Tax Competition for International Producers and the Mode of Foreign Market Entry[f]

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Abstract: This paper studies non-cooperative tax competition between two countries for an international producer. The international producer chooses where to locate its headquarters and whether to serve the overseas market through exports or foreign direct investment (FDI). We show that, in the absence of tax competition, the international firm may choose FDI even though this has welfare costs from a global point of view. With tax competition, the host country can use its tax rate to enforce exporting instead of FDI, thereby leading to a Nash equilibrium in the tax setting game which is associated with higher world welfare than the no-tax situation. Thus, because of the effect on entry mode, tax competition provides heretofore unexplored benefits.

Key Words: Tax competition; Multinational enterprises; Profit taxation; Double taxation relief

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1. Introduction

In the literature on multinational enterprises (MNEs), increasing focus has been given to modeling the endogenous choice of firm structure.[1] When servicing an overseas market, a firm can either export from its parent country or establish a subsidiary abroad through foreign direct investment (FDI). The key trade-off between these two options is the "proximity-concentration trade-off", that is, balancing the reduction in transport costs from replacing exports with FDI against the additional fixed costs of establishing the overseas subsidiary.[2] Despite the central role this choice plays in the FDI literature, it is missing from the literature on tax competition.

This paper fills the existing gap by analyzing tax competition between countries for a mobile firm that chooses both the location of its headquarters and its market entry mode (as a single-plant exporter or as a multi-plant MNE). In doing so, we show that tax competition provides a heretofore unrecognized benefit because it can induce the world welfare-maximizing entry mode even when this does not arise in a no-tax equilibrium. Furthermore, we are able to separate tax incentives into those used to attract a firm's headquarters and those used to manipulate its entry mode. Finally, we show that since the firm's entry decision depends on the proximity-concentration trade-off, so too do equilibrium taxes. Thus, equilibrium taxes depend on transport costs and the costs of establishing an overseas subsidiary. Standard models of tax competition treat the entry mode as exogenous and often neglect the impact of national policies on headquarters location. Therefore, they are unable to consider these issues.

[1] A handful of examples include Markusen and Venables (2000), Helpman, Melitz, and Yeaple (2004), Eicher and Kang (2005), and Bergstrand and Egger (2006). See Markusen (2002) for a more comprehensive review of this literature.

[2] Evidence by Brainard (1997), Blonigen (2002), Helpman, Melitz, and Yeaple (2004) and others gives support for this trade-off. See Blonigen (2005) for a recent survey of the empirical literature on FDI.

Locational competition through national tax policies has long been an issue for policy makers. Sinn (2003, p. 2) points to an increasing interest among firms in transferring "their operations to countries with low wages and low taxes to hold their own in the increasingly intensive international product and cost competition". In recognition of this, at the 2000 European Council meeting in Lisbon, the EU member countries agreed to measure competitiveness using a benchmark method that includes taxation as a key factor. Beyond the distributional consequences of locational competition, there is also a wide-spread concern that uncoordinated tax policies have detrimental welfare effects from a global point of view. Such concerns prompted the OECD (1998, p. 14) to warn that globalization has "the negative effects of opening up new ways by which companies and individuals can minimize and avoid taxes and in which countries can exploit these new opportunities by developing tax policies aimed primarily at diverting financial and other geographically mobile capital. These actions induce potential distortions in the patterns of trade and investment and reduce global welfare."

This attention in policy circles has been matched by attention from researchers. Beginning with the seminal work of Wilson (1986) and Zodrow and Mieszkowski (1986), the open economy public finance literature has analyzed the cases in which strategic tax competition impacts both the international allocation of capital and the efficiency of taxation. The standard result in these models is that tax competition triggers a race to the bottom as governments lower tax rates to attract mobile capital.[3] This leads to inefficiently low tax revenues (and eventually to an underprovision of public goods), even if the distribution of capital across countries is unchanged. As a consequence,

[3] See Wilson (1999) and Gresik (2001) for surveys of this literature.

international coordination of national tax policies becomes attractive from an integrated point of view.

A key assumption in the traditional public finance literature is that one of perfectly competitive markets (cf. Bucovetsky, 1991, Wilson, 1991 and Kanbur and Keen, 1993). This renders the traditional literature different from more recent theoretical contributions, which address the issue of tax competition from a new trade theory perspective and investigate the role of profit taxation in an imperfectly competitive environment. Two motives of strategic tax policies are emphasized in this literature, namely (i) attraction of a mobile firm's headquarters and (ii) attraction of foreign direct investment from outside the world.

High profile examples have brought attention to the first motive. For example, in 2003, the Australian firm James Hardie moved its headquarters from Australia to the Netherlands because of the favorable Dutch tax policies. Such anecdotic evidence substantiates the concern that tax differentials can impact the choice of headquarters location, not just the allocation of capital across borders. Changes in the headquarters location affect the tax jurisdiction of profits. In particular, if an MNE operates a production plant in two countries, the parent country can tax profits earned in both locations whereas the host country can only tax the profits generated locally. Although several theoretical contributions focus on the role of tax competition for the headquarters of mobile producers,[4] the discussion of the second motive – regional tax competition for FDI from outside the world – is predominant in the recent tax competition literature.[5] The central outcome of existing theoretical studies in this field is similar to the key insight of

[4] Two notable examples are Janeba (1998) and Baldwin and Krugman (2004).
[5] See for example Haufler and Wooton (1999, 2006), Raff (2004) or Bjorvatn and Eckel (forthcoming).

the (more traditional) public finance literature: Non-cooperative national tax policies trigger a race to the bottom in profit taxation and lead to a suboptimal outcome (in terms of world welfare). Again, this renders coordination of national tax policies beneficial from an integrated point of view.

We set up a two-country model with imperfect competition in the goods market and study the impact of strategic tax competition on both headquarters location of an internationally mobile producer and its mode of foreign market entry. A simultaneous consideration of these two issues renders our analysis different from existing studies on non-cooperative profit taxation. Accounting for oligopolistic competition between the internationally mobile producer and national firms constitutes a further difference to existing work, which primarily looks at the monopoly case (cf. Haufler and Wooton, 1999; 2006; Raff, 2004). An oligopoly structure is particularly important in our analysis, as it allows us to study the effect of the mobile firm's decision about its mode of foreign market entry on the profits of domestic competitors. This effect is accounted for by policy makers and therefore introduces a new facet to host country taxation that is quite distinct from the competition for headquarters of mobile producers or the competition for FDI from outside the world. It is this facet that differentiates our paper also from Lahiri and Ono (1998) and Bjorvatn and Eckel (forthcoming) who account for oligopolistic competition between foreign MNEs and local firms, but do not consider the role of tax competition in affecting the endogenous choice of entry mode.[6]

As a key result of our analysis, we find that tax competition can be welfare-improving. This relates our work to a sizable literature which points towards the potential

[6] Ferrett and Wooton (2005) also consider tax competition for FDI in an oligopoly model. However, in contrast to our analysis, they assume that all competitors are mobile and they keep the mode of market entry exogenous.

benefits of an uncoordinated tax game. Examples include the Leviathan models of corrupt governments (such as Brennan and Buchanan, 1980, and Edwards and Keen, 1996), information signaling (Bond and Samuelson, 1986), increased output due to subsidization (Davies, 2005) and reduced average cost of public goods (Black and Hoyt, 1989). Our paper adds to this literature by pointing towards a new channel through which tax competition can be beneficial: changes in the mode of foreign market entry.

The paper proceeds as follows. In Section 2, we set up our basic model. Section 3 solves the benchmark case of a no-tax equilibrium. Section 4 introduces tax competition, derives the Nash equilibrium tax policies and confronts welfare levels under tax competition with those in the no-tax equilibrium. Section 5 extends the analysis by relaxing several simplifying assumptions and Section 6 concludes.

