Country Size and Tax Competition for Foreign Direct Investment

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Abstract

We analyze tax competition between two countries of unequal size trying to attract a foreign-owned monopolist. When regional governments have only a lump-sum profit tax (subsidy) at their disposal, but face exogenous and identical transport costs for imports, then both countries will always offer to subsidize the firm. Furthermore, the maximum subsidy is greater in the larger region. However, if countries are given an additional instrument of either a tariff or a consumption tax, then the larger country will no longer underbid its smaller rival and its best offer may involve a positive profit tax. In both cases the equilibrium outcome is that the firm locates in the larger market, paying a profit tax that is increasing in the relative size of this market and which is made greater when the tariff (consumption tax) instrument is permitted.

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1 Introduction

When a firm chooses to become a multinational enterprise and establish a foreign production plant, it seldom builds a factory to service only the domestic market of the country in which it is investing. Instead, it establishes a base from which it supplies consumers in surrounding countries. This foreign direct investment (FDI) may have been triggered by efforts at increasing the level of integration between countries in the region, as have recently been taken by regional economic groupings such as the European Union (EU), NAFTA and the ASEAN countries. Thus, for example, the EU's Single Market Initiative has reduced the remaining barriers to trade between member states and has raised the level of competition within the region (see Smith and Venables, 1988). Even if external trade barriers are unchanged, these policies of reducing intra-regional trade costs put suppliers from outwith the region at a disadvantage (for example, transforming the EU into "Fortress Europe"). The foreign firms may respond by setting up production within the region in order to avoid the external trade barriers and avail themselves of access to the single market. Consequently the tariff-jumping incentive to build a branch plant is increased when trade barriers within the region are lowered (see, for example, Norman and Motta, 1993).

In this paper, we investigate what influences a foreign-owned firm in its choice of country in which to invest, once it has opted for foreign direct investment rather than exporting from its home base. In particular, we focus on foreign direct investment in a region in which population is asymmetrically distributed between countries and there are some remaining barriers to intra-regional trade (though these are lower than on trade with countries outside the region). The existence of trade costs creates a "home market bias" familiar from the new trade theory (e.g. Krugman, 1980), which interacts with tax policy as governments attempt to attract the foreign firm by offering investment incentives. Recent empirical work has shown that both market size and the effective tax rate on capital are important factors in influencing multinational firms' choices of countries in which to invest (Devereux and

Freeman, 1995; Devereux and Griffith, 1996; Grubert and Mutti, 1996).

These empirically relevant determinants of FDI lead us to draw on two fields which have traditionally been largely separated in the literature – the new trade theory on the one hand and the public finance related literature on international tax competition on the other. In the trade literature, much of the traditional analysis has examined FDI in a general-equilibrium, competitive setting. Thus Bhagwati and Brecher (1980) establish that international trade can be harmful for a nation in which some of the productive resources are foreign owned. More recent work has focused on imperfectly competitive markets and has introduced transport costs as a model element that plays an important role for the decision whether to export or produce locally. Horstman and Markusen (1992) show that different types of equilibria will arise in a two-firm, two-country setting, depending on the relative importance of unit transport costs vs. fixed costs at the plant and at the firm level. Trade costs also play a critical role in the economic geography model of Krugman (1991), in which the locations of monopolistically competitive firms are endogenously determined by the migration decisions of manufacturing workers. In this model, trade costs encourage agglomeration as they make foreign-produced goods relatively more expensive than goods produced domestically and hence affect the real wage of workers.

Several very recent papers have incorporated tax competition in a framework of imperfectly competitive markets. Markusen, Morey and Olewiler (1995) study a model where governments compete through environmental taxes when production activity causes local pollution and a multinational firm may operate plants in one, both, or none of the competing regions. Environmental tax policy is also studied in Rauscher (1995), who compares non-cooperative and cooperative outcomes when countries compete for the location of a foreign-owned monopolist. Janeba (1996) combines oligopolistic behaviour and international mobility of firms and shows that a second-best efficient zero-tax equilibrium results in this case, in contrast to the subsidy race that occurs in the case where firms cannot relocate production. Walz

and Wellisch (1996) ask whether the decentralized provision of local public inputs is efficient in a setting where the local governments compete for the location of an oligopolistic firm. Lahiri and Ono (1996) consider a small host country that optimally deploys profit taxes and local content rules when a variable number of identical foreign and domestic firms compete in its domestic market. Finally, Ludema and Wooton (1996) extend the Krugman model to allow for tax competition between governments as each country tries to induce workers to migrate by altering its taxes on labour.

On the other hand, most contributions on tax competition in the public finance tradition have adopted a framework of perfect competition, but have introduced various sources of asymmetries between countries and have studied the interaction between different tax instruments. One branch in this literature which is directly relevant for the present work focuses on asymmetric tax competition between countries of different size (Bucovetsky, 1991; Wilson, 1991; Kanbur and Keen, 1993; Trandel, 1994). A general result from this literature is that the small country chooses the lower tax rate and achieves the higher per-capita utility level in the Nash equilibrium, relative to the large country. Another strand in this literature considers the optimal mix of source- and residence-based capital taxation when there is cross-hauling of foreign direct investment and rents from fixed factors cannot be (fully) taxed by a separate instrument (Mintz and Tulkens, 1996; Huizinga and Nielsen, 1997). A still different set of papers with links to the present analysis analyzes subsidy competition for interregionally mobile firms. In Black and Hoyt (1989), two cities are trying to attract firms and benefit from scale economies in the provision of public goods and services. Another reason for subsidy payments is analyzed in Haaparanta (1996), where the competing countries face different levels of exogenously fixed wages. However, none of these papers incorporates trade costs between the competing regions. Hence differences in market size – if they exist – do not affect the location decision of the multijurisdictional firm.

