autonomy of countries seemingly depends on the volume of trade and thus trade costs, since a substantial part of intra-firm trade is in goods where arm's length prices are not easily established (see Markusen (2002, ch1)).

There is a literature on tax competition in the presence of multinationals under imperfect competition and transfer pricing. But almost all of this literature ignores trade costs and thus the possibility that economic integration may affect equilibrium corporate tax rates.¹ Mansori and Weichenrieder (2001) and Raimondos-Møller and

¹A second strand of this literature ignores transfer pricing, but analyzes tax competition in the

Scharf (2002) model transfer pricing regulations by two governments and investigate how transfer pricing affects equilibrium tax rates. Elitzur and Mintz (1996) discuss corporate tax competition under alternative transfer pricing rules when transfer pricing affects managerial incentives as well as the overall tax payment. Haufler and Schjelderup (2000) investigate the optimal taxation of corporate profits when governments can choose both the tax rate and the base of the corporate tax, and multinationals shift profits by transfer pricing. Finally, Smart and Mintz (2001) study corporate income taxation when firms operating in multiple jurisdictions can shift income by using financial planning strategies. Most of these papers embed trade explicitly, but none of them incorporates the effect of trade liberalization on the outcome of their analysis.

The purpose of this paper is two-fold: (i) to develop a model of tax competition in the presence of multinationals and transfer pricing where the corporate tax base is partly foreign owned and the tax base endogenously determined by the tax rates set by each government, and (ii) to illustrate the impact on equilibrium taxes of trade liberalization and foreign ownership. We use a two-country model with trade costs, which assumes for simplicity that each country is host to a multinational firm (henceforth MNC) producing a consumer good. The two MNCs serve their home markets, but also export goods to their foreign sales offices unless trade costs are too high. Each government sets taxes so as to maximize national welfare, taking into consideration the strategic choices of the multinationals and their ability to shift profits. We demonstrate that trade liberalization: (1) reduces taxes in the tax competition equilibrium if MNCs are owned by residents of a foreign country, but (2) increases equilibrium taxes if MNCs are owned by home country residents². We moreover show that increased foreign ownership gives higher equilibrium tax rates.

presence of multinationals over a wide range of issues. Papers by Konan (1997), Janeba (1998), and Haufler and Wooton (1999) are a few examples.

²*Home country* refers to the country where the MNC's parent company is located.

2 The modelling framework

The purpose of this paper is to analyze the relationship between economic integration, corporate taxation, and transfer pricing of multinational corporations (MNCs). We therefore abstract from MNCs' localization decisions, i.e. the decision of whether or not to set up an affiliate abroad, and employ a model that has two identical countries, A and B , and two identical multinational companies.³ Multinational company MNC_i has headquarters with production facilities in country i and a sales office in country j ($i \neq j$). Part of the production in country i is sold in country i and the rest is exported to the sales office in country j . Domestic and foreign profits before tax for MNC_i are equal to π_{ii} and π_{ij} , respectively, where the first subscript indicates where the headquarters are located and the second where profits are derived. Aggregate profit before tax for MNC_i is $\pi_i = \pi_{ii} + \pi_{ij}$ ($i, j = A, B, i \neq j$).

The MNCs produce homogenous goods, and face the inverse demand curve

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

where p_i is the price in country i , and x_{ii} and x_{ji} denote quantities supplied by the domestic and foreign MNC, respectively. Without any effect on the main conclusions of this analysis we assume for simplicity that marginal costs of production are equal to zero.

The foreign sales office of each MNC is charged g_i for each unit that it buys from its parent. Since marginal costs are zero, it follows that the transfer price is higher (lower) than true production costs if $g_i > 0$ ($g_i < 0$). In addition to the transfer price, the foreign affiliate must also pay a trade cost $\tau \geq 0$ for each unit it receives from its headquarters. These trade costs include all formal and informal barriers to

³In some industries the long-run localization pattern of multinational companies may partly be determined by tax incentives (e.g. for export-oriented MNCs) and partly by access to specific factors of production. Our focus, however, is on MNCs where the foreign subsidiaries are primarily set up to serve local markets, and we therefore treat the number of MNCs and affiliates in each country as exogenous.

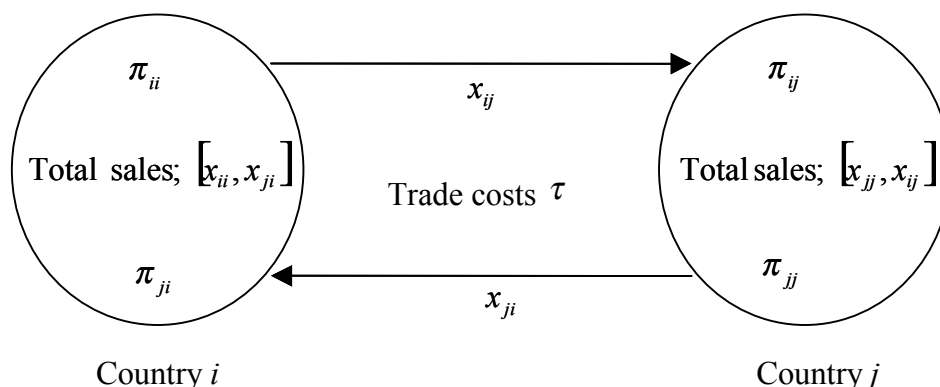


Figure 1: The model

international trade. The model is illustrated in Figure 1.