2. The Model

Consider a two country world with two sectors. The two countries do not differ in their economic fundamentals, such as technology, factor endowments and preferences.[7] They are populated by L units of labor, which are inelastically supplied in perfectly competitive and internationally segmented factor markets. By assumption, each country $i = A, B$ diversifies production and provides each of the two sectors' goods. The first sector produces good Y, a numéraire good that is manufactured using labor in a constant returns to scale technology and sold under perfect competition. We normalize units so that the unit labor requirement of Y is one. Since there are no transport costs for good Y,

[7] The symmetry assumption is not critical for our results. It is imposed for the mere reason of notational simplicity. This becomes clear in Section 5, where factor endowment differences are accounted for.

under diversified production the equilibrium wage rate in each country is constant and equal to one.

In the second sector, three imperfectly-competitive firms produce a homogenous good *X* using labor in a constant returns to scale technology. These "industrial-sector" firms operate under Cournot competition. The unit labor requirement for production of good *X* is *c*. Two of these firms are national in scope and are exogenously assigned to each of the two countries. They produce and sell their output only in a single location. In models of endogenous firm structure, the presence of national competitors is a standard feature.[8] A further component of the national firms' costs are fixed costs $f > 0$ (in units of the numéraire good) which are invested to establish a production plant. The third firm, which is the firm of particular interest in the following analysis, acts as an international producer and faces two choices the others do not. The first choice is where to locate its headquarters. We designate the location of the headquarters as the third firm's parent country. Second, unlike the national firms, this "international producer" operates in both markets. It can do so either by choosing to be an exporter (the EXP-organization) or a multinational enterprise (the MNE-organization). As has been widely discussed in the FDI literature, there are advantages and disadvantages to both.

Under the EXP-organization, like the national firms, the international producer incurs a fixed cost *f* in its parent country. However, when serving the overseas host market, it must pay transport costs of ρ per unit exported. Under the MNE-organization, the international producer establishes a plant both in the parent and in the overseas host

[8] See, for example, Markusen (2002). Accounting for trade of the national producers would not change our main conclusions. Therefore, in the interest of simplicity, we assume that these firms do not export.

country.[9] Doing so allows it to avoid the transport costs of exporting. However, establishing this overseas affiliate's plant requires an additional fixed cost f_a. Thus, without taxation the international producer faces the well-known proximity-concentration trade-off, evidence of which is provided by Brainard (1997).

In our analysis, the proximity-concentration trade-off also depends on national tax policies. In particular, the MNE-organization exposes the international producer to host-country taxation, a feature which plays a central role in our tax competition story and something not found in tax competition models considering the location decision of exporting firms (cf. Baldwin and Krugman, 2004).

With respect to the ranking of fixed costs, we follow recent contributions in the FDI literature and impose the following parameter restriction:

Assumption 1: $f_a > f$.

Assumption 1, which will be relaxed in the robustness analysis of Section 5, implies that it is more costly to establish a plant in the host country than in the MNE's parent country (cf. Markusen, 2002, and Helpman, Melitz, and Yeaple, 2004). Note that since an MNE-organized firm produces its good in both locations, it is a horizontal firm in the tradition of Markusen (1984). Evidence of the predominance of horizontal FDI is provided by Markusen and Maskus (2002) and Blonigen, Davies and Head (2003).

Turning to the demand side of the economy, we assume that the utility of the representative consumer in country *i* is given by:

$$U_i = aD_i - \frac{D_i^2}{2} + Y_i^D \qquad (1)$$

[9] Note that for ease of discussion, we refer to the non-parent country as the host country, both when it literally hosts an MNE's subsidiary and when it is the target of exports from the parent country.

where D_i is *i*'s consumption of *X* and Y_i^D is *i*'s consumption of *Y*. Denoting the price of good *X* in country *i* by p_i, the budget constraint of the representative consumer is:

$$p_i D_i + Y_i^D = M_i \tag{2}$$

where M_i denotes total income. M_i is the sum of labor income, profits of firms headquartered in *i*, and, in the presence of taxes, tax revenue which is redistributed by the government in a lump-sum fashion.

Using the consumer's first order conditions, we derive inverse demand for *X* in country *i*:

$$p_i = a - D_i \tag{3}$$

Substituting equations (2) and (3) into (1), we can determine indirect utility for the representative consumer, which is a utilitarian welfare measure:

$$V_i = \frac{(a - p_i)^2}{2} + M_i \tag{4}$$

With respect to the available tax instruments, we assume that each country *i* can set a non-discriminatory local profit tax rate t_i that applies to profits resulting from domestic production. In addition, when a country *i* is the parent of an MNE, it can apply the tax rate τ_i to the overseas profits of the MNE. The relationship between τ_i and t_i will depend on the double tax relief method used by country *i*, a topic we discuss in Section 4.

Combining the different model elements implies that profits of a national firm located in country *i* are:

$$\pi_i^N = (1 - t_i)\left[(p_i - c)\, x_i - f\right] \tag{5}$$

where x_i indicates its production level and superscript *N* refers to "national". The international producer's profits are conditional on its organizational structure. When it headquarters in country *i* its profits are:

$$\pi_i = \begin{cases} \pi_i^{EXP} = (1-t_i)\left[(p_i - c)q_i + (p_j - c - \rho)q_j - f\right] & \text{if } \pi_i^{EXP} > \pi_i^{MNE} \\ \pi_i^{MNE} = (1-t_i)\left[(p_i - c)q_i - f\right] + (1-\tau_i - t_j)\left[(p_j - c)q_j - f_a\right] & \text{if } \pi_i^{EXP} < \pi_i^{MNE} \end{cases} \quad (6)$$

where q_i and q_j are the quantities it sells in the two countries and the *EXP* and *MNE* superscripts refer to the "EXP-organization" and "MNE-organization", respectively.[10]

To simplify the analysis, we make two assumptions to guarantee interior solutions. First, we assume that $a > c$, i.e. the representative consumers' marginal willingness to pay exceeds the firms' marginal cost of production for the first unit of output. Without this, no firm will choose to produce in equilibrium. Second, in order to guarantee non-negative equilibrium profits, this difference must be sufficiently large relative to the fixed costs. Therefore, we assume $(a-c)^2/9 > \max\{f, f_a\}$ throughout our analysis.

3. A Benchmark Case of No Profit Taxes

In the next section, the focus will be on the endogenous choice of tax rates. For now, however, we exogenously set tax rates equal to zero to determine the firm structure and the welfare levels in the no-tax equilibrium. This provides a useful benchmark for a discussion of the welfare implications of tax competition.

[10] Recall that under the EXP-organization, both q_i and q_j are produced in country *i*, whereas under MNE-organization, the international firm produces in both countries to service local consumers. In both cases, total supply of industrial goods in countries *i* and *j* can be denoted by $X_i = x_i + q_i$ and $X_j = x_j + q_j$, respectively.

Taking taxes as given, the game is played out in two stages. First, the international producer chooses its mode of foreign market penetration and its headquarters location.[11] After that, the three firms simultaneously choose their output levels, exchange takes place, and payoffs are realized. We solve the game through backward induction.

3.1 The Tax-free MNE Subgame Equilibrium

We first analyze the subgame in which the international producer chooses the MNE-organization. In this case, if the firm headquarters in country *i*, since marginal costs are the same equilibrium outputs are the same out of each plant regardless of whether it is operated by a national firm or the MNE. Using the appropriate first-order conditions resulting from the maximization of profits (5) and (6), the equilibrium quantities are:

$$x_i = x_j = q_i = q_j = (a-c)/3. \tag{7}$$

Substituting these in inverse demand (2) yields equilibrium prices:

$$p_i = p_j = (a+2c)/3. \tag{8}$$

Therefore profits of the national firms are:

$$\pi_i^N = \pi_j^N = (a-c)^2/9 - f. \tag{9}$$

The MNE meanwhile earns equilibrium profits of:

$$\pi_i = \pi_i^{MNE} = 2(a-c)^2/9 - f - f_a. \tag{10}$$

By virtue of (4), utilitarian welfare in the parent country *i* is given by:

$$V_i^{MNE} = 5(a-c)^2/9 - 2f - f_a + L. \tag{11}$$

In the host country *j*, welfare is:

[11] Recall that countries do not differ in their economic fundamentals. Hence they are symmetric *ex ante*. However, after the international firm chooses its headquarters location (and its mode of foreign market entry), there is an *ex post* asymmetry between the two economies.

$$V_j^{MNE} = (a-c)^2/3 - f + L. \tag{12}$$

Combining (11) and (12) yields:

$$\Delta V^{MNE} \equiv V_i^{MNE} - V_j^{MNE} = 2(a-c)^2/9 - f - f_a > 0 \tag{13}$$

Thus, when the international producer is an MNE and taxes are zero, a country gains by having the headquarters of the MNE because its citizens enjoy the benefits of the MNE's local and overseas profits.