The present paper combines the trade cost element from the new trade

literature with the existence of differences in country size and multiple tax instruments. We argue from the empirical evidence quoted above that this is a relevant setting for studying tax competition for foreign direct investment, producing results that differ critically from those established in the previous literature. Our analysis considers two different settings. Initially, we assume that there are exogenously determined trade costs which are incurred when goods are shipped between countries. In this case, the only instrument available to each government is the ability to tax or subsidize the operations of a firm that invests within its national frontiers. We find that the existence of trade costs reverses the answer to the question whether the large or the small country "wins" the competition for internationally mobile capital. Later, we shall replace the trade costs by a second policy instrument which can either be interpreted as a tariff or – closer to the European setting – as a consumption tax. We show that in the presence of this second instrument the large country will not only be able to attract the firm, it will also quite likely be able to impose a positive profit tax in the locational equilibrium.

Throughout our analysis, we keep the production structure as simple as possible and focus on a monopolist which locates in only one of the two regional markets. Furthermore, we take a partial-equilibrium view of FDI and ignore the consequences of the investment for factor earnings. The optimal tax policy in each region is determined by the gains and losses – in the form of tax revenues and consumer surplus – that arise from having a domestic factory, rather than importing the good from abroad.

The remainder of this paper is organized as follows: section 2 describes the basic model, which applies to both policy settings discussed thereafter. Section 3 analyzes profit tax competition between the two governments when trade costs are exogenous and represent a source of pure waste. Section 4 then turns to the case where trade costs take the form of an additional policy instrument (tariff or consumption tax) and provide a source of tax revenues. Section 5 compares our results with those established in previous contributions on interregional capital tax competition and section 6 concludes.

2 The Model

2.1 The households

Consider a model of a region composed of two countries, labelled A and B. Two goods are consumed in each country: the numeraire good Z is produced by competitive firms, while good X is produced by a monopolist intent on establishing production facilities in one of the countries to service the regional market. Preferences in both countries are identical and equal to:[1]

$$u_i = \alpha\, x_i - \frac{1}{2}\,\beta\, x_i^2 + z_i \quad \forall \quad i \in \{A, B\}, \tag{1}$$

where u_i is the utility of a representative household and x_i and z_i are its consumption of goods X and Z, respectively. We assume that there is a single household in country B and $n > 1$ identical households in country A. Therefore, without loss of generality, country A is the large marketplace for good X in the region.

Each household supplies one unit of labour for which it receives a wage of w, in units of the numeraire good Z. Furthermore, we assume that in each country all revenues that the government obtains from taxation are distributed equally and in a lump-sum fashion across the population. If these revenues are negative, then our treatment implies symmetrically that each government can impose lump-sum taxes on its population. Denoting total tax revenues by T_i, the budget constraints facing a representative household in each region are:

$$w + \frac{T_A}{n} = z_A + q_A x_A, \qquad w + T_B = z_B + q_B x_B, \tag{2}$$

where q_i is the consumer price of good X in country i. Maximization of (1) subject to the budget constraint (2) yields the representative household's

[1]The quadratic utility functions in (1) are frequently used in the new trade literature because they offer a simple way to compare welfare levels in discrete choice problems as the one studied here (see, for example, Markusen and Horstman, 1992 and Markusen, Morey and Olewiler, 1995). As we will point out, however, some of our results do not depend on this specific utility structure.

inverse demand for good X:

$$\alpha - \beta x_i = q_i \quad \forall \quad i \in \{A, B\}.$$

Note that the individual's tax receipts or payments do not enter the demand function for good X since, at the margin, income changes affect only the demand for the numeraire good Z. Aggregating over households in country A and rewriting yields the market demand curves for the two countries:

$$X_A = n\, x_A = \frac{n\,(\alpha - q_A)}{\beta}\,,$$

$$X_B = x_B = \frac{\alpha - q_B}{\beta}\,. \tag{3}$$

Hence the market demand curve of the small country B is steeper than the demand curve of country A. This has immediate implications for the optimal price policy of the monopolist, to which we now turn.

2.2 The firm

We assume that the firm cannot price discriminate between markets and consequently charges the same producer price p (the consumer price net of trade costs), irrespective of the country in which the good is sold. This assumption can be motivated either by the existence of a common competition policy as in the EU (Smith and Venables, 1988), or by international anti-dumping regulations which prohibit price discrimination between markets (Haaland and Wooton, 1995). The consumer price of good X in country i will, however, depend on whether it is locally produced or imported from the other country in the region, as imports incur a trade cost of τ_i per unit.[2] We therefore have to distinguish between the cases of the monopolist setting up in country A and its establishing production facilities in country B. Let q_i^j denote the

[2] In section 4, the price wedge between markets will take the form of a tariff or a consumption tax. Good Z is assumed to be freely traded at all times (that is, without trade costs or tariffs).

consumer price of good X in country i when it is manufactured in country j. This leads to the following price relations:

$$\begin{aligned} q_A^A &= p_A, \qquad q_B^A = p_A + \tau_B \qquad \text{for FDI in country A,} \\ q_A^B &= p_B + \tau_A, \qquad q_B^B = p_B \qquad \text{for FDI in country B.} \end{aligned} \tag{4}$$

We assume a very simple production structure. There is a one-time fixed cost of setting up production in either country, and this is sufficiently large to ensure that the firm will not choose to operate plants in both countries. Labour is the single factor of production and the production technology has constant returns to scale. The input of one unit of labour is necessary for the production of one unit of good X so that marginal cost is equal to the wage rate w. In order to focus on differences in country size we assume the wage rate to be the same in both countries.