The transfer price is potentially an instrument that the MNCs can use to shift profit from one country to the other in order to save taxes. It is assumed that the good is specialized, so that the true cost of exporting cannot be directly observed by tax authorities. But, in line with most of the literature on transfer pricing we make the realistic assumption that it is costly to conceal deviations in the transfer price from the true cost of production. More specifically, we assume that the concealment cost function is strictly convex, and equal to $C_i = \delta g_i^2 x_{ij}$ so it is equally expensive to manipulate the transfer price upwards as downwards. This assumption can be interpreted either as an increased probability of detection by the tax authorities (see, e.g. Kant, 1988) or as costs that need to be incurred in order to conceal the true price of the product for example by hiring of lawyers and accountants (see, e.g., Hauffer and Schjelderup, 2000).⁴

We can now express profit before taxes as

$$\pi_{ii} = p_i x_{ii} + g_i x_{ij} - \delta g_i^2 x_{ij}, \quad (2)$$

while the profit level of the foreign plant equals

⁴The latter interpretation implies that tax authorities may not even know that these costs are related to transfer pricing decisions by the multinational.

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

Total profits for MNC_i before taxes are thus

$$\pi_i = \pi_{ii} + \pi_{ij} = p_i x_{ii} - \delta g_i^2 x_{ij} + (p_j - \tau)x_{ij}, \quad (4)$$

and this equation shows that manipulation of the transfer price is intrinsically wasteful.

We assume that the countries use separate accounting as foundation for their corporate tax system, i.e. each country imposes a tax on the profits generated within its borders. The aim of this tax code is to identify the precise receipts and expenditures attributable to the corporation's activities in each jurisdiction. Although repatriated profits in principle are taxed in the country of residence, there is general agreement that due to deferral possibilities and limited tax credit rules, the source principle of taxation is effectively in operation in most OECD countries (Keen, 1993, and Tanzi and Bovenberg, 1990). Taking this into account, global after tax profits of a multinational firm with headquarters in country i are

$$\Pi_i = (1 - t_i)\pi_{ii} + (1 - t_j)\pi_{ij}. \quad (5)$$

We consider a game with two stages. In the first stage the two countries simultaneously set their tax rates, t_A and t_B . In the second stage the headquarters set the transfer prices to their foreign affiliates, and compete á-la Cournot in the two segmented end-user markets.

Stage 2: In the second stage, the multinational firm with its parent company in country i maximizes (5) with respect to x_{ii} , x_{ij} and g_i , taking the quantities supplied by the other multinational firm (i.e., MNC_j) and the tax rates as given. Using equations (1), (2) and (3) we find that differentiating (5) with respect to g_i gives

$$\frac{\partial \pi_i}{\partial g_i} = 0 \implies g_i = \frac{t_j - t_i}{2\delta(1 - t_i)}, \quad (6)$$

which shows that MNC_i wants to underinvoice its exports ($g_i < 0$) and shift profits to country j if $t_i > t_j$. Similarly, an incentive for overinvoicing arises when $t_i < t_j$. We further see that the firm will shift all profits to the low-tax country if it is costless to manipulate the transfer price ($\delta = 0$), whilst it will set the transfer price equal to marginal cost if it is prohibitively costly to manipulate the transfer price ($\delta \rightarrow \infty$), or if $t_i = t_j$ (in which case no profit shifting motive exists). Note that the transfer price is independent of trade cost, τ .

Differentiating (5) with respect to x_{ii} and x_{ij} we obtain the first order conditions for x_{ii} and x_{ij} . Solving this simultaneously for the two MNCs and using (6), allows us to derive the following expressions for home sales and exports:

$$\frac{\partial \pi_i}{\partial x_{ii}} = 0 \implies x_{ii} = \frac{1 + \tau}{3} - \frac{1}{12\delta} \frac{(t_i - t_j)^2}{(1 - t_i)(1 - t_j)}, \quad (7)$$

$$\frac{\partial \pi_i}{\partial x_{ij}} = 0 \implies x_{ij} = \frac{1 - 2\tau}{3} + \frac{1}{6\delta} \frac{(t_i - t_j)^2}{(1 - t_i)(1 - t_j)}. \quad (8)$$

Since the firm can always choose to set $g_i = 0$, the marginal profit of exports for firm i is higher when it can manipulate the transfer price ($\delta < \infty$) as opposed to when it is unable to do so (i.e., when $\delta = \infty$). Thus, when $t_i \neq t_j$, the ability to set $g_i \neq 0$ increases the export incentive and we may state:

Lemma 1: *Suppose that $\delta \in [0, \infty)$ and $t_i \neq t_j$. In this case firm i will set $g_i \neq 0$ and export more than if it is unable to manipulate the transfer price ($g_i = 0$).*

Proof: See the Appendix.

Equations (7) and (8) show that a decrease in trade costs (τ) increases exports and thus import competition. As a result, domestic sales fall and exports rise if trade is liberalized. If it is prohibitively expensive to manipulate the transfer prices

($\delta \rightarrow \infty$) or if the countries levy the same taxes ($t_i = t_j$) equilibrium quantities become⁵

$$x_{ii}^* = \frac{1 + \tau}{3}, \quad \text{and} \quad x_{ij}^* = \frac{1 - 2\tau}{3}, \quad (9)$$

where it is seen that symmetry – denoted by an asterisk – or absence of transfer pricing means that x_{ii}^* and x_{ij}^* are independent of tax rates. As will become clear later, this is a useful property.