3.2 The Tax-free Exporter Subgame Equilibrium

Now we analyze the subgame in which the international producer has chosen to be a firm headquartered in country *i* that exports to country *j*. Using the first-order conditions resulting from the maximization of profits (5) and (6), we find that the equilibrium outcome depends critically on the level of transport costs. Specifically, the equilibrium quantities sold in the parent country *i* are:

$$x_i = q_i = (a-c)/3, \tag{14}$$

while the quantity sold by the host country's national firm is

$$x_j = \begin{cases} (a-c+\rho)/3 & if\ \rho \le \bar{\rho} \\ (a-c)/2 & if\ \rho > \bar{\rho} \end{cases}. \tag{15}$$

The equilibrium level of exports is:

$$q_j = \begin{cases} (a-c-2\rho)/3 & if\ \rho \le \bar{\rho} \\ 0 & if\ \rho > \bar{\rho} \end{cases} \tag{16}$$

where $\bar{\rho} \equiv (a-c)/2$. Thus, if transport costs exceed this cutoff level, the exporter has no incentive to export and *j*'s national firm is free to act as a monopolist. Using these results in the inverse demand functions yields the following prices:

$$p_i = (a+2c)/3 \tag{17}$$

and

$$p_j = \begin{cases} (a+2c+\rho)/3 & \text{if } \rho \le \bar{\rho} \\ (a+c)/2 & \text{if } \rho > \bar{\rho} \end{cases}. \tag{18}$$

Plugging these into the profit equations then gives:

$$\pi_i^N = (a-c)^2/9 - f\ , \tag{19}$$

$$\pi_j^N = \begin{cases} (a-c+\rho)^2/9 - f & \text{if } \rho \le \bar{\rho} \\ (a-c)^2/4 - f & \text{if } \rho > \bar{\rho} \end{cases} \tag{20}$$

and

$$\pi_i = \begin{cases} \pi_i^{EXP} = (a-c)^2/9 + (a-c-2\rho)^2/9 - f & \text{if } \rho \le \bar{\rho} \\ \pi_i^{EXP} = (a-c)^2/9 - f & \text{if } \rho > \bar{\rho} \end{cases}. \tag{21}$$

Looking at indirect utility of the representative consumer in (4), in the parent country *i*, utilitarian welfare is:

$$V_i^{EXP} = \begin{cases} 4(a-c)^2/9 + (a-c-2\rho)^2/9 - 2f + L & \text{if } \rho \le \bar{\rho} \\ 4(a-c)^2/9 - 2f + L & \text{if } \rho > \bar{\rho} \end{cases}. \tag{22}$$

In the host country *j*, equilibrium welfare is:

$$V_j^{EXP} = \begin{cases} \left(2(a-c)-\rho\right)^2/18 + (a-c+\rho)^2/9 - f + L & \text{if } \rho \le \bar{\rho} \\ 3(a-c)^2/8 - f + L & \text{if } \rho > \bar{\rho} \end{cases}. \tag{23}$$

Using these, we can calculate the relative gain from being the parent country *i* instead of the host country *j*:

$$\Delta V^{EXP} \equiv V_i^{EXP} - V_j^{EXP} = \begin{cases} \left(4(a-c)^2 - 8\rho(a-c) + 5\rho^2\right)/18 - f & \text{if } \rho \le \bar{\rho} \\ 5(a-c)^2/72 - f & \text{if } \rho > \bar{\rho} \end{cases}. \tag{24}$$

It is unclear in general whether the parent country is better off or not if the international producer has the EXP-organization. If $\rho = 0$, then welfare is strictly higher for the parent

country. However, if ρ increases, then the welfare differential ΔV^{EXP} declines when $\rho < \overline{\rho}$ and remains unchanged for $\rho \geq \overline{\rho}$. If $\rho = \overline{\rho}$, then (24) reduces to:

$$\Delta V^{EXP} = 5(a-c)^2/72 - f \qquad (25)$$

which may be positive or negative, depending on the size of fixed cost parameter *f*. Being the headquarters location has three consequences. First, the parent country gains since profits of the international producer enter its welfare. Second, if $\rho > 0$, there is stronger competition in the parent country, leading to higher consumer surplus as compared to the host country. Third, stronger competition reduces profits of the national firm. This third effect counteracts the first two ones and it dominates if fixed set-up costs *f* are sufficiently high.

3.3 The Location and Entry Mode Decision

When countries are identical, the firm is indifferent between them. Hence, to determine the headquarters location, we add the following assumption:

Assumption 2: *In the case of indifference, the international producer locates in country A and chooses an MNE-organization.*

Given the *ex ante* symmetry between countries, the choice of entry mode reduces to comparing the profits in (10) and (21). If $\rho \geq \overline{\rho}$, profits are strictly greater under MNE-organization. This is because foreign sales of the international producer fall to zero under EXP-organization if transport costs are too high. As a result, the only way to earn positive overseas profits is to choose the MNE-organization.[12] To the contrary, if $\rho = 0$, profits are strictly greater under EXP-organization since the international producer can

[12] Recall that local profits in the parent country are independent of the international producer's choice of foreign market entry.

economize on fixed costs yet remain just as competitive in the overseas market. This implies existence of a cutoff transport cost level $\rho_I \in (0, \bar{\rho})$ at which the international producer is indifferent between the two foreign entry modes. This cutoff level is implicitly determined by:

$$(a-c)^2/9 - (a-c-2\rho_I)^2/9 - f_a = 0. \tag{26}$$

Equation (26) has a unique solution in the interval $(0, \bar{\rho})$. The relationship between transport costs ρ and the mode of foreign market entry is depicted in Figure 1.

>Figure 1<

We can now state our first proposition for the no-tax scenario.

Proposition 1: *If $\rho < \rho_I$, the international producer chooses the EXP-organization and headquarters in country A. In contrast, if $\rho \geq \rho_I$, the international producer chooses the MNE-organization and headquarters in country A.*

The final item to consider is welfare in the no-tax equilibrium. Using the above results, we see that for the parent country *A*:

$$V_A^{MNE} - V_A^{EXP} = \begin{cases} (a-c)^2/9 - (a-c-2\rho)^2/9 - f_a & \text{if } \rho \leq \bar{\rho} \\ (a-c)^2/9 - f_a & \text{if } \rho > \bar{\rho} \end{cases}. \tag{27}$$

By virtue of equation (26), this implies that both country *A* and the international producer are strictly better off with the MNE-organization if $\rho > \rho_I$, while both of them prefer the EXP-organization if $\rho < \rho_I$. For country *B* we can calculate:

$$V_B^{MNE} - V_B^{EXP} = \begin{cases} -\rho^2/6 & if\ \rho \le \bar{\rho} \\ -(a-c)^2/24 & if\ \rho > \bar{\rho} \end{cases} \tag{28}$$

i.e. unless transport costs are zero, the host country always prefers the EXP-organization. This is because the transport costs incurred under this entry mode render the international producer less competitive. This raises profits of the national firm, which dominates the decline in the consumer surplus (under a linear demand function). Also, note that the size of the welfare loss is increasing in the transport cost.

Comparing (27) and (28), we can identify a potential conflict between the two governments. While welfare in the parent country is maximized by the international producer's own decision regarding its entry mode, the host country is unhappy with this decision if transport costs are significant, i.e. if $\rho \ge \rho_I$. As will become clear in Section 4, this gives an incentive for strategic profit taxation in the host country.