The host country can levy a lump-sum tax (subsidy, if negative) on the firm's profits if it sets up operations within its frontiers. In a stylized form, this tax instrument incorporates both direct investment subsidies paid to firms and (cash flow) taxes on pure profits. Let the tax set by host country i be t_i. Net profits of a firm based in country i will be its profits from sales in both countries less this tax.[3] Since X_i are the firm's aggregate sales in each country this gives

$$\begin{aligned} \Pi_A &= (p_A - w)\ \left[X_A(q_A^A) + X_B(q_B^A)\right] - t_A \qquad \text{for FDI in country A,} \\ \Pi_B &= (p_B - w)\ \left[X_A(q_A^B) + X_B(q_B^B)\right] - t_B \qquad \text{for FDI in country B.} \end{aligned}$$

Substituting the demand equations (3) and the consumer price definitions (4)

[3]Our treatment implies that the *source principle* of taxation is relevant for foreign direct investment. The home countries of multinational enterprises typically allow the firm to defer taxes on the profits of foreign subsidiaries until these profits are repatriated. Furthermore, they generally limit the tax credit that the multinational can claim for the taxes paid in the host country to the residence country's own tax rate on the same income. Both of these practices imply that corporate taxation indeed conforms quite closely to the source principle (cf., for example, Tanzi and Bovenberg, 1990, and the references cited there).

yields

$$\Pi_A = \frac{(p_A - w)}{\beta}\left[(\alpha - p_A)\,(n+1) - \tau_B\right] - t_A,$$

$$\Pi_B = \frac{(p_B - w)}{\beta}\left[(\alpha - p_B)\,(n+1) - n\,\tau_A\right] - t_B. \tag{5}$$

The optimal price policy of the firm will generally depend upon its choice of location. Differentiating each of the profit expressions in (5) and solving for the optimal prices yields:

$$\hat{p}_A = \frac{1}{2}\left[\alpha + w - \frac{\tau_B}{(n+1)}\right] \quad \text{for FDI in country A,}$$

$$\hat{p}_B = \frac{1}{2}\left[\alpha + w - \frac{n\,\tau_A}{(n+1)}\right] \quad \text{for FDI in country B.} \tag{6}$$

Note that prices are independent of the lump-sum taxes on establishment set by each country, but do depend on the trade cost. If trade costs are the same in both directions ($\tau_A = \tau_B$), then the firm will charge a lower producer price if it settles in the smaller country B than if it were to establish in country A. This result is obtained because the majority of trade costs are avoided by the firm producing in its larger market. Hence there is an incentive for the firm to locate in the large market – the "home market bias" familiar from the new trade literature – if wages and tax rates are equal in the two countries.

Inserting (6) into (5) gives the maximum profits attainable from locating in a particular country:

$$\hat{\Pi}_A = \frac{\left[(n+1)\,(\alpha - w) - \tau_B\right]^2}{4\,(n+1)\,\beta} - t_A,$$

$$\hat{\Pi}_B = \frac{\left[(n+1)\,(\alpha - w) - n\,\tau_A\right]^2}{4\,(n+1)\,\beta} - t_B. \tag{7}$$

The firm will be indifferent between locating in country A or country B if $\hat{\Pi}_A = \hat{\Pi}_B$. We define by $\Gamma \equiv t_A - t_B$ the amount by which country A's tax can exceed that of country B and still leave the firm indifferent between production locations. This "tax premium" that the firm is willing to pay for locating in country A is given by:

$$\Gamma = \frac{\left[2(n+1)\,(\alpha - w) - n\,\tau_A - \tau_B\right](n\,\tau_A - \tau_B)}{4\,(n+1)\,\beta}\,. \tag{8}$$

Equation (8) determines the location decision of the firm for any given set of tax rates t_i and transport costs τ_i. In the following we will consider two different cases. In section 3, transport costs are exogenous and assumed to be equal across countries so that tax competition between national governments occurs solely with respect to the lump-sum tax t_i. In section 4, the transport costs are re-interpreted as tariffs or – equivalently in the present framework – consumption taxes on good X. Hence governments have two instruments at their disposal and we will analyze how this affects the outcome of tax competition between the large and the small region.

3 Tax Competition with Symmetric Trade Costs

In this section we assume that trade costs (transportation costs) are exogenous and equal to τ per unit, no matter in which direction good X is shipped. In this case equation (8) simplifies to:

$$\Gamma = \left[(n-1)\,\left(\alpha - w - \frac{\tau}{2}\right)\right]\,\frac{\tau}{2\,\beta}\,. \tag{9}$$

This expression is zero when countries are of equal size ($n = 1$); the model is then completely symmetric and the firm has no preferences for locating in either country. For $n > 1$, however, Γ must be unambiguously positive since $\alpha - w - \tau/2 > 0$ gives the average of the gross profits earned from selling the *first* unit of output in the two national markets. Thus country A can set a higher tax rate than country B, yet still attract the firm. We note that this result is not confined to the case of linear demand functions but it will hold for any downward-sloping market demand curve as long as preferences in the two countries are identical. Furthermore, differentiating (9) with respect to τ gives:

$$\frac{d\Gamma}{d\tau} = \frac{(n-1)\,(\alpha - w - \tau)}{2\beta}\,,$$

which is positive for positive sales in the importing region. Hence the tax premium that the firm is willing to pay for locating in country A is larger, the greater are the per-unit trade costs τ.