Stage 1: At the first stage each government sets its tax rate in order to maximize national welfare, taking the taxes of the other country as given. In order to see how the tax equilibrium is affected by various ownership constellations we define $\alpha \in [0, 1]$ as the share of each multinational that is owned by domestic residents. The residual ($1 - \alpha$) is owned by residents of a third country. Welfare in country i is given by

$$W_i = CS_i + T_i + \alpha\Pi_i. \quad (10)$$

We note that tax income equals $T_i = t_i(\pi_{ii} + \pi_{ji})$ and that $\Pi_i = (1 - t_i)\pi_{ii} + (1 - t_j)\pi_{ij}$, which allows us to rewrite the expression for welfare as

$$W_i = CS_i + \underbrace{\alpha(\pi_{ii} + \pi_{ij})}_{\text{(I)}} - \underbrace{\alpha t_j \pi_{ij}}_{\text{(II)}} + \underbrace{t_i \pi_{ji} + (1 - \alpha)t_i \pi_{ii}}_{\text{(III)}}. \quad (11)$$

In equation (11) we have in addition to the consumer surplus (CS_i) identified three effects; (I) *the profit ownership effect*; (II) *the foreign tax exporting effect*, and (III) *the home tax exporting effect*. The profit ownership effect shows that welfare in country i depends positively on the size of the profits of the local multinational (i.e., MNC_i) and the share of these profits owned by country i residents. The foreign tax exporting effect portrays that the foreign country has the ability to tax profits by MNC_i occurring in country j (by taxing its foreign affiliate), thus reducing the amount available to country i residents. The foreign tax exporting effect is

⁵Notice that there will be no trade if $\tau \geq 1/2$.

detrimental to welfare in country i , and is more severe the larger the share of MNC_i that is owned by domestic residents. The home tax exporting effect has a positive impact on welfare and indicates how country i can shift the burden of taxation onto foreigners through two channels. This can be done by taxing the foreign affiliate located in country i , and by taxing profits of the MNC that is owned by third country residents $((1 - \alpha) t_i \pi_{ii})$.

In the symmetric equilibrium we have that $\partial x_{ii}^*/\partial t_i|_{t_i=t_j} = \partial x_{ji}^*/\partial t_i|_{t_i=t_j} = 0$. Thus, a small increase in the tax rates from a symmetric equilibrium will not have any effect on supplied quantities, and thereby no effect on consumer surplus. Hence, taxation only affects welfare through (I)-(III). From (11) it is apparent that the relative magnitudes of the three terms depend on the ownership structure (α). If MNC_i is entirely owned by domestic residents ($\alpha = 1$), national welfare depends on MNC_i 's profits, the foreign tax exporting effect, and the taxing of the foreign affiliate of MNC_j . In contrast, if MNC_i is entirely owned by third country residents ($\alpha = 0$), terms (I) and (II) vanish, and the effect of tax policy on welfare is entirely determined by the degree to which the government can tax the foreign affiliate of MNC_j and third country shareholders in MNC_i (i.e., effect (III)).

The government in country i maximizes (11) with respect to t_i , taking t_j as given. In the appendix we show that in the symmetric equilibrium $\partial \pi_{ii}^*/\partial t_i = -\partial \pi_{ij}^*/\partial t_i$. This result implies that the impact of taxes on term (I) is zero. Invoking symmetry conditions on the first order conditions and defining $t^* \equiv t_A^* = t_B^*$ in the symmetric equilibrium, the solution to the government's maximization problem gives equilibrium tax rate

$$t^* = \delta \frac{(2 - 2\tau + 5\tau^2) - \alpha(1 + \tau)^2}{(2 - 2\tau + 5\tau^2)\delta + 3 - 6\tau - \delta\alpha(1 + \tau)^2}. \quad (12)$$

Equation (12) provides us with a useful starting point for a discussion on how tighter economic integration affects tax policy.

3 Economic integration and tax policy

The concept of tighter economic integration can be given several interpretations within the framework of the model. One possible interpretation is that it encompasses an increased mobility of national tax bases that makes it less expensive for the multinationals to shift profits to low tax countries (a fall in δ). A perhaps more immediate interpretation is to view economic integration as an increase in the international ownership of the firms. In our model this is captured by an increase in the ownership share that foreigners in a third country hold in the domestic MNC (i.e., a reduction in α). Finally, economic integration may be interpreted as trade liberalization (a reduction in τ). In what follows we will discuss how these three effects of economic integration influence the equilibrium tax rate.

3.1 Increased mobility of the tax base

It is by no means obvious that economic integration should imply that it becomes more easy for multinationals to shift profits. An alternative interpretation may be that governments become better at preventing transfer pricing. In this section, however, we shall interpret economic integration as an increase in the mobility of the corporate tax base in the sense that it lowers the cost (δ) of shifting profits between countries. Such an interpretation is in line with the tax competition literature, which assumes that as countries become more integrated, capital becomes more mobile and it becomes harder to tax capital due to compliance problems (see e.g. Wilson (1999)). One could also see the case for more profit shifting simply as a result of the substantial growth in FDI, intra-firm trade, and affiliate activity the last two decades (Markusen (2002)).

The effect on the equilibrium tax rate from changes in the cost of profit shifting can be derived from (12) as

$$\lim_{\delta \rightarrow 0} t^* = 0 \quad \text{and} \quad \lim_{\delta \rightarrow \infty} t^* = 1. \quad (13)$$

Equation (13) shows that the equilibrium tax rate is equal to zero if firms can costlessly manipulate the transfer price, while the tax rate is equal to 100 percent if it is prohibitively expensive for the MNCs to shift profits. Furthermore, from (12) we have:

$$\frac{dt^*}{d\delta} > 0 \quad \text{for} \quad t^* \in (0, 1), \quad (14)$$

which allows us to state:

Proposition 1: *Other things equal, the equilibrium tax rate is reduced if economic integration implies more profit shifting.*

This result is in line with the basic message from the tax competition literature, which states that as capital becomes mobile internationally and countries compete to attract mobile capital, taxes on mobile factors will fall.⁶

3.2 Increased foreign ownership

In order to analyze how an increase in the foreign ownership of firms ($d\alpha < 0$) affects the equilibrium tax rate, we differentiate equation (12) with respect to α ,

$$\frac{dt^*}{-d\alpha} = -\frac{3\delta(1-2\tau)(1+\tau)^2}{\left((2-2\tau+5\tau^2)\delta+3-6\tau-\delta\alpha(1+\tau)^2\right)^2} > 0.$$

Thus:

Proposition 2: *Other things equal, the equilibrium tax rate increases if economic integration leads to higher foreign ownership of firms.*

The intuition for Proposition 2 is that the larger the share of the corporate tax base owned by residents of a third country, the greater is the share of the tax burden that can be shifted onto foreigners. Put differently, the more important the home tax exporting effect (III), the stronger is the incentive to raise the tax rate. Proposition 2 has a parallel in Huizinga and Nielsen (1997) who show that if economic integration

⁶For a survey of the tax competition literature, see Wilson (1999).