In a final step, we can examine how world welfare depends on the entry mode. By virtue of (27) and (28), we can define $\Delta V \equiv V_A^{MNE} + V_B^{MNE} - V_A^{EXP} - V_B^{EXP}$ and calculate:

$$\Delta V = \begin{cases} (a-c)^2/9 - (a-c-2\rho)^2/9 - f_a - \rho^2/6 & if\ \rho \le \bar{\rho} \\ 5(a-c)^2/72 - f_a & if\ \rho > \bar{\rho} \end{cases}. \tag{29}$$

Differentiating the right hand-side of (29) with respect to ρ, we see that the welfare differential ΔV has a unique maximum in interval $(0, \bar{\rho})$ at $\rho^* = 4(a-c)/11$. On the one hand, higher transport costs ρ render exporting more expensive and, therefore, exhibit a positive impact on ΔV. On the other hand, a higher ρ raises the social surplus loss in country *B* if the international producer decides for MNE-organization instead of EXP-organization (see (28)). It is the interplay of these two opposing effects, which explains the (non-monotonic) relationship between transport costs ρ and welfare

differential ΔV. The first effect dominates if transport costs are low, while the second effect is stronger if ρ is sufficiently high. Of course, as ρ approaches $\bar{\rho}$, sales to foreign consumers fall to zero under EXP-organization. After this point, a further increase of transport costs has no impact on ΔV. Beyond that, we can note that the welfare differential is negative if $\rho = 0$, while its sign turns out to be ambiguous if $\rho = \bar{\rho}$.

To present our main results in the most transparent way, it is useful to impose a further parameter restriction (which will be relaxed in Section 5).

Assumption 3: $5(a-c)^2/72 > f_a$.

Assumption 3 guarantees that ΔV becomes positive if $\rho = \bar{\rho}$. Together with the formal properties outlined above, we can conclude that there exists a unique transport cost level $\rho_V \in (0, \bar{\rho})$ for which world welfare is identical under both entry modes. This transport cost level is implicitly determined by

$$(a-c)^2/9 - (a-c-2\rho_V)^2/9 - f_a - \rho_V^2/6 = 0. \qquad (30)$$

Comparing (26) and (30), we obtain $\rho_V > \rho_I$, i.e. there is a range of transport costs in which the international producer chooses the MNE-organization and reduces world welfare by doing so. This is illustrated graphically in Figure 2.

>Figure 2<

One further remark is in order here. Together, Assumptions 1 and 3 imply that for any ρ, $\Delta V^{EXP} > 0$, according to (24). Hence, in the parameter domain we are focusing on in the subsequent analysis, it is always beneficial to be parent of the international

producer (irrespective of its mode of foreign market entry) if both countries set zero tax rates.

The above discussion isolates three important aspects of our analysis. First, even in the absence of taxation, the equilibrium is not second-best efficient for certain transport cost levels, i.e. there is a potential for a Pareto-improvement if the entry mode of the international producer can be manipulated through national tax policies (and lump-sum transfers are available to redistribute the welfare gains). Second, since the parent country is always better off than the host country, there is an incentive to attract the headquarters of the international producer. Third, without tax revenues from inbound FDI, the host country prefers the international firm to choose the EXP-organization, irrespective of the transport cost level.

In the next section, we account for these three aspects and investigate how uncoordinated tax policies affect the equilibrium outcome.

4. Tax Competition

We now focus on the role of taxes which are set (simultaneously and) non-cooperatively in the stage prior to the international producer's headquarters and entry mode decisions (which again precede the output game among the three firms). We can solve for the Nash equilibrium tax rates through backward induction.

Given the international producer's decision on where to headquarter and how to structure its firm, profit taxes have no effect on output levels. Thus, the pre-tax profits of the firms in the various subgames of Section 3 do not change and after-tax profits when the international producer chooses an MNE-organization are given by:

$$\pi_i^N = (1-t_i)\left[(a-c)^2/9 - f\right] \tag{31}$$

$$\pi_j^N = (1-t_j)\left[(a-c)^2/9 - f\right], \tag{32}$$

and

$$\pi_i = \pi_i^{MNE} = (1-t_i)\left[(a-c)^2/9 - f\right] + (1-\tau_i - t_j)\left[(a-c)^2/9 - f_a\right]. \tag{33}$$

When the international producer chooses the EXP-organization, after-tax profits are:

$$\pi_i^N = (1-t_i)\left[(a-c)^2/9 - f\right], \tag{34}$$

$$\pi_j^N = \begin{cases} (1-t_j)\left[(a-c+\rho)^2/9 - f\right] & if\ \rho \le \bar{\rho} \\ (1-t_j)\left[(a-c)^2/4 - f\right] & if\ \rho > \bar{\rho} \end{cases}, \tag{35}$$

and

$$\pi_i = \begin{cases} \pi_i^{EXP} = (1-t_i)\left[(a-c)^2/9 + (a-c-2\rho)^2/9 - f\right] & if\ \rho \le \bar{\rho} \\ \pi_i^{EXP} = (1-t_i)\left[(a-c)^2/9 - f\right] & if\ \rho > \bar{\rho} \end{cases}. \tag{36}$$

Note that under the EXP-organization, the international producer only faces local taxes in the parent country *i*.

Given its entry mode, the international producer will choose to locate its headquarters in the country with the lowest overall tax burden. Under the EXP-organization, the international producer locates in country *i* if $t_i < t_j$. Under the MNE-organization, the international producer must also consider parent country taxes on its overseas profits. If $\tau_i = \tau_j$, then the parent country tax rate on host country profits is the same when headquartering in either country, and again the international producer locates in country *i* if $t_i < t_j$.

Given that the international producer headquarters in country *i*, its choice of entry mode is similar to that in the no-tax case of Section 3, with the difference that tax policies become relevant. In particular, if the international producer chooses the MNE-organization, it not only faces taxation by the parent country *i* but also taxation by the host country *j* on those profits earned in *j*. Thus, for given transport costs, there exists a host tax rate $t_j = \bar{t}(t_i, \tau_i) > 0$ at which the international producer is indifferent between entry modes. Specifically, according to (33) and (36), this tax rate is given by:

$$\bar{t}(t_i, \tau_i) = \begin{cases} 1 - \tau_i - (1 - t_i)\dfrac{(a - c - 2\rho)^2}{(a - c)^2 - 9 f_a} & \text{if } \rho \le \bar{\rho} \\ 1 - \tau_i & \text{if } \rho > \bar{\rho} \end{cases}. \qquad (37)$$

For $t_j > \bar{t}(t_i, \tau_i)$, the extra tax burden of the MNE-organization makes this entry mode unattractive and the international producer becomes an exporter. For $t_j \le \bar{t}(t_i, \tau_i)$, the extra tax burden is relatively small compared to the savings on transport costs and the firm becomes an MNE. The critical tax rate $\bar{t}(t_i, \tau_i)$ is increasing in t_i when $\rho \le \bar{\rho}$ and is decreasing in τ_i regardless of the transport cost level. Since τ_j only impacts an MNE headquartered in *j*, it has no effect on this critical tax rate and, therefore, also no effect on the international firm's entry mode.

In the first stage of the game, the two governments simultaneously set their two profit tax rates: the non-discriminatory tax rate $t_i \in [0,1]$, which is applied to all local profits that accrue in country *i* and a discriminatory instrument τ_i to tax overseas profits of an MNE. In general, τ_i can differ from t_i because of double taxation relief. Following Davies (2003), we consider four different double taxation regimes:

$$\tau_i = \begin{cases} t_i & \text{if } i \text{ offers no double taxation relief} \\ t_i(1-t_j) & \text{if } i \text{ uses tax deductions} \\ \max\{t_i - t_j, 0\} & \text{if } i \text{ uses tax credits} \\ 0 & \text{if } i \text{ uses tax exemptions.} \end{cases} \tag{38}$$

Under no double taxation relief, it is possible that the effective profit tax could be greater than one, in which case the MNE would actually owe more in taxes on its overseas profits than it earns there.[13] Under tax deductions, the parent country deducts host country taxes from the tax base it uses to calculate the tax bill, i.e. it treats host taxes as any other cost of doing business in the host. Under credits, the parent country uses the pre-host tax level of profits as the tax base, but offers a limited tax credit for the host taxes paid. If the parent tax bill is greater than the credit (known as an excess limit position), the MNE must pay only the remaining amount to the parent. If the credit is greater than the parent tax bill (an excess credit position), the MNE owes no parent taxes on its overseas profits.[14] Under the exemption method, the parent country does not tax overseas profits at all. Of these four methods, credits are the most commonly employed double taxation relief method in real world, followed by exemptions.