Each government compares the welfare of its representative household when the country is host to the firm to that when it is not. The income of the representative household in country A arises from the earnings from employment together with its share of any tax revenues collected (and re-distributed lump-sum) by the government. Thus the household's budget constraint in country A [cf. eq. (2)] is:

$$\begin{aligned} q_A^A\, x_A + z_A &= w + \frac{t_A}{n} && \text{for FDI in country A,} \\ q_A^B\, x_A + z_A &= w && \text{for FDI in country B.} \end{aligned} \tag{10}$$

Substituting (10) together with the demand function (3), the consumer price definitions (4) and the firm's profit-maximizing producer prices (6) into the utility function (1) yields for country A:

$$\begin{aligned} u_A^A &= \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)+\tau}{2(n+1)}\right]^2 + w + \frac{t_A}{n} && \text{for FDI in country A,} \\ u_A^B &= \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)-(n+2)\,\tau}{2(n+1)}\right]^2 + w && \text{for FDI in country B.} \end{aligned} \tag{11}$$

The government of country A (and its citizens) will be indifferent between being the host and importing the good when $u_A^A = u_A^B$. This equality determines the minimal tax rate, or the maximum subsidy, that country A is willing to offer in order to attract the firm. Solving for this tax rate, which is denoted by $\tilde{t}_A$, gives:

$$\tilde{t}_A = \frac{-n\,(n+3)\,\tau\,[2(\alpha-w)-\tau]}{8(n+1)\,\beta} < 0. \tag{12}$$

Thus country A would be prepared to subsidize the firm in order to induce it to locate within its borders. As home production reduces the consumer price for good X in country A, relative to importing, a lump-sum subsidy can be paid to the firm that still leaves consumers in country A equally well off than if they had to import good X from country B. Note that q_A^A (the consumer price with home production) is less than q_A^B (the consumer price with importing) even though the firm's producer price will be higher if it

locates in country A [cf. eq. (6)]. However, the difference in producer prices will be less than the trade cost per unit; this follows from the fact that a monopolist will not find it optimal to fully shift a cost increase into consumer prices if demand functions are linear.[4]

Similar calculations can be carried out for country B. The household budget constraint for this country is:

$$\begin{aligned} q_B^A\, x_B + z_B &= w \qquad && \text{for FDI in country A,} \\ q_B^B\, x_B + z_B &= w + t_B \qquad && \text{for FDI in country B.} \end{aligned} \tag{13}$$

Substituting (13) along with (3), (4) and (6) into the utility function (1) gives for country B:

$$\begin{aligned} u_B^A &= \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)-(2n+1)\,\tau}{2(n+1)}\right]^2 + w \qquad && \text{for FDI in country A,} \\ u_B^B &= \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)+n\,\tau}{2(n+1)}\right]^2 + w + t_B \qquad && \text{for FDI in country B.} \end{aligned} \tag{14}$$

Setting $u_B^A = u_B^B$ determines the tax rate at which country B is indifferent between having good X produced at home or abroad:

$$\tilde{t}_B = \frac{-(3n+1)\,\tau\,[2(\alpha-w)-\tau]}{8(n+1)\,\beta} < 0. \tag{15}$$

Thus, country B is also ready to offer a subsidy in order to get the foreign direct investment and save transportation costs. To see which of the two countries offers the higher subsidy we compare the tax rates in (12) and (15) and define $\Delta \equiv \tilde{t}_A - \tilde{t}_B$ to be the difference between the profit tax rates at which both countries would be indifferent between being host and importer. This gives:

$$\Delta = \frac{-(n^2-1)\,\tau\,[2(\alpha-w)-\tau]}{8(n+1)\,\beta} < 0. \tag{16}$$

[4]Note that the precise level, but not the sign of the tax rate $\tilde{t}_A$ is affected by our assumption that the government of country A can levy lump-sum taxes from its residents in order to finance a subsidy to the firm. If distortive taxes had to be used instead, then $\tilde{t}_A$ would be smaller in absolute value but it would still be negative.

Hence country A is always prepared to offer a bigger subsidy to the firm than would be offered by country B. This result seems surprising at first glance since the benefits of home production in the form of reduced consumer prices are higher in country B. By the argument made earlier, this last observation follows because country B not only saves transport costs if it is able to attract the firm, but the producer price [eq. (6)] will also be lower in this case. However, the *per capita costs* of the subsidy are smaller in country A since there are a larger number of residents who share in the aggregate tax burden. For the utility specification chosen here, the latter effect dominates the former and country A offers the higher subsidy because of this "club-good" effect.[5]

The next step is to bring together equations (9) and (16), which summarize the conditions under which the firm on the one hand and the two governments on the other are indifferent between the two alternative outcomes. From (9) we know that the firm is willing to accept a higher tax level in country A and still locate there, whereas (16) states that the maximum subsidy country A would be willing to offer is higher than that of country B. Hence it is immediately clear in this setting of exogenous and equal transport costs that the firm will settle in the large country A.

However, to attract the firm, country A need not actually pay the subsidy $\tilde{t}_A$; it suffices to slightly improve (from the perspective of the firm) on the best offer of country B in order to get the investment.[6] Country A's *optimal* tax rate is thus $\hat{t}_A \equiv \tilde{t}_B + \Gamma$. Given country B's best offer, this is the maximum tax that country A can charge while keeping the firm indifferent between locations.[7] Taking country B's best offer from (15) and substituting into (9)

[5] We note that, with more general utility and demand functions, it may not be possible to unambiguously sign the term Δ in eq. (16). However, as the following discussion will show, this is also not required for our main argument.

[6] This is a standard result from the theory of auctions: the winner of the auction pays a price equal to the valuation of his last remaining rival and earns some economic rent. See, e.g., McAfee and McMillan (1987).

[7] Note that this always implies positive net profits to the firm in equilibrium since gross profits are positive in country B [eq. (7)] and country B's best offer involves a subsidy to the firm.

yields:

$$\hat{t}_A = \frac{(2n^2 - 3n - 3)\,\tau\,[2(\alpha - w) - \tau]}{8(n+1)\,\beta}\,. \tag{17}$$

A slightly lower tax (higher subsidy) than given in (17) will guarantee that the firm sets up in country A. From the quadratic equation in the numerator of the equation, one can establish that country A will actually be able to charge a *positive* profit tax if its market is sufficiently large, relative to that of country B. The critical value at which country A's optimal tax rate turns positive is $n \approx 2.19$. Differentiating $\hat{t}_A$ with respect to relative market size gives:

$$\frac{d\hat{t}_A}{dn} = \frac{n\,(n+2)\,\tau\,[2(\alpha - w) - \tau]}{4(n+1)^2\,\beta} > 0,$$

and so the optimal tax charged by country A is increasing with the relative size of the country.