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 study, however, does not model trade, transfer pricing, or the behavior of multinationals. Proposition 2, therefore, indicates that the impact on tax rates of the home tax exporting effect is quite robust to modelling assumptions.

3.3 Trade liberalization

In order to investigate how the equilibrium tax rate is affected by trade liberalization it is convenient first to consider two special cases; one where MNC_i is fully owned by residents of country i and one where both multinationals are owned by residents of a third country.

Domestic ownership ($\alpha = 1$) We start by analyzing the case when MNC_i is fully owned by residents of country i ($\alpha = 1$) in which case welfare - as before - can be written as the sum of CS plus effects (I), (II), and (III) as follows,

$$W_i = CS_i + \underbrace{(\pi_{ii} + \pi_{ij})}_{(I)} - \underbrace{t_j \pi_{ij}}_{(II)} + \underbrace{t_i \pi_{ji}}_{(III)} \quad (15)$$

Recall that in the symmetric equilibrium CS_i^* is independent of taxes, and the net impact of taxes on the term (I) is zero. Differentiating equation (15) with respect to t_i yields

$$\frac{\partial W_i^*}{\partial t_i} = \underbrace{t^* x_{ij}^* \frac{\partial g_i^*}{\partial t_i}}_{\partial(\text{II})/\partial t_i} - \underbrace{\left[t^* x_{ji}^* \frac{\partial g_j^*}{\partial t_i} - \pi_{ji}^* \right]}_{\partial(\text{III})/\partial t_i} = 0. \quad (16)$$

Before we discuss (16), it is useful to keep in mind that an increase in t_i induces MNC_i and MNC_j to shift profits to country j by under and overinvoicing exports respectively. The first term in (16) shows that a higher t_i induces MNC_i to reduce its transfer price by $\partial g_i^*/\partial t_i$ per unit that it exports to its affiliate in country j . The effect is to increase π_{ij}^* , thus allowing the foreign country to export more of its taxes

to residents of country i . The last term in (16) is the change in country i 's ability to shift tax burdens onto foreigners and consists of two effects: (a) the rise in t_i induces the foreign MNC_j to increase its transfer price by $\partial g_j^*/\partial t_i > 0$ per unit on the goods it exports to its affiliate in country i . This lowers π_{ji}^* and reduces the scope for taxing foreigners. (b) a higher tax rate in country i - for constant transfer price - allows country i to tax profits derived by foreigners harder, thus increasing welfare. To sum up, the profit shifting effect following an increase in t_i has a detrimental impact on welfare in country i , while the direct effect on tax revenue has a positive welfare effect. By substituting the equilibrium values of $\partial g_i^*/\partial t_i^*$ and $\partial g_j^*/\partial t_i^*$ and using symmetry ($t_i^* = t^*$) in (16) we can express the welfare effects more explicitly as

$$\frac{\partial W_i^*}{\partial t_i} = - \underbrace{\left(\frac{1-2\tau}{3}\right) \left(\frac{1}{\delta(1-t^*)}\right)}_{\text{profit shifting}} + \underbrace{\left(\frac{1-2\tau}{3}\right)^2}_{\text{direct revenue effect}} = 0. \quad (17)$$

In equation (17) we have grouped the detrimental effects of profit shifting on welfare in the first term, and the direct effects on tax revenue from levying a higher tax on foreigners in the second term. From the first term of (17) we see that a reduction in trade costs increases the amount of profits shifted away from country i . This reduces the scope for home tax exporting, and increases tax exporting by the foreign country. The second term reflects the fact that trade liberalization increases the foreign affiliate's market share and thus its profits in country i , thereby allowing country i to export more of its tax burden to the foreign firm. Intuitively, since the profit shifting implies a loss of tax base it suggests that t^* is decreasing when trade costs (τ) fall, while the direct revenue effect points to a benefit of raising t^* when trade is liberalized. From (17) we derive explicit expressions for the equilibrium tax rate and the impact of trade liberalization:

$$t^*|_{\alpha=1} = \delta \frac{1-2\tau}{3 + \delta(1-2\tau)}, \quad \text{and} \quad \frac{dt^*|_{\alpha=1}}{d\tau} = -6 \frac{\delta}{[3 + \delta(1-2\tau)]^2} < 0 \quad (18)$$

which allows us to state:

Proposition 3: *The equilibrium tax rate rises subsequent to trade liberalization*

if MNC_A and MNC_B are fully owned by residents of country A and B , respectively.

The reason for the rise in equilibrium tax rates is that the direct revenue effect dominates the profit shifting effect. From (18) it can further be seen that as trade costs (τ) go to zero and the maximum tax level is reached, the equilibrium tax rate is a function of the mobility of the tax base (δ) only, that is, $t^* = \delta/(3 + \delta)$. Hence, the more mobile the tax base (i.e., the lower is δ), the lower is the equilibrium tax rate.