Following Haufler and Wooton (1999, 2006) and Raff (2004), governments choose their tax rates to maximize the indirect utility of their own representative consumers. Assuming that tax revenues (T_i) are redistributed in lump sum fashion, this simply augments (4) so that income includes tax revenue.

We can now derive the Nash equilibrium tax rates, location choice, and entry mode.[15]

[13] This does not occur in equilibrium under the present model assumptions, as will become clear later on.
[14] Note that the MNE cannot use excess credits to offset the taxes owed on its domestically earned profits.
[15] By assumption, if host country *j* is indifferent, it sets a tax rate that induces MNE-organization in equilibrium.

Proposition 2: *Nash equilibrium tax rates for country A are* $t_A = \tau_A = 0$. *Nash equilibrium tax rates for country B are* $t_B = \bar{t}(0,0)$ *if* $\rho \geq \rho_V$, $t_B > \bar{t}(0,0)$ *if* $\rho < \rho_V$, *and an indeterminate value of* τ_B. *The international producer headquarters in country A. If* $\rho < \rho_V$, *the international producer chooses the EXP-organization. If* $\rho \geq \rho_V$, *it chooses the MNE-organization.*

Proof: Since, for a given headquarters location and a given foreign market entry mode, profit taxes are non-distortionary and since the income of parent country *i*'s representative consumer is the sum of profits, tax revenues, and labor income, tax rates t_i, τ_i affect welfare V_i only to the extent that they affect choices of the international producer with respect to its headquarters location and its mode of foreign market entry. Any tax rates in the parent country which leave these two choices unaffected are welfare equivalent. However, the welfare level in the parent country *i* also depends on tax rates in the host country *j* if the international producer chooses MNE-organization. In this case, welfare in the parent country *i* declines if the host country increases its non-discriminatory profit tax rate t_j.

With these insights at hand, we can now proceed by showing that countries prefer to headquarter the international producer, irrespective of the tax policy in the host economy. To do this, let us first suppose that the international producer is an exporter headquartered in country *i*. In this case, country *j* does not collect profit taxes from the international producer and country *i*'s welfare level is independent of t_j. Thus, the result

from the no-tax scenario in Section 2 still holds and a country benefits from being the parent of the international producer, according to Assumptions 1 and 3. This provides an incentive for the well-known race to the bottom in profit taxation.

Second, suppose that the international producer is located in country *i* and has the MNE-organization. In this case, *i*'s welfare is:

$$V_i^{MNE} = 5(a-c)^2/9 - 2f - f_a + L - t_j\left((a-c)^2/9 - f_a\right) \tag{39}$$

i.e. what it earned in the no tax case minus what is lost to country *j*'s taxes. Meanwhile *j*'s welfare is:

$$V_j^{MNE} = (a-c)^2/3 - f + L + t_j\left((a-c)^2/9 - f_a\right) \tag{40}$$

i.e. what it earned in the no-tax case plus what it collects in tax revenue. Comparing the two, we see that:

$$\Delta V^{MNE} \equiv V_i^{MNE} - V_j^{MNE} = (a-c)^2/9 - f + (1-2t_j)\left[(a-c)^2/9 - f_a\right] \tag{41}$$

which is positive, as $f_a > f$ (by Assumption 1) and $t_j \leq 1$. Thus, if the international producer chooses MNE-organization, it is better to be the parent country, even if the other country sets a positive tax rate. Again, this provides an incentive for a race to the bottom in profit taxation (in order to attract the MNE's headquarters).

Putting together, $t_i(t_j, \tau_j) = \tau_i(t_j, \tau_j) = 0$ is a best response to any combination of (t_j, τ_j) with $t_j > 0$, i.e. parent country *i* has no incentive to deviate from a policy with $t_i(t_j, \tau_j) = \tau_i(t_j, \tau_j) = 0$, irrespective of the tax rates in country *j*.[16] Best-response policies of both countries ensure that $t_i(t_j, \tau_j) = \tau_i(t_j, \tau_j) = 0$ is realized in a Nash equilibrium (otherwise host country *j* has an incentive to underbid the tax rates of parent country *i*.)

[16] By virtue of equation (38), $t_i = 0$ implies $\tau_i = 0$ for any double taxation regime.

If both countries set zero taxes, by Assumption 2, country *A* will headquarter the international producer as in the no-tax scenario. However, setting $t_B = 0$ is not necessarily optimal for the host country *B*. On the one hand, if the international producer decides for multinational production, a positive tax rate $t_B > 0$ raises total income M_B and thus welfare in country *B*. On the other hand, the host country *B* can also use its tax rate to manipulate the international producer's mode of foreign market entry.

When *A* sets both of its tax instruments to zero, the critical tax rate becomes:

$$\bar{t}(0,0) = \begin{cases} 1 - \dfrac{(a-c-2\rho)^2/9}{(a-c)^2/9 - f_a} & \text{if } \rho < \bar{\rho} \\ 1 & \text{if } \rho \geq \bar{\rho} \end{cases}. \tag{42}$$

Thus, if transport costs are above $\bar{\rho}$, the international producer will choose the MNE-organization irrespective of t_B. If, however, $\rho < \bar{\rho}$, *B* can induce the firm to choose the EXP-organization by setting a high enough tax rate. Since, given an MNE-organization, *B*'s welfare is strictly increasing in its tax revenue, it will choose a tax rate at least as large as $\bar{t}(0,0)$. Whether *B* exceeds this tax rate depends on whether the loss in tax revenue is offset by the benefits of a change in entry mode from MNE to EXP, i.e. whether *B* sets a tax above $\bar{t}(0,0)$ depends on the sign of:

$$V_B^{MNE} - V_B^{EXP}\Big|_{\rho \leq \bar{\rho}} = (a-c)^2/9 - (a-c-2\rho)^2/9 - f_a - \rho^2/6, \tag{43}$$

according to (28), (40) and (42). From (30), we see immediately that ρ_V is the level of transport costs at which the right-hand side of (43) equals zero. This implies that, for $\rho > \rho_V$, *B* prefers the MNE-organization, while, for $\rho < \rho_V$, it prefers the EXP-

organization. Finally, $\rho = \rho_V$ renders country *B* indifferent between the two entry modes. Hence, *B*'s best response tax rate is:

$$t_B(0,0) = \begin{cases} t_B > \bar{t}(0,0) & \text{if } \rho < \rho_V \\ t_B = \bar{t}(0,0) & \text{if } \rho \geq \rho_V \end{cases} \tag{44}$$

where host country *j* sets a tax rate which allows for MNE-organization in the case of indifference. Since τ_B does not affect firm decisions, its value is indeterminate. This completes the proof. ***Q.E.D.***

One important implication of non-cooperative tax competition in our framework is that it yields a second-best efficient equilibrium, so that potential Pareto-improvements are not possible for the underlying competitive environment in the goods market. This is, because the condition needed for country *B* to permit the MNE-organization ($\rho \geq \rho_V$) is the same condition necessary for the world as a whole to benefit from the MNE-organization. Since neither the international producer nor country *A* internalizes the impact of entry mode on country *B*, there is a negative externality which leads to a potential welfare loss in the absence of profit taxation. However, because *B* has the ability to force the international firm into the EXP-organization by setting a sufficiently high tax rate, it is able to correct for this externality. Thus, tax competition yields a heretofore unrecognized benefit: the ability to induce a welfare-improving entry mode.