One caveat to our analysis is that the firm always has the outside option of not locating in the region at all, but rather to export to both countries A and B from its home base. Thus there may be an additional limit to the taxing power of the large country A which is not modelled in the present paper. The exporting vs. FDI decision has been extensively discussed in several recent studies (e.g. Markusen and Horstman, 1992; Markusen, Moley and Olewiler, 1995; Norman and Motta, 1993). In particular, Norman and Motta (1993) have shown that continuing integration within a union makes local production in *one of* the union countries more attractive because it reduces the costs of exporting from this country to its union partners, relative to the costs of exporting from a third (non-member) state. Hence as long as extra-regional trade costs are sufficiently high, the firm will have an incentive to directly invest in country A at all relevant levels of $\hat{t}_A$ offered by this country.

4 Tax Competition with Two Instruments

We now assume that the wedge between the consumer prices in the two markets arises not from an exogenous trade cost, but from a trade tax chosen

optimally by each of the two countries. For simplicity, we will generally refer to this trade tax as a tariff, but we emphasize that the additional instrument can equivalently be seen as a consumption tax. The equivalence is strict in our model because there is no domestic production of good X in the importing country. The interpretation of the trade tax as a consumption tax is, of course, especially important in a EU context. As is argued, for example, in Keen (1987, 1989) there is evidence that nationally chosen levels of specific commodity taxation in the EU include a strategic element to discriminate against imports and thus act as a partial substitute for import tariffs.

To incorporate the additional policy instrument, we must first modify the budget constraints to take into account that tariffs – in contrast to transportation costs – represent a source of revenues for the importing country.[8] Hence the budget constraint for country A is now:

$$\begin{aligned} q_A^A\, x_A + z_A &= w + \frac{t_A}{n} && \text{for FDI in country A,} \\ q_A^B\, x_A + z_A &= w + \tau_A\, x_A && \text{for FDI in country B,} \end{aligned} \tag{18}$$

and similarly for country B:

$$\begin{aligned} q_B^A\, x_B + z_B &= w + \tau_B\, x_B && \text{for FDI in country A,} \\ q_B^B\, x_B + z_B &= w + t_B && \text{for FDI in country B.} \end{aligned} \tag{19}$$

Recall that, due to our assumption of quasi-linear preferences, this change in the representative individual's budget constraint has no effect on the market demand functions for good X [eq. (3)]. Furthermore, the profit-maximizing price chosen by the firm in each particular location is independent of the source of the trade cost. Hence, the model presented in section 2 is completely unchanged when we replace exogenous transportation costs by endogenously

[8] If the tax is interpreted as a consumption tax, then this instrument is also available to the host country. However, in our model the only reason for the host country to employ the specific commodity tax is to indirectly tax the profits of the firm. But this can be done directly with the profit tax t_i, which does not distort the consumer's choice between goods X and Z. Hence, in the optimum, the host country will always choose *not* to employ the commodity tax, and this is why we can neglect this instrument from the outset.

chosen tariffs. Note, however, that equation (8) – which summarizes the conditions under which the firm is indifferent between locations – now depends on both the tariffs and the profit tax rates chosen by the two governments.

Governments again compare the utility of the representative consumer in the situations where the monopolist locates at home or abroad. Incorporating the budget constraints (18)–(19) and using (3), (4) and (6) gives for country A:

$$u_A^A = \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)+\tau_B}{2(n+1)}\right]^2 + w + \frac{t_A}{n} \qquad \text{for FDI in country A,}$$

$$u_A^B = \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)+n\,\tau_A}{2(n+1)}\right]^2 + w - \frac{\tau_A^2}{2\,\beta} \qquad \text{for FDI in country B,} \tag{20}$$

and for country B:

$$u_B^A = \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)+\tau_B}{2(n+1)}\right]^2 + w - \frac{\tau_B^2}{2\,\beta} \qquad \text{for FDI in country A,}$$

$$u_B^B = \frac{1}{2\,\beta}\left[\frac{(n+1)\,(\alpha-w)+n\,\tau_A}{2(n+1)}\right]^2 + w + t_B \qquad \text{for FDI in country B,} \tag{21}$$

Comparing (20)–(21) with the analogous expressions in the case of exogenous transportation costs [eqs. (11) and (14)] shows that the utility expressions are unchanged for the host country, except that they now depend on the tariff in the other region rather than the exogenous transportation cost. In contrast, the utility level for an importing region is changed through the additional revenue collected from the tariff.[9]

From eqs. (20) and (21) we can determine the optimal tariff that each country will set when it fails to induce the firm to set up local production facilities. Thus the optimal tariff for country A is determined from the second equation in (20) while country B's optimal tariff is obtained from the first

[9] In the importing regimes of (20)–(21), the tariff terms in the squared bracket are positive whereas they were negative in (11) and (14). Hence tariff revenue will enter the importing country's utility level with a positive sign, even though the last terms in the importing regimes of (20) and (21) are negative.

equation in (21). Partial differentiation with respect to τ_i yields:

$$\hat{\tau}_A = \frac{n\,(n+1)\,(\alpha - w)}{(n+2)\,(3n+2)} > 0,$$

$$\hat{\tau}_B = \frac{(n+1)\,(\alpha - w)}{(2n+1)\,(2n+3)} > 0. \tag{22}$$

Thus each country will set a positive tariff if it imports good X. The intuition underlying this result is a conventional terms of trade argument since the tariff reduces the producer price chosen by the monopolist located in the other country [eq. (6)]. Furthermore, for $n > 1$ we can see that $\hat{\tau}_A$ must exceed $\hat{\tau}_B$; the numerator is larger, but the denominator is smaller in the optimal tariff formula for country A. Of course, this is because country A, as the larger country, enjoys the greater monopoly power in trade.