Foreign ownership ($\alpha = 0$) When the multinationals are owned by residents of a third country, welfare in country i is given by

$$W_i = CS_i + \underbrace{t_i \pi_{ji} + t_i \pi_{ii}}_{(III)}. \quad (19)$$

It is useful to note that in this case corporate income is fully received by foreigners so only the home tax exporting effect remains. This effect is now made up by profits of the foreign affiliate of MNC_j located in country i , and the parent company of MNC_i . Since all corporate income derived in country i is earned by foreigners, the tax exporting incentive suggests that a tax rate of 100 percent should be applied. However, such a rate would trigger transfer pricing and thus a reduction in π_{ji}^* and π_{ii}^* . Country i must therefore balance the incentive to shift taxes onto foreigners against a potential loss of tax revenue from profit shifting. Differentiating equation (19) gives

$$\frac{\partial W_i^*}{\partial t_i} = \underbrace{-t^* x_{ji}^* \frac{\partial g_j^*}{\partial t_i} + t^* x_{ij}^* \frac{\partial g_i^*}{\partial t_i}}_{\partial(III)/\partial t_i} + \pi_{ji}^* + \pi_{ii}^* = 0 \quad (20)$$

There are four terms in (20). The two last terms reflect the direct tax revenue effect of raising the tax rate, while the two first terms are the change in taxable profits due to profit shifting. In order to see how these effects depend on trade

liberalization we substitute and obtain,

$$\frac{\partial W_i^*}{\partial t_i} = - \underbrace{\left(\frac{1-2\tau}{3}\right) \left(\frac{1}{\delta(1-t^*)}\right)}_{\text{profit shifting}} + \underbrace{\left(\frac{1-2\tau}{3}\right)^2 + \left(\frac{1+\tau}{3}\right)^2}_{\text{direct revenue effect}} = 0. \quad (21)$$

The first term is the effect of profit shifting on tax revenue. As before, it is negative, indicating that as trade is liberalized, more profits will be shifted following a tax increase. The direct revenue effect is in turn made up of two terms, which reflects that trade liberalization increases the market share of the foreign affiliate (π_{ji}^*) and reduces the market share of the domestically based MNC_i (π_{ii}^*). The total effect on tax revenue is negative, since allowing trade implies that the monopoly profits of MNC_i are replaced by duopoly profits. Taken together, both effects – the profits and the direct revenue effect – therefore suggest that tax rates should fall in equilibrium if trade is liberalized. This is confirmed by solving (21) with respect to the equilibrium tax rate,

$$\begin{aligned} t^*|_{\alpha=0} &= \delta \frac{2 - \tau(2 - 5\tau)}{(2 - 2\tau + 5\tau^2)\delta + 3 - 6\tau}, \\ &\text{and} \\ \frac{d t^*|_{\alpha=0}}{d\tau} &= 6\delta \frac{1 + 5\tau(1 - \tau)}{[(2 - 2\tau + 5\tau^2)\delta + 3 - 6\tau]^2} > 0. \end{aligned} \quad (22)$$

We have:

Proposition 4: *The equilibrium tax rate falls subsequent to trade liberalization if the multinationals are fully owned by residents of a third country.*

Figure 1 provides a numerical example (with $\delta = 10$) to illustrate Propositions 2 - 4. The upward-sloping curve labelled $\alpha = 0$ illustrates how the tax rate declines as trade is liberalized when both multinationals are owned by residents of a third country (cf. proposition 4). As stated above, it conveys that trade liberalization will reduce the tax base due to import competition and transfer pricing. The downward-sloping curve $\alpha = 1$ illustrates proposition 3. It reflects the fact that when MNC_i is

fully owned by domestic residents, trade liberalization increases the equilibrium tax rate since it enhances the profits earned by the foreign MNC_j in country i , and thus the tax base of country i . Finally, we see that taxes are highest when multinationals are owned by residents of a third country (i.e., a move from $\alpha = 1$ to $\alpha = 0$ - cf. Proposition 2). The reason is that the motive for tax exporting is strongest in this case.

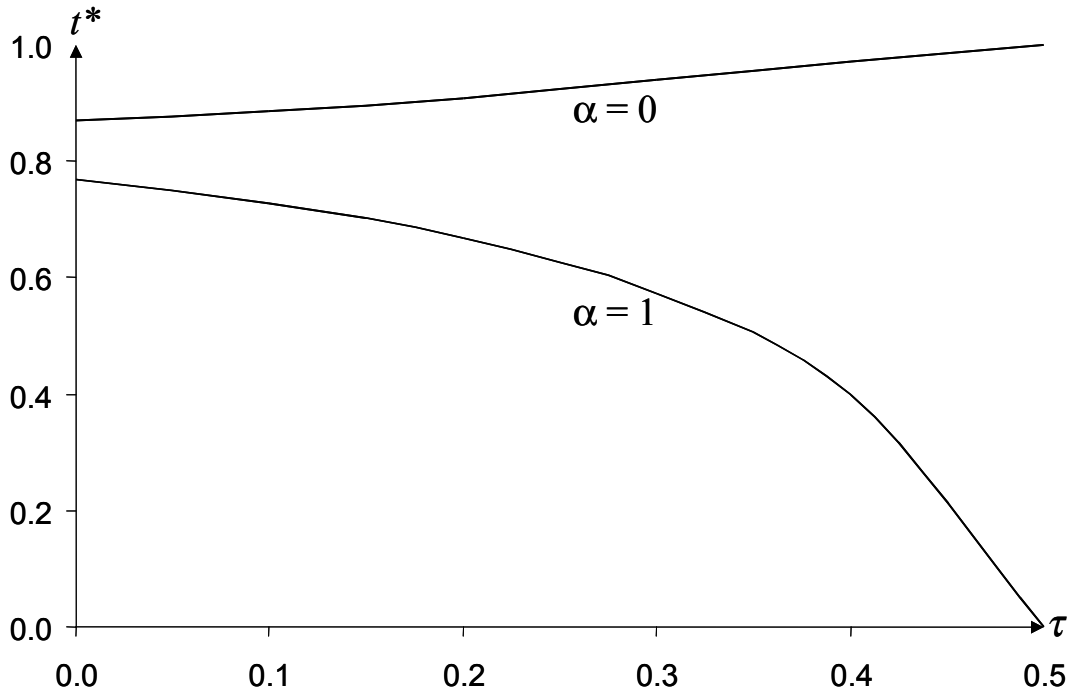


Figure 1: Trade liberalization and its effect on the equilibrium corporate tax t^*

