Tax Competition for Foreign Direct Investments and the Nature of the Incumbent Firm

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Abstract

We investigate tax/subsidy competition for FDI between countries of different size when a domestic firm is the incumbent in the largest market and we study how the nature (public or private) of the incumbent firm affects policy competition. We show that, differently from the case of a private firm, the country hosting the incumbent always benefits from FDI if the domestic firm is a public welfare-maximizing firm. We also show that the public firm acts as a disciplinary device for the foreign multinational that will always choose the efficient welfare-maximizing location. An efficiency-enhancing role of policy competition may then arise just when the domestic incumbent is a private firm, while tax competition is always wasteful in the presence of a public firm.

Keywords: Foreign Direct Investment, Tax/Subsidy Competition, Public Firm

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1 Introduction

One of the most well documented trends in the world economy over the last three decades has been the rise in foreign direct investments (FDI) by multinational enterprises (MNEs). At an aggregate level, the empirical evidence indicates that FDI grew rapidly in the last 15 years of the 20th century, far outpacing the growth of international trade among industrialized countries.[1] Because of the widely held advantages of receiving FDI (e.g., cheaper or higher-quality goods for domestic consumers, technological spillovers to domestic producers, job creation, etc.), an increasing number of national governments are prone to offer MNEs countervailing fiscal incentives to attract their investments and competition mostly takes place at an intra-regional level, i.e., between countries belonging to the same economic or geographical area (e.g., Latin America, South-East Asia, Central and Eastern Europe, and so on).[2] In spite of that, FDI can be an issue to the extent that foreign investors often operate in the same sector as some incumbent domestic (private or public) firm.

In some industries characterized by relevant FDI flows, the relative importance of public state-owned enterprises is indeed expanding in recent years also (but not only) because of the global financial crisis that has prompted many governments worldwide to increase their stakes in private corporations. In the oil industry, for example, state-owned companies such as Saudi Aramco, Gazprom (Russia), China National Petroleum Corp., National Iranian Oil Co., Petroleos de Venezuela, Petrobras (Brazil) and Petronas (Malaysia), now control more than 75% of all crude oil production.[3] Since national oil companies generally hold exclusive rights to exploration and development of petroleum resources within the home country, they can also decide on the degree to which they require participation by private companies in those activities. This might negatively affect the investment decisions of foreign MNEs as it was the case in Venezuela in June 2007, when ExxonMobil Corporation and ConocoPhillips, two of the largest U.S. oil companies, abandoned their multi-billion dollar investments in the heavy oil deposits of the Orinoco basin. Similarly, the telecommunications industry provides several examples of FDI in the presence of a state-owned incumbent.[4]

In the automotive sector, state-owned and state-controlled companies play a major role in many developed and emerging countries markets. In China, for instance, two of the largest car-makers (Shanghai Automotive Industry Corporation and First Automobile Works) are state-owned enterprises that simultaneously act as partner companies of the Volkswagen Group operating in that country. At the same time, the automotive sector provides notable examples of inter-government competition to attract FDI. To cite one, in 1997 the UK and France competed for the biggest Japanese investment in Europe in a decade proposed by the car-maker Toyota. At that time, the French car market was characterized by the presence of the government-controlled incumbent Renault that commanded the largest share in the domestic market. Under the European rules to date, countries could have offered subsidies up to a third of the total investment of $1.6 billion, even though Toyota officials in London insisted that the government aid offered to lure inward investment would have played only a minor role in such decisions.[5] In December 1997, Toyota announced that it had chosen the northern French town

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[1]See, e.g., Markusen (1995), Markusen & Venables (1998), and Barba Navaretti et al. (2004).

[2]For an overview of this issue, see Oman (2001).

[3]The Wall Street Journal (2010).

[4]See OECD (2011) for a full account of the presence and market shares of state-owned incumbents as well as of new entrants' market shares in OECD telecommunications markets.