The optimal tariffs obtained above can now be substituted into the conditions under which both the firm and the governments are indifferent between alternative location decisions. Given that each country will optimally tax its imports when it cannot attract the firm, the profit tax differential $\Gamma \equiv t_A - t_B$ that leaves the firm indifferent between the two locations is given by inserting (22) into (8). This gives, after straightforward manipulations:

$$\Gamma = \frac{(\alpha - w)^2\, 2(n+1)^4\,(n-1)}{2\beta\,\gamma^2}\ \left[\gamma + 8(n+1)^4 + 16n\,(n+1)^2 + 3n^2\right], \tag{23}$$

where

$$\gamma = (2n+3)\,(2n+1)\,(3n+2)\,(n+2) > 0.$$

Hence the firm is again willing to pay a "tax premium" for locating in the large market. This premium is now due to two distinct factors: if the firm should locate in country B, then a larger number of its customers face the tariff, and the tariff imposed by country A is higher than the tariff that would be chosen by country B. While the first of these two effects is the direct analogue to the transportation cost analysis of the previous section, the second effect stems from the endogeneity of the trade cost component in the present setting. Overall then, the availability of the new tax instrument

tends to further strengthen the incentive for the firm to locate in the large country A.

To derive the taxes at which governments would be indifferent between importing the good and having local production, we substitute (22) into (20)–(21). This gives for country A:

$$\hat{u}_A^A = \frac{1}{2\,\beta}\left[\frac{2(n+1)^2\,(\alpha-w)}{(2n+3)\,(2n+1)}\right]^2 + w + \frac{t_A}{n} \qquad \text{for FDI in country A,}$$

$$\hat{u}_A^B = \frac{1}{2\,\beta}\left[\frac{(n+1)^2\,(\alpha-w)^2}{(3n+2)\,(n+2)}\right] + w \qquad \text{for FDI in country B} \tag{24}$$

and analogously for country B:

$$\hat{u}_B^A = \frac{1}{2\,\beta}\left[\frac{(n+1)^2\,(\alpha-w)^2}{(2n+3)(2n+1)}\right]^2 + w \qquad \text{for FDI in country A,}$$

$$\hat{u}_B^B = \frac{1}{2\,\beta}\left[\frac{2(n+1)^2\,(\alpha-w)}{(3n+2)(n+2)}\right]^2 + w + t_B \qquad \text{for FDI in country B} \tag{25}$$

Country A is indifferent between being host and being importer when $u_A^A = u_A^B$ in (24). This gives the minimum tax (maximum subsidy) that country A is willing to offer the monopolist:

$$\tilde{t}_A = \frac{n\,(n+1)^2\,(\alpha-w)^2\,\delta_A}{2\,\beta\,\gamma\,(2n+3)\,(2n+1)}\,, \tag{26}$$

where $\gamma > 0$ is given in (23) and

$$\delta_A = 4n^4 + 8n^3 - 4n^2 - 16n - 7.$$

It is easily seen that δ_A is negative for small values of n but turns positive as n increases, with a critical value of $n \approx 1.40$ where country A's best offer involves a profit tax of zero. Hence, in contrast to the case of exogenous transportation costs, country A will not generally offer a subsidy to attract the firm. The reason is that, as n increases, country A will set higher tariffs on the import of good X and benefit from reduced producer prices forced by its tariff. The existence of the second tax instrument thus increases the bargaining power that country A has vis-a-vis the monopolist and will generally enable country A to offer a less favourable tax treatment to the firm.

Analogously, country B is indifferent between being host and being importer when $u_B^A = u_B^B$ in (25). This gives country B's best offer to the firm:

$$\tilde{t}_B = \frac{(n+1)^2\,(\alpha - w)^2\,\delta_B}{2\,\beta\,\gamma\,(3n+2)\,(n+2)}, \tag{27}$$

where

$$\delta_B = -7n^4 - 16n^3 - 4n^2 + 8n + 4 < 0.$$

As in the previous section, country B will thus offer a subsidy to the firm for all values of $n \geq 1$, even though it can set a positive tariff in the case that the firm locates in country A. This shows that it is only the *relative* monopoly power in trade that affects the profit tax rates offered to the firm.

Next, we compare the best offers made by countries A and B. Forming $\Delta \equiv \tilde{t}_A - \tilde{t}_B$ and substituting in from (26) and (27) gives:

$$\Delta = \frac{(\alpha - w)^2\,(n+1)^2\,(n-1)}{2\beta\,\gamma^2}\left\{\gamma\,n + 12(n+1)^4\left[(n+1)^2 + n\right]\right\} > 0. \tag{28}$$

Comparing (28) with the analogous expression in the case where trade costs were exogenous and symmetric [eq. (16)] shows that country A now offers fewer – rather than more – location incentives to the firm, relative to country B. This change in the relative tax levels arises because country A now has an improved alternative to local production. If it has to import, it applies a relatively high optimal tariff and collects the tariff revenues.