Figure 1 does not tell us anything about the relationship between trade liberalization and equilibrium taxes for $\alpha \in (0, 1)$, since trade liberalization increases the tax rate when $\alpha = 1$ and decreases the tax rate when $\alpha = 0$. To examine the relationship between τ and t^* for $\alpha \in (0, 1)$, notice from equation (18) that $\alpha = 1$ and prohibitively high trade costs ($\tau = 1/2$) give rise to a zero tax rate ($t^* = 0$). Suppose now that a tiny part of both multinationals are owned by third country residents and that we are in autarchy ($\tau = 1/2$). In this case any positive tax rate is a pure tax on foreigners, since there is no profit shifting or import competition. It is therefore optimal to set $t^* = 1$ due to the tax exporting motive. If τ is somewhat

lower than $1/2$ the benefit of a high tax rate ($t^* = 1$) still outweighs the costs, since import competition and profit shifting are negligible. However, as trade costs fall, the tax base becomes more sensitive to tax changes as the scope for profit shifting through transfer pricing increases, and the cost of taxation rises. A reduction of τ , therefore, reduces the equilibrium tax rate in the neighborhood of $\tau = 1/2$ for all $\alpha \in [0, 1)$. This is shown for $\alpha = 0.1$ and $\alpha = 0.9$ in Figure 2.

From Proposition 3 and $\alpha = 1$ we know that the equilibrium tax rate is higher the lower are trade costs, while the opposite is true from Proposition 4 and $\alpha = 0$. Intuitively, for the case $\alpha \in (0, 1)$ one would therefore expect that the equilibrium tax rate should fall as trade is liberalized for low values of α (close to zero). For high values of α (close to unity) one would expect the tax rate to increase as τ approaches zero. In particular, we can state:

Proposition 5: *Trade liberalization increases the equilibrium tax rate for sufficiently low levels of trade costs if $\alpha > 1/2$, otherwise trade liberalization reduces the tax rate.*

Proof: See the Appendix.

Figure 2 illustrates our findings in Proposition 5 for $\alpha = 0.9$. It shows a U-shaped relationship between t^* and τ ; a small reduction of trade costs reduces the tax rate if trade costs are initially high, but the tax rate rises again if trade is sufficiently liberalized. For low values of α , on the other hand, t^* will monotonically fall as trade is liberalized (since the benefits of a high tax rate are then highest when trade is expensive). The latter point is illustrated by the curve $\alpha = 0.1$.

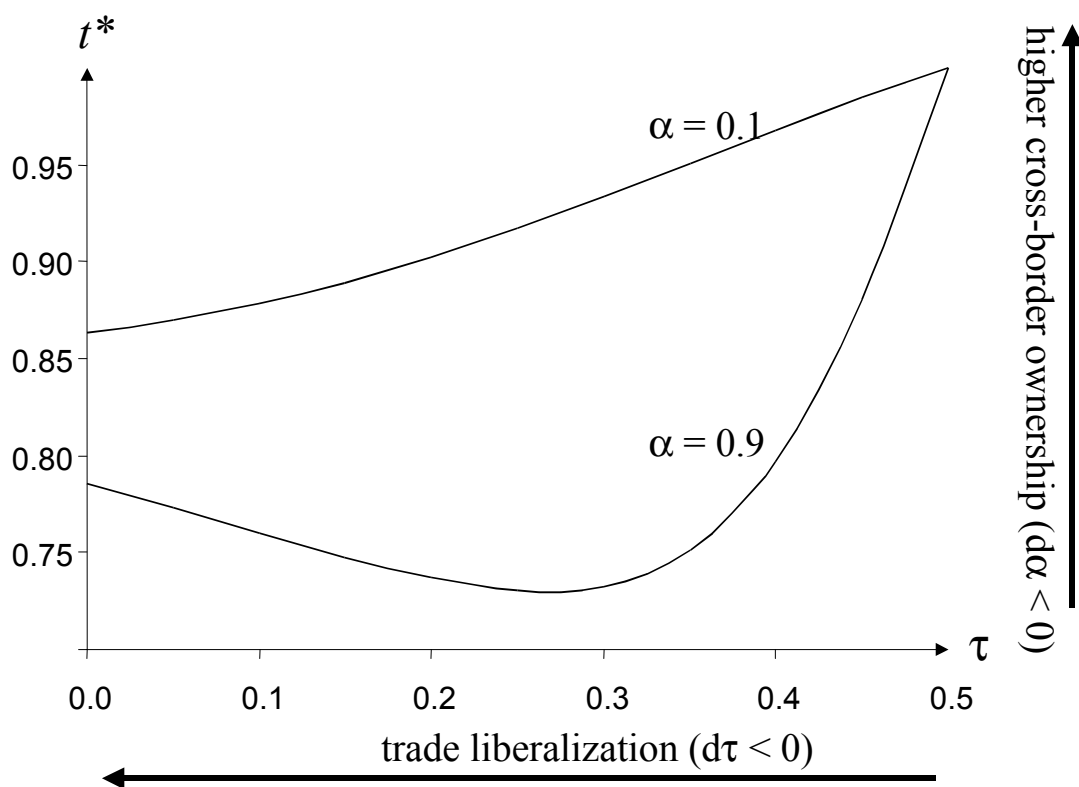


Figure 2: Consequences of trade liberalization for different values of α .