Beyond its effect on utilitarian world welfare, tax competition also has distributional consequences in our model. While an MNE-organization is detrimental for the host country *B* if tax rates are zero, its ability to set a positive tax rate helps to offset these losses. As such, if $\rho > \rho_V$ and the equilibrium entry mode is through FDI, host

welfare rises compared to the no-tax equilibrium. This yields a more even welfare distribution between the ex-ante symmetric countries. Therefore, if cross-country welfare distribution matters, permitting tax competition can yield an additional benefit over the no-tax equilibrium.

We conclude this section with two final remarks. First, if welfare is utilitarian, there is no role for tax coordination between countries. This differs from the results of Bjorvatn and Eckel (forthcoming), who emphasize the gains from coordination when governments use national tax policies to attract FDI from outside the world. It also differs from Davies (2003) and Chisik and Davies (2004) where the tax competition equilibria act as Prisoners' Dilemmas, giving rise to mutually beneficial tax unions. Second, the double tax rule is irrelevant in our model. This matches the result found in Janeba (1995) where tax competition drives the parent country's taxes "down to zero, such that the form of double taxation relief becomes irrelevant" (Janeba, 1995, p. 313).

5. Robustness Analysis

The above results were derived under rather strong assumptions on parameter constellation and country characteristics (like symmetry in technology and factor endowments). It is the purpose of this section to probe the robustness of the above results, when relaxing some of these restrictive assumptions.

A first modification is with respect to Assumption 3, where an arbitrary parameter constraint has been imposed on the relationship between operative profits of an MNE's foreign affiliate and its fixed set-up costs.[17] The consequences of giving up the respective parameter constraint are at the agenda of Subsections 5.1 and 5.2. A second modification

[17] The formal condition in Assumption 3 can be interpreted in this way.

we are interested in is a change in the ranking of fixed costs. Following recent contributions in the FDI literature, we have imposed condition $f_a > f$ in Assumption 1. However, this assumption seems less plausible if a provision of headquarters services within the firm is of importance since this may create assets such as R&D that can be used in multiple plants at no additional costs. In this case, a ranking with $f_a < f$ may be more realistic. Note that this would imply that the MNE's fixed costs are greater than a national firm's fixed costs, but less than twice as great. Since conclusive empirical evidence on the size of local and foreign plant set-up costs is not available, we study the robustness of our results with respect to the fixed-cost assumption in Subsection 5.3. Finally, in Subsection 5.4 we address the role of (ex ante) asymmetries in the factor endowments of countries.

5.1 Assuming $f < 5(a-c)^2/72 < f_a$

Giving up Assumption 3 but keeping Assumption 1, we may end up in a parameter constellation with $f < 5(a-c)^2/72 < f_a$. Then, by virtue of (29), world welfare is strictly lower under MNE-organization when $\rho \geq \bar{\rho}$. This is because the fixed cost of setting up the overseas plant outweighs the benefits this brings to consumer surplus and operative profits. Since world welfare is lower under MNE-organization than under EXP-organization if $\rho \geq \bar{\rho}$, there also exist transport costs just below $\bar{\rho}$ that yield lower world welfare under the MNE-organization. How far below $\bar{\rho}$ this region extends depends on how large f_a is.

>Figure 3<

Figure 3 illustrates two possibilities when $f_a > 5(a-c)^2/72$. For illustrative purposes, Figure 3 also includes a baseline level of fixed costs $f_a^0 < 5(a-c)^2/72$, i.e. a level of affiliate fixed costs that satisfy Assumption 3 and yield a world welfare differential like that in Figure 2. Recall that with this fixed cost, ΔV is positive for all $\rho > \rho_V$, implying that world welfare is higher under the MNE-organization for sufficiently high transport cost levels. Now consider a fixed cost f_a^1 that is just slightly greater than $5(a-c)^2/72$. This rise in fixed costs creates a parallel shift down in the world welfare differential from ΔV_0 to ΔV_1. As the figure shows, although the EXP-organization is more desirable for low and high transport costs, there exists an intermediate range between ρ_v^1 and ρ_v^2 for which the MNE-organization is still beneficial from an integrated point of view. Now consider a fixed cost f_a^2 that is significantly greater than $5(a-c)^2/72$. Then, the welfare differential becomes negative for any possible transport cost level ρ and the EXP-organization is always associated with higher world welfare. Such an outcome is represented by the ΔV_2-locus in Figure 3.

These changes in the welfare implications of entry modes impact the best responses. Since $5(a-c)^2/72 > f$, it is still desirable to be the parent country, regardless of the entry mode. Therefore, *A*'s best response remains $t_A = \tau_A = 0$. As before, *B* will attempt to use its tax rate to induce its preferred entry mode. If $\rho \in [\rho_v^1, \rho_v^2]$, then *B* prefers the MNE-organization and will again set $t_B = \bar{t}(0,0)$. Outside of this range, Country *B* has an incentive to set $t_B > \bar{t}(0,0)$. If the fixed cost is large enough so that

$\Delta V_2 < 0$ for all ρ (as with f_a^2 in Figure 3), then *B* has an incentive to set $t_B > \bar{t}(0,0)$ for all ρ.[18]

As before, country *B*'s tax rate can potentially be used to enforce a better, welfare-improving entry mode of the international producer. However, unlike in Section 4, it is not always able to do so. If $\rho \geq \bar{\rho}$, to the detriment of world welfare the international producer chooses the MNE-organization (by Assumption 2), regardless of tax rates. In this case, *B* will set $t_B = 1$ in order to capture as much of the subsidiary profits as possible but will still be unable to correct the entry mode.[19]

5.2 Assuming $5(a-c)^2/72 < f < f_a$

In Section 4, the driving force behind the race to the bottom in tax rates was that countries desired to be the parent country. When $5(a-c)^2/72 < f$, this is not always the case. By (24), we know that under this alternative assumption it is detrimental to be the location of an exporter's headquarters when $\rho \geq \bar{\rho}$. While it is still the case that without transport costs (i.e. $\rho = 0$) it is beneficial to be the parent, there will exist a critical transport cost level $\rho_f \in (0, \bar{\rho})$ such that for transport costs above this level, a country strictly prefers to be the host country instead of the parent country if the international producer chooses EXP-organization. This critical transport cost level ρ_f is illustrated in Figure 4.

>Figure 4<

[18] Note that $\bar{t}(0,0) = 1$ if $\rho \geq \bar{\rho}$, according to (42). Therefore, $t_B > \bar{t}(0,0)$ is only possible if $\rho < \bar{\rho}$.

[19] If the two countries form a tax union and implement tax rates $t_A = t_B = \tau_A = \tau_B = 1$ (under double taxation), then the international producer has an incentive to choose the EXP-organization even if $\rho \geq \bar{\rho}$, in order to avoid non-negative after-tax profits. Hence, foundation of a tax union is beneficial in this case.

For transport costs $\rho \in [0, \rho_f]$ or $\rho \geq \bar{\rho}$, best responses are exactly as they are in Section 5.1. For $\rho \in (\rho_f, \bar{\rho})$, however, things are different. In this range, the Nash equilibrium cannot involve an MNE at $t_A = \tau_A = 0$ since the host country would choose a tax rate to force the international producer into an EXP-organization (as $\Delta V < 0$).[20] Furthermore, under this entry mode, both governments have an incentive to expel the international producer by raising their tax rates (as $\Delta V^{EXP} < 0$). This then leads to a race to the top in profit taxation. Thus, in equilibrium, $t_B = 1$ (while the level of t_A is not unique in general) and, by virtue of Assumption 2, the international firm headquarters in country *A*.