When trade costs were exogenous, country A was always willing to subsidize the firm's investment more than was country B. Given the preference of the firm for the larger market, this guaranteed that country A was able to induce the firm to set up there. With endogenous tariffs, however, country A is less willing to subsidize foreign direct investment, raising the question whether country A will still attract local production. Thus we have to compare $\Gamma - \Delta$ from (23) and (28). This gives, after straightforward manipulations:

$$\begin{aligned} \Gamma - \Delta \;&=\; \frac{(\alpha - w)^2\,(n+1)^2\,(n-1)}{2\,\beta\,\gamma^2}\,\left\{(2n^2 + 3n + 2)\,\gamma\right. \\ &+\; \left. 2(n+1)^2\left[2(n+1)^4 + 10n\,(n+1)^2 + 3n^2\right]\right\} > 0. \end{aligned} \tag{29}$$

Since this difference is unambiguously positive, country A will still get the firm, even though it imposes the higher profit tax. Hence it is again the efficient solution that prevails in equilibrium – a smaller number of consumers then faces a lower tariff as compared to production in country B. These aggregate efficiency gains can be divided up between the firm and the government of country A, ensuring that the tax premium that the firm is willing to pay for locating in country A exceeds the tax premium implied by country A's best offer.[10]

In the following we assume again that country A is able to appropriate the entire locational rent by offering a tax rate $\hat{t}_A$ that leaves the firm only marginally better off than if it accepted the best offer of country B. Hence $\hat{t}_A = \Gamma + \tilde{t}_B$ and substituting in from (23) and (27) gives:

$$\hat{t}_A = \frac{(\alpha - w)^2\,(n+1)^2}{2\,\beta\,\gamma^2} \qquad \Big\{2(n-1)\,(n+1)^2\,\Big[\gamma + 8(n+1)^4 + 16n\,(n+1)^2 + 3n^2\Big] + [4(n+1)^2 - 1]\,\delta_B\Big\}, \tag{30}$$

where $\delta_B < 0$ is given in (27). To interpret (30), let us first consider the benchmark case where countries are of equal size. For $n = 1$ the positive first term in the square bracket disappears and country A must offer a subsidy to the firm to induce home production. For sufficiently small differences in size, country A's optimal profit tax rate will thus still be negative, even if it has the additional tariff instrument. However, as n increases, the optimal tax rate $\hat{t}_A$ grows more rapidly now than in the case of exogenous transportation costs, and turns positive at a value of $n \approx 1.08$. This compares with a critical value of $n \approx 2.19$ in the case without tariffs. Hence the existence of a second tax instrument raises the likelihood that country A is able to charge a positive profit tax rate in the locational equilibrium.

[10] This efficiency result is well known for auctions of the simple type modelled here (McAfee and Mc Millan, 1987). It is also emphasized in Black and Hoyt (1989).

5 Discussion of Results

This section compares the results of the present model with those derived in the previous literature on capital tax competition. In particular, we will argue that introducing trade costs to a model of tax competition between two countries of different size critically affects the results obtained and points to an important difference between the competition for financial capital versus the competition for foreign direct investment.

The first contrast with previous results concerns the sign of the profit tax rate that is imposed on the firm in the locational equilibrium. Haaparanta (1996) considers two countries that differ both in their exogenously fixed wage rate (creating unemployment) and in country size. There are no trade costs in his model, however. Under these conditions it turns out that differences in market size are inessential for the optimal tax policy. Both countries will always subsidize foreign direct investment in equilibrium in an attempt to alleviate domestic unemployment. An alternative reason for subsidy payments to the firm is given in Black and Hoyt (1989) where the labour market is cleared but countries attempt to realize scale economies with respect to the provision of public goods and services. Black and Hoyt show that under these conditions the maximum bid of both countries always involves a subsidy to the firm, even if countries differ with respect to a non-labour cost component.

In contrast, there is a distinct possibility in the present model that the large country is able to extract a positive tax rate from the firm that locates within its borders. In the presence of trade costs, the difference in country size gives rise to a location-specific rent that the firm can earn in the large country, and this in turn allows the large country to tax some of these rents in equilibrium. Moreover, if the tariffs (consumption tax) instrument is added then even the *best offer* of the large country may involve a positive profit tax rate. This links our paper to contributions by Mintz and Tulkens (1996) and Huizinga and Nielsen (1997) where countries are small in perfectly competitive capital markets but location-specific rents derive from

fixed domestic factors. In these models positive taxes on internationally mobile capital serve as an indirect way of taxing rents, which cannot be (fully) taxed by an independent instrument.

The difference between our model and those of Mintz and Tulkens (1996) and Huizinga and Nielsen (1997) is that we link the source of the locational rent directly to an observable country characteristic – market size. This brings us to the second departure from the existing literature on capital tax competition, which concerns the question whether the large or the small country "wins" the competition for mobile capital. Bucovetsky (1991) and Wilson (1991) have shown that when two countries of different size, but with equal per capita endowments, compete for internationally mobile capital, then the small country faces the more elastic tax base and hence chooses the lower tax rate in the non-cooperative tax equilibrium. As a consequence, the small region attracts a more than proportional share of mobile capital and achieves a higher per-capita utility level than the large region (Wilson, 1991, Propositions 1 and 2).

In the present model, the small country will also underbid the large country, if both countries have an additional trade tax at their disposal (section 4). In this case, the lower monopoly power in trade induces the small country to offer the higher subsidy to the firm, even though the per-capita costs of a given, aggregate subsidy are higher than in the large region. The small country's higher elasticity of the domestic tax base and its reduced potential to use restrictive trade policies as a bargaining device towards the firm may thus serve as complementary and mutually compatible explanations for the empirical observation that small countries tend to have lower rates of capital taxation.

However, in contrast to the earlier literature, the large region "wins" the competition for foreign direct investment in the present model in that it attracts the foreign firm. Furthermore, the large country A will always have the higher per capita welfare level in the resulting locational equilibrium. The last result is easily established for both cases covered in our analysis by

noting that country A's welfare if it is host cannot fall below the level of u_A^B in eqs. (11) and (24), and it will actually be higher since country A does not have to offer the tax rate $\tilde{t}_A$ to get the firm. Since, for $n > 1$, u_A^B is in turn greater than u_B^A in (14) and (25), the per capita utility level that country A achieves in equilibrium must exceed the utility level obtained by country B.