4 International cross-ownership

The discussion above suggests that economic integration may lead to higher or lower tax rates in the tax equilibrium depending on who owns the corporate tax base. To explore the impact of different ownership structures further, and test the robustness of our results, we consider a different ownership structure which allows cross-ownership in the sense that consumers in country i own a share β of MNC_i and a share $(1 - \beta)$ of MNC_j . Likewise, consumers in country j own a share β of MNC_j and a share $(1 - \beta)$ of MNC_i . The welfare function of country i can be expressed by

$$W_i = CS_i + (\pi_{ii} + \pi_{ij}) - \beta t_j \pi_{ij} + (1 - \beta) t_i \pi_{ii} - (1 - \beta) t_j \pi_{jj} + \beta t_i \pi_{ji}. \quad (23)$$

As before, the welfare function contains a tax base term and home and foreign tax exporting terms. It is straightforward to derive the equilibrium tax rate as

$$t^* = \delta \frac{(1 + \tau)^2 - (6 - 3\tau)\beta\tau}{(1 + \tau)^2\delta + 3 - 6\tau - (6 - 3\tau)\delta\beta\tau} \quad (24)$$

Again we can illustrate how the equilibrium tax rate is affected by changes in ownership structure and trade costs. This is done in Figure 3. It shows that increased international cross-ownership, implying that residents of country i increase their share in MNC_j while residents in country j increase their share in MNC_i , portrays the same relationship between taxes and trade costs as increased foreign ownership by third country residents in the previous section. However, there is one notable exception: with free trade ($\tau = 0$) the degree of foreign ownership, which was decisive for the equilibrium tax rate in the previous section, does not matter any more: the equilibrium tax rate is $t^* = \delta/(3 + \delta)$ and thus identical to the equilibrium tax rate when $\alpha = 1$. Free trade means that each multinational's foreign affiliate contributes just as much to tax revenue as the parent firm of the local MNC. Free trade moreover implies that whether residents of a country own 50 percent of each MNC, or 100 percent of one and zero of the other, is irrelevant for their income.

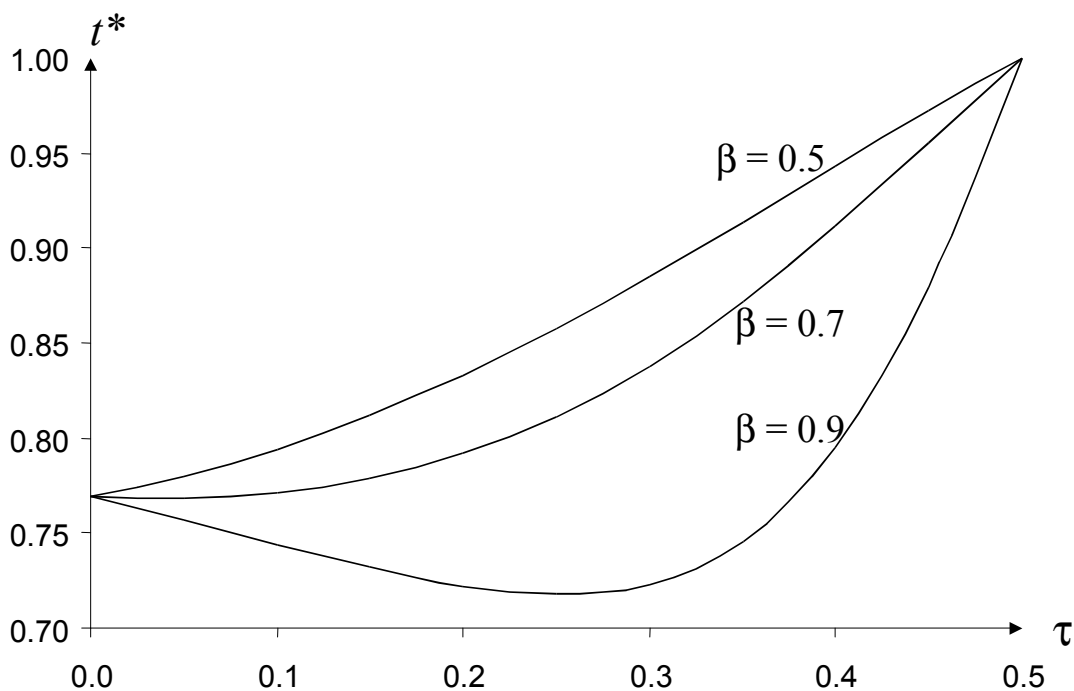


Figure 3: International cross ownership.

5 Concluding remarks

In this paper we have analyzed the outcome of corporate tax competition when governments set taxes to maximize national welfare, taking into consideration the strategic choices of the multinational firms. The aim has been to investigate how economic integration, described as increased trade and international ownership, affects equilibrium tax rates. We find that increased international ownership unambiguously leads to higher taxes, while the effect on trade liberalization depends on how ownership is structured. Three results emerge: (1) If MNCs are owned by residents of a foreign country, trade liberalization reduces equilibrium taxes; (2) if MNCs are owned by home country residents, trade liberalization increases equilibrium taxes; (3) if MNCs are partly owned by foreigners and partly by home country residents – with the latter group holding the majority of shares – trade liberalization increases the equilibrium tax rate for sufficiently low levels of trade costs.

Our results have a profound implication for one's view on the outcome of competition over corporate income. In the tax competition literature the main message is that tax competition will lead to a downward pressure on capital tax rates (see Wilson (1999) for a survey). Our analysis predicts that the rising importance of multinationals combined with increased foreign ownership of firms, may dampen and even give rise to higher tax rates as economic integration proceeds. If anything, empirical results give some support to this conclusion in the sense that corporate tax revenues have been stable over the years both as a share of GDP and as a share of total tax revenue (see Chennels and Griffith (1997) and Bond and Chennels (2000)).