If $t_B = 1$, then $\tau_A = 0$ if country *A* offers credits, deduction or exemption (see (38)). The level of τ_B is indeterminate as the international firm headquarters in country *A*. Finally, the international firm prefers EXP-organization if $t_A < 1$, while it is indifferent between the two entry modes if $t_A = t_B = 1$ and $\tau_A = 0$. Then, it will choose MNE-organization, according to Assumption 2.[21]

This race to the top is similar to that found in models with a mobile polluting firm. As illustrated by Rauscher (1995) and Markusen, Morey, and Olewiler (1995), in these "not in my backyard" models governments raise tax rates in order to drive the damaging firm out of their jurisdiction, leading to a similar race to the top. In our model, the damages come from a profit-stealing effect, as local production of the international

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[20] Note that $\Delta V^{EXP} - \Delta V\big|_{\rho \leq \bar{\rho}} = 2(a - c - 2\rho)^2 / 9 + f_a - f > 0$ and that $\Delta V^{EXP} - \Delta V\big|_{\rho > \bar{\rho}} = f_a - f > 0$, according to (24) and (29). Hence, $\Delta V^{EXP} > \Delta V$ for any ρ and thus $\Delta V < 0$ for $\rho \geq \rho_f$.

[21] In contrast, if country *A* decides for double taxation and sets $t_A = \tau_A = 1$, the international producer prefers the EXP-organization to avoid negative after-tax profits.

producer reduces profits of the national competitor. Outside the literature on pollution, the possibility that a country can lose by being the parent of a mobile producer is not commonly discussed in the literature on tax competition for headquarters of mobile firms. However, the policy implications of such losses can be severe if discriminatory measures which aim to drive unwelcome producers out of the market are forbidden by legislative rules. This is the case in several international agreements including Chapter 11 of the North American Free Trade Agreement and articles 94 and 96 of the treaty establishing the European Union. Emphasizing the possibility of unwelcome local investment is also warranted, as the focus among policy makers has so far been primarily on eliminating the special tax breaks afforded to multinational firms (see Haufler, 2001, for detailed discussion) and not on how to secure local firms from detrimental investment by a mobile producer.

5.3 Assuming $f_a < f < 5(a-c)^2/72$

In this section, we consider a variant of the model in which it costs less to set up the overseas plant than to create the domestic plant (plus headquarters). Note that this implies that the total fixed costs of an MNE are between one and two times those of an exporter.

For values of $\rho < \rho_I$, none of our results from Section 4 change since $\bar{t}(0,0) < 0$, so that a policy with $t_A = \tau_A = 0$ guarantees $t_B > \bar{t}(0,0)$ and headquarters of the international producer (with EXP-organization) in country *A*. Therefore, we focus on a parameter domain with $\rho > \rho_I$ in the following analysis. To proceed, it is useful to consider a sub-domain with $\rho > \rho_V$ first. In this case, we know from Section 4 that the EXP-organization is not consistent with a best-response tax policy in country *B*.

However, unlike in Section 4, tax rates[22] $t_A = \tau_A = 0$ and $t_B = \bar{t}\,(0,0)$ are also inconsistent with best-response policies, as the MNE prefers locating in the high-tax country *B*. The reason for this is that, although revenues and variable costs are the same across countries, fixed costs are now higher in the parent country, due to $f > f_a$. Thus, in order to minimize its overall tax burden, the MNE will shift these costs (and its headquarters) to the high-tax location. This provides incentives for a mutual bidding up of tax rates, as countries would like to become parent of the MNE (as long as tax rates are sufficiently low).

However, the higher the tax rate in the host country, the less attractive it becomes to be parent of the international firm. By virtue of (41), we can determine a critical host country tax level[23]

$$\hat{t} = \frac{1}{2}\left[1 + \frac{(a-c)^2/9 - f}{(a-c)^2/9 - f_a}\right] \tag{45}$$

which is implicitly determined by $\Delta V^{MNE} = V_i^{MNE} - V_j^{MNE} = 0$. If the host country sets a tax rate $t_j = \hat{t}$, the two economies are indifferent between being host or being parent of the MNE, while $t_j > \hat{t}$ implies that the parent country *i* would benefit from adjusting its tax policy to expel the MNE. Hence, in a Nash equilibrium with MNE-organization $t_j \leq \hat{t}$ must prevail in the host-country. Furthermore, best-response policies imply $t_i \geq \hat{t}$ in the parent country, so that host country *j* has no incentive to overbid country *i*. Finally, existence of a Nash equilibrium also requires $t_i \leq \bar{t}$. Otherwise, the host country *j* could

[22] To fix ideas, let us assume that the host country, which is indifferent between the various double taxation relief methods, decides for tax exemption.

[23] Note that $\hat{t} \in (0,1)$ if $f > f_a$.

deviate to $t_j = \tau_j = 0$ in order to attract headquarters of the international producer who switches to EXP-organization if $t_i > \bar{t}(0,0)$.

In the case of $\rho \geq \bar{\rho}$, we have $\bar{t}(0,0) = 1$, so that existence of an MNE equilibrium is guaranteed (and country *A* as well as country *B* can become the parent of the international producer). In contrast, if ρ is sufficiently close to ρ_V, $\bar{t}(0,0)$ may fall short of $\hat{t}$. In this case, an equilibrium with MNE-organization does not exist. Since EXP-organization is also inconsistent with best-response policies of the two countries, there is no Nash equilibrium in pure strategies under such a parameter domain. In this case, coordination of national tax policies can serve a role by implementing a welfare-improving firm structure (MNE) and sharing welfare gains between the two tax authorities (through lump-sum transfers).

The final item to be determined is what happens at transport cost levels $\rho \in (\rho_I, \rho_V)$. For this parameter domain, tax rates $t_A = \tau_A = 0$ and $t_B > \bar{t}(0,0)$ have been identified as a candidate for a Nash equilibrium in Section 4. However, such an outcome is inconsistent with a best-response policy of country *B* if $f > f_a$, as deviating to a policy with $0 < t_B \leq \bar{t}(0,0)$ (and $\tau_B = 0$) would attract the international producer's headquarters and render MNE-organization the preferred entry mode. This would definitely increase utility of *B*'s representative consumer. Hence, there are again incentives for bidding up the non-discriminatory tax rates in order to attract headquarters of the international producer with MNE-organization. As outlined above, an MNE

equilibrium can only exist if $\hat{t} \leq \bar{t}(0,0)$ holds and it is definitely ruled out if $\rho = \rho_f$, as $\bar{t}(0,0)$ falls to zero at this transport cost level.

5.4 Assuming $L_A > L_B$

For our final robustness check, we reinstate our original assumptions so that $f < f_a < 5(a-c)^2/72$. However, unlike the baseline case, we now introduce an ex ante asymmetry by assuming that country *A* has a greater labor endowment than country *B* does. Without loss of generality, we can assume that $L^A = \lambda L^B$, $\lambda > 1$ (and keep L^B constant at *L*). As long as production remains diversified in both economies, this modification has no impact on production costs. However, there is a market size effect, if the number of consumers rises *pari passu* with the number of workers. This leads to a modified inverse demand curve in country *A*, which is given by

$$p_A = a - D_A / \lambda . \qquad (3')$$

Analogous to Sections 3 and 4, we can then solve the no-tax equilibrium and the Nash equilibrium of the tax game for the case of market size differences. Since this is straightforward, we leave the respective formal analysis open for the interested reader and present the main results in a concise and intuitive way.

First of all, in the no-tax scenario, the international producer still has an incentive to locate its headquarters in country *A*. This incentive is even stronger under EXP-organization, as market size differences matter in the presence of transport costs (cf. Haufler and Wooton, 1999). However, the central result of a potentially suboptimal entry mode also survives in the case of market size differences and, since country *B*'s labor endowment is held constant, the parameter range where a suboptimal entry mode is

realized – (ρ_I, ρ_V) – remains unaffected by changes in λ as long as $\lambda > 1$ and production remains diversified in both economies (see (26) and (30)).

Let us now turn to the tax game. Since the negative effect of the MNE-organization on host country welfare is still present if countries differ in their labor endowments, country *B* can again use its tax instruments to enforce a welfare-improving international firm's mode of foreign market entry. Furthermore, noting the role of profit taxation in our analysis, it is straightforward that the tax rates in Proposition 2 also characterize a Nash equilibrium in the more general model variant with market size differences and $\lambda > 1$. Hence, the insights of Sections 3 and 4 are robust to endowment differences.