The critical difference between the two approaches lies again in the existence of trade costs, which implies that population size has *two* counteracting effects in the present model. The first effect is that the large country will (in the second model with endogenous trade costs) charge the higher profit tax rate in equilibrium. At the same time, however, there is a second effect of country size since the existence of transport costs gives the firm an incentive to locate in the larger market. As our analysis has shown, the second effect will dominate in equilibrium and the large country is able to attract the firm despite the higher tax that it charges. When trade costs are excluded, however, then only the first of these two effects is present and capital always locates in the low-tax region.

Empirical evidence strongly suggests that market size is an important determinant for the location of foreign direct investment in a particular country. Surveying the theoretical and empirical literature on the role of multinational corporations, Cantwell (1994) concludes that much of foreign direct investment since 1945 has been local market-oriented. Similarly, recent econometric studies find that the size of the host country has a positive and significant effect on the probability of a U.S. multinational to invest in this country – this is true both in a European context (Devereux and Griffith, 1996) and worldwide (Grubert and Mutti, 1996). Furthermore, Grubert and Mutti also find a statistically significant and positive relationship between country size and the effective average tax rate on capital, indicating that larger countries can afford higher tax rates.

In the new trade literature it has become common to distinguish sharply between the modelling of portfolio investments on the one hand and foreign direct investment on the other (Cantwell, 1994). With respect to the latter,

trade costs have become a standard model element that allows to capture the empirically confirmed role of country size in a simple way. In contrast, models of tax competition in the public finance tradition typically do not consider trade costs, so there is often no clear analytical distinction between the two types of foreign investment. We argue here that this distinction can be critical in a setting where countries of unequal size engage in tax competition. To give a simple example, Luxembourg attracts a large amount of foreign portfolio capital through low taxes, quite in line with the results of Bucovetsky (1991) and Wilson (1991) that small countries win tax wars. At the same time, Luxembourg is clearly a less attractive host country for foreign direct investment, even though corporate taxes are low by international standards. This suggests to us that while agglomeration effects – or trade costs – may be relatively unimportant for portfolio investment, they cannot be neglected in a model of foreign direct investment.

6 Conclusion

The previous literature on fiscal competition between countries of unequal size has led to a general notion that (sufficiently) large countries "win" tariff wars, whereas small countries gain from capital tax competition (see Wilson, 1991). In this paper we have introduced an element of the new trade literature – trade costs, capturing agglomeration effects – to reconsider this issue in a framework where two countries compete for the location of a foreign-owned monopolist. Two alternative settings have been analyzed. First, when countries have only a lump-sum profit tax (subsidy) at their disposal, but face exogenous and identical transport costs for imports, then both countries will always offer to subsidize the firm. Furthermore, the maximum subsidy is greater in the larger region. However, if countries are given an additional instrument of either a tariff or a consumption tax, then the larger country will no longer underbid its smaller rival and its best offer may involve a positive profit tax. The equilibrium outcome in both cases is that the firm locates in

the larger market, paying a profit tax that is increasing in the relative size of this market and which is made greater for any given difference in market size when the tariff (consumption tax) instrument is permitted. Hence, in a setting with trade costs, both tax and tariff competition work in favour of the large country.

Two further aspects of our analysis may be worth emphasising. The first point is that, in the presence of the tariff instrument, even small differences in country size lead to a positive profit tax rate being charged by the large country in the locational equilibrium. This result may be interesting in view of the obvious difficulties that many existing models of tax competition have in explaining the persistence of relatively high corporate tax rates in EU countries. In the existing literature on capital tax competition, with its emphasis on competitive markets and the absence of trade costs, the optimal capital tax for a large country is determined by terms of trade considerations. This, however, implies that the optimal capital tax rate should change signs when the country switches from being a net capital importer to being a capital exporter – a prediction that is clearly at odds with empirical evidence (cf. Gordon, 1992). Instead, in the present model the ability of the large country to charge positive profit taxes depends on the advantage of a large home market, which offers a location-specific rent to the firm. We would argue that this effect should not be neglected in a model that tries to explain existing taxes on corporate profits.

The second point concerns the available set of tax instruments – a feature that is known to be of critical importance in many optimal taxation analyses. In our model, the threat to impose high taxes on imports – either in the form of tariffs or of consumption taxes – serves as a bargaining tool for large countries, enabling them to charge relatively high profit tax rates from firms locating in their jurisdiction. Turned around, this implies that the elimination of internal market barriers is likely to force these countries to offer lower profit taxes (or even subsidies) for any given market size advantage that the large country has vis-a-vis its neighbours. Importantly, to the extent

that current patterns of commodity taxation include a strategic element to discriminate against foreign imports (Keen, 1987, 1989), similar effects can be expected from supranational efforts to align commodity tax rates in the EU. Commodity tax harmonization may thus have unexpected repercussions on the optimal levels of capital taxation with which EU member states compete for foreign direct investment.

Finally, we briefly assess the robustness of our results in more general settings. A first and obvious extension is to consider the case of more than two countries competing for FDI. If countries differ only in population size, then we would expect that it is again the largest market which attracts the firm. However, the optimal tariff (or consumption tax) of the largest country will now depend on its relative size vis-a-vis all other countries. Furthermore, the size of the second largest country will be critical in determining which offer the biggest country has to beat. Essentially, the equilibrium profit tax that the largest country can extract from the firm will then depend on its market size advantage over the *next largest* competitor.

Secondly, our partial equilibrium analysis has neglected the factor market repercussions of foreign direct investment. In particular, if there is unemployment in the potential host countries then the incentives to attract the firm will increase (Brander and Spencer, 1987). Furthermore, the employment effects of a given level of foreign direct investment – and thus the per capita gain from attracting the firm – are likely to be stronger in the small country. Hence incorporating general equilibrium effects in factor markets may widen the gap between the best offers made by the large and the small country. This could lead to less clear-cut answers as to where the firm will settle in equilibrium and may offer an explanation for the success of some small countries (such as Ireland) in attracting foreign direct investment by means of very low tax rates.

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