One feature that our model does not encompass is the competition among countries to attract FDI. Intuitively, this effect should be qualitatively similar to the profit shifting effect in that it leads to a downward pressure on tax rates. Whether the inclusion of this effect within a similar model framework would change our results is a task for future research.

6 Appendix

Proof of Lemma 1

The first order conditions for MNC_i are

$$\frac{\partial \pi_i}{\partial x_{ii}} = 1 - 2x_{ii} - x_{ji} = 0, \quad (25)$$

$$\frac{\partial \pi_i}{\partial x_{ij}} = (1 - t_i)(g_i - \delta g_i^2) + (1 - t_j)(1 - 2x_{ij} - x_{jj} - \tau - g_i) = 0. \quad (26)$$

Suppose that $t_i \neq t_j$. By using equation (6) for g_i we can then express the latter first-order condition as

$$\frac{\partial \pi_i}{\partial x_{ij}} = (1 - t_i) \left(\frac{t_j - t_i}{2\delta(1 - t_i)} - \delta \left(\frac{t_j - t_i}{2\delta(1 - t_i)} \right)^2 \right) + (1 - t_j) \left(1 - 2x_{ij} - x_{jj} - \tau - \frac{t_j - t_i}{2\delta(1 - t_i)} \right). \quad (27)$$

If the firm is unable to manipulate the transfer price we know from equation (26) that $1 - 2x_{ij}^* - x_{jj}^* - \tau = 0$. Inserting this into (26) we have

$$\frac{\partial \pi_i}{\partial x_{ij}} = \frac{1(t_j - t_i)^2}{4\delta(1 - t_i)} > 0 \text{ for } t_i \neq t_j \text{ and } \delta < \infty.$$

The firm will choose to increase x_{ij} until the marginal profit of export is equal to zero, from which it follows that $x_{ij} > x_{ij}^*$ if $t_i \neq t_j$ and $\delta < \infty$. Q.E.D.

Steps in deriving the equilibrium tax rate

$$\begin{aligned} \frac{\partial \pi_{ii}}{\partial t_i} &= 2x_{ii} \frac{\partial x_{ii}}{\partial t_i} + (g_i - \delta g_i^2) \frac{\partial x_{ij}}{\partial t_i} + (x_{ij} - 2\delta g_i x_{ij}) \frac{\partial g_i}{\partial t_i} \\ \frac{\partial \pi_{ji}}{\partial t_i} &= x_{ji} \left(-\frac{1}{2} \frac{\partial x_{ji}}{\partial t_i} - \frac{\partial g_j}{\partial t_i} \right) + (p_i - \tau - g_j) \frac{\partial x_{ji}}{\partial t_i}. \end{aligned} \quad (28)$$

In a symmetric equilibrium we have $t^* \equiv t_A^* = t_B^*$, in which case it is optimal for the firms to set transfer prices equal to zero (i.e., $g_A^* = g_B^* = 0$). By differentiating equations (7) and (8) with respect to t_i we find that $\partial x_{ii}^*/\partial t_i|_{t_i=t_j} = \partial x_{ji}^*/\partial t_i|_{t_i=t_j} = 0$. This is due to the envelope theorem: domestic sales and exports are independent of the actual tax rates if $t_i = t_j$. Thus, a small increase in one of the tax rates from a symmetric equilibrium will not have any effect on the supplied quantities.⁷ The changes in the profits of the domestic and foreign MNCs when t_i increases are

$$\frac{\partial \pi_{ii}^*}{\partial t_i} = x_{ij}^* \frac{\partial g_i^*}{\partial t_i} = -\left(\frac{1-2\tau}{3}\right) \left(\frac{1}{2\delta(1-t^*)}\right) < 0 \quad (29)$$

$$\frac{\partial \pi_{ji}^*}{\partial t_i} = -x_{ji}^* \frac{\partial g_j^*}{\partial t_i} = -\left(\frac{1-2\tau}{3}\right) \left(\frac{1}{2\delta(1-t^*)}\right) < 0. \quad (30)$$

Proof that trade liberalization may increase the equilibrium tax rate if $\alpha \in (0, 1)$

By differentiating equation (12) with respect to τ we find

$$\frac{\partial t^*}{\partial \tau} = -\frac{6\delta(\tau+1)(2-\tau)}{\underbrace{\left((2-2\tau+5\tau^2)\delta+3-6\tau-\delta\alpha(1+\tau)^2\right)^2}_{<0}} (\alpha - \hat{\alpha}),$$

⁷Differentiating, we find $\partial x_{ii}/\partial t_i = -(t_i - t_j)(2 - t_i - t_j) / [12\delta(1 - t_i)^2(1 - t_j)]$ and $\partial x_{ij}/\partial t_i = \partial x_{ji}/\partial t_i = (t_i - t_j)(2 - t_i - t_j) / [6\delta(1 - t_i)^2(1 - t_j)]$.

where $\hat{\alpha} \equiv (1 + 5\tau - 5\tau^2) / ((\tau + 1)(2 - \tau))$. Since $\tau \leq 1/2$ we thus see that trade liberalization ($d\tau < 0$) increases the equilibrium tax rate if $\alpha > \hat{\alpha}$. $\hat{\alpha}$ is decreasing in τ , is equal to $1/2$ if $\tau = 0$, and is equal to 1 if $\tau = 1$. The term $(\alpha - \hat{\alpha})$ must therefore always be negative for $\alpha < 1/2$, meaning that trade liberalization unambiguously reduces the equilibrium tax rate.

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