6. Conclusion

The goal of this paper has been to demonstrate a heretofore unexplored benefit of tax competition for mobile firms. When an international producer chooses both where to locate its headquarters and how to serve the foreign market, this latter choice can yield a welfare loss not considered in models where the entry mode is exogenous. In particular, we show that there exist situations in which both the firm and the parent country prefer the multinational structure even though this is detrimental from a global perspective. In such a situation, the host country can use its tax rate to enforce a more desirable entry mode, thereby correcting for this externality.

This result should not be taken to imply that tax competition is always beneficial since our model lacks the features that often lead to problems such as inefficient output levels, underprovision of public goods and the like. Nevertheless, our result adds to the

growing list of beneficial aspects of tax competition. The most appropriate view of tax policy must consider both the costs and benefits of non-cooperative taxation in order to arrive at the best implementation of policy. Our hope is that, by synthesizing the latest innovations from the literature on the formation of multinational firms with the literature on tax competition we have added a new facet to this debate.

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Figure 1: Choice of Entry Mode

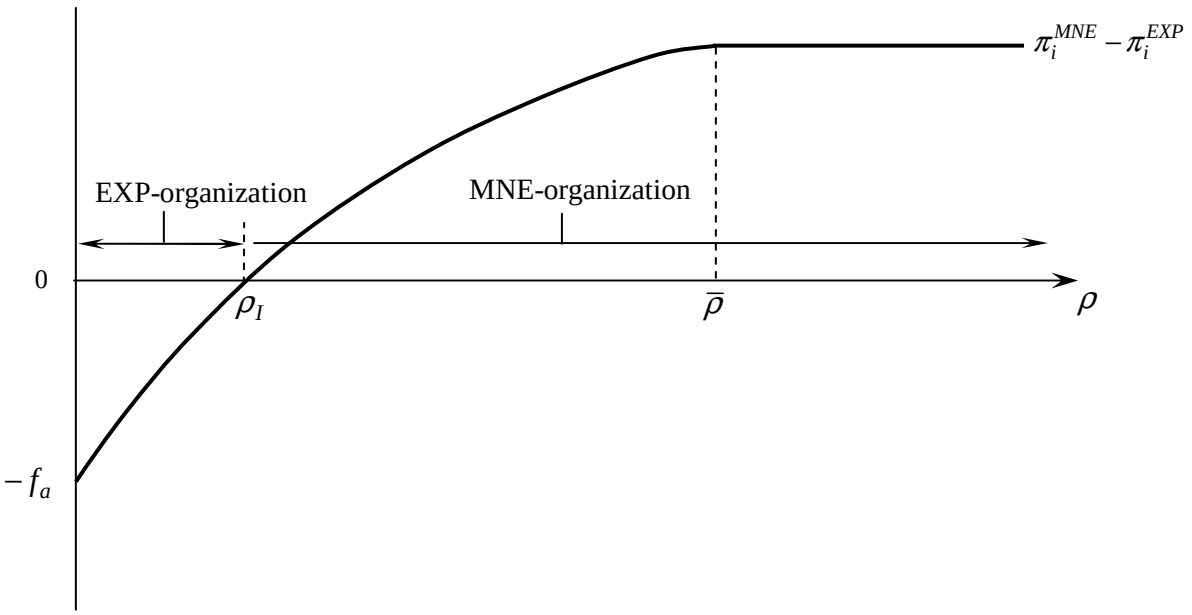

Figure 2: Welfare Implications of Entry Mode

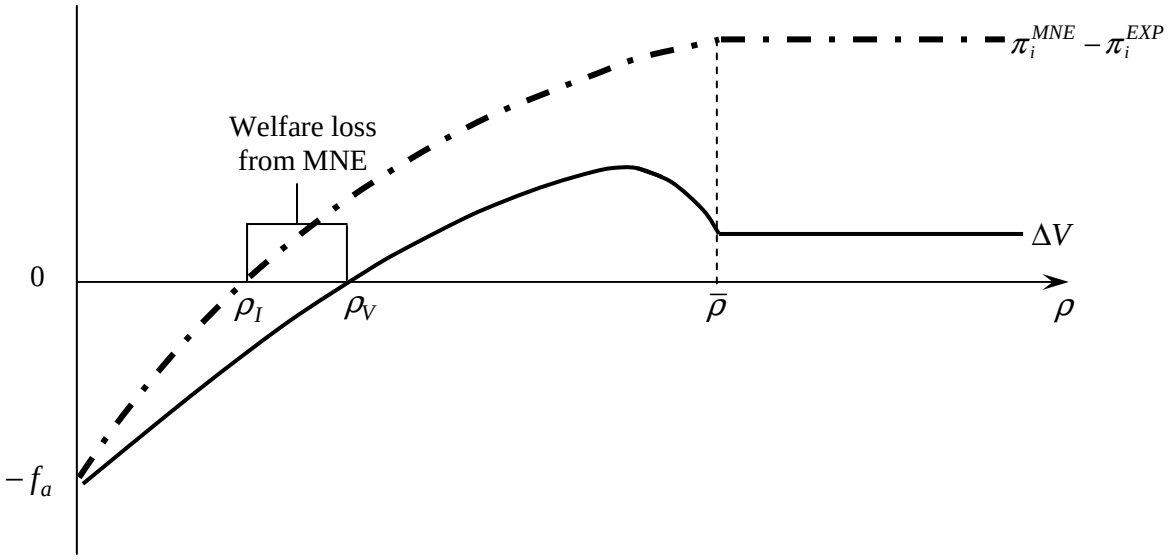

Figure 3: Welfare Differential for Different f_a Levels

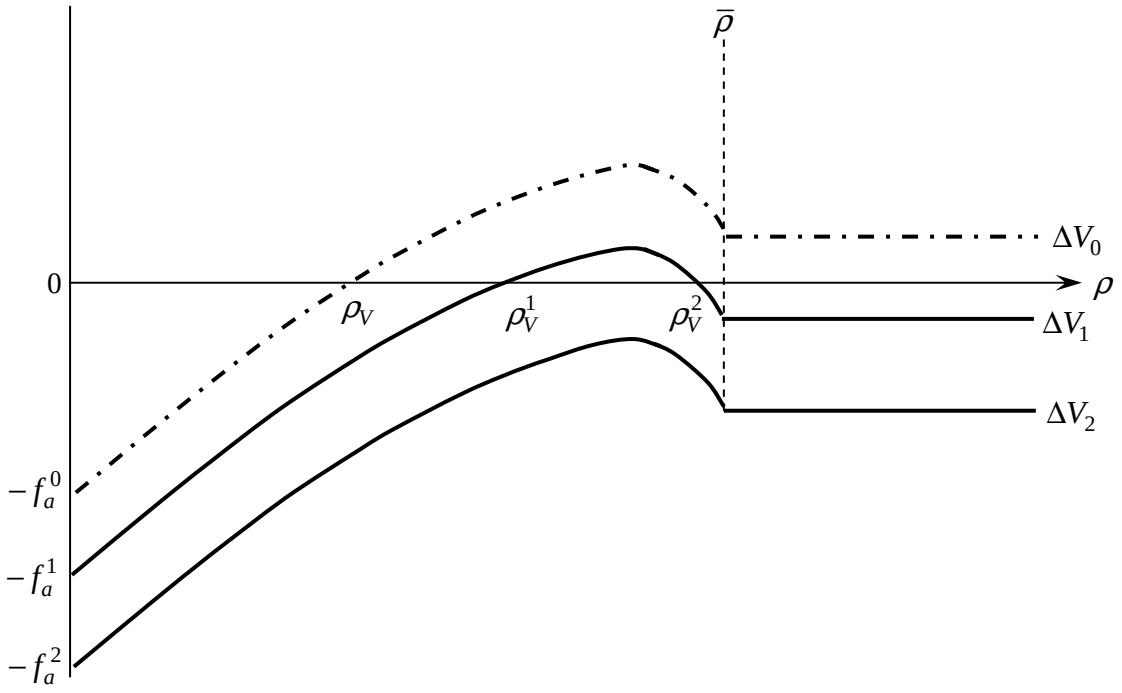

Figure 4: Welfare Differentials when $5(a-c)^2/72 < f < f_a$