[5]The Economist (1997).

of Valenciennes as the site for its new car assembly plant. The French government agreed to provide around 10% of the initial investment and this turned out to be a key factor in the Japanese manufacturer's choice of location for its new factory.[6]

Besides being crucial actors in their domestic markets, state-owned companies are also becoming international players with operations that spread outside national boundaries. For example, Norway's state-owned oil company Statoil operates not only in the Norwegian continental shelf (where it faces the competition of two MNEs, Esso Norge and Norske Shell), but also in West Africa, the Gulf of Mexico, and off the coast of Brazil. Moreover, it owns two refineries (one in Norway and one in Denmark) and its gasoline retail activities span across Scandinavia and the Baltic States.[7]

It seems therefore interesting to analyze the impact of FDI by taking into account its potentially negative consequences on the profitability of a local incumbent. These consequences might differ depending on the nature (private or public) of the local firm. To this end, we set up a theoretical framework that builds on two distinct strands of literature.

On the one hand, the literature about policy competition for FDI in the presence of imperfect product market competition, country-size asymmetry, and intra-regional trade costs. This literature grows out of the paper by Haufler & Wooton (1999) analyzing competition between two countries of unequal size trying to attract a foreign-owned monopolist and showing that trade costs can give rise to location-specific rents that countries can optimally extract from the foreign firm by means of source-based capital taxes.[8] Subsequent contributions extend the original set-up to analyze policy competition for FDI in the presence of a domestic private firm - in the big country - competing with the foreign investor on the regional market (Bjorvatn & Eckel, 2006) (henceforth B&E (2006)); or competition for investments by two firms from the same industry producing homogeneous goods in either of the two countries (Ferrett & Wooton, 2010); or competition for FDI between a union of two countries and a third potential-host country (Haufler & Wooton, 2006).

On the other hand, the theoretical literature on mixed oligopoly. The latter has generally focused on the optimal strategies of the public firm, the characterization of market equilibria and the effects of privatization by adapting the standard models of oligopolistic competition. Starting from the contribution of Merrill & Schneider (1966), the theoretical literature on mixed oligopolies assumes that a public firm maximizes the sum of consumer surplus and domestic private firm's profits.[9] More recently, some work has been devoted to the analysis of instruments, such as production subsidies, that are alternative to direct public provision (White, 1996; Poyago-Theotoky, 2001; Sepahvand, 2004; Matsumura & Tomaru, 2013), or to make the timing of competition between private and public competitors endogenous (Pal, 1998; Matsumura, 2003; Amir & De Feo, 2014). Of particular interest for the present paper is the literature on international mixed oligopolies, given that the public firm's behavior is sensitive to the nationality of its private competitors.[10]

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[6]EIROnline - European Industrial Relation Observatory on-line (1997).

[7]See Flores-Macias & Musacchio (2009).

[8]Recently, Johannesen (2016) finds an alternative explanation for the fact that most countries levy corporate taxes at fairly high rates. In the presence of multinational firms that finance investment in one country with loans from affiliates in another country, the burden of the corporate taxes levied in the latter partly falls on investment and thus workers in the former. This tax exporting mechanism introduces a scope for strictly positive corporate taxes, which is not present in standard models of international taxation.

[9]See also the contributions of Rees (1984), Bös (1986), de Fraja & Delbono (1989), and Beato & Mas-Colell (1984).

[10]See Fjell & Pal (1996); Fjell & Heywood (2002); Matsushima & Matsumura (2006); Heywood & Ye (2009);

In this paper, we apply the analysis of international mixed oligopoly to a context where two active governments seek to attract FDI by a foreign firm from a third country. In particular, we follow B&E (2006) and postulate the presence of a domestic incumbent in the big country. Differently from them, however, we assume that the incumbent is a public welfare-maximizing firm rather than a private firm. An interesting result from their model is that the country hosting the incumbent firm does not always gain from the investment of the MNE as the benefit for consumers may be offset by the shift of profit from the domestic incumbent to the foreign firm. In contrast to their result, we find that the country hosting the incumbent firm always benefits from receiving FDI when the incumbent is a public firm. Another important contribution relates to the welfare implications of tax/subsidy competition for FDI. B&E (2006) indeed show that the introduction of policy competition may improve the efficiency of the location choice of the MNE. The reason is that imperfect competition on the product market distorts the FDI choice so that the profit-maximizing location may not coincide with the efficient (i.e, aggregate welfare-maximizing) one. Policy competition internalizes the external effect of the location choice in the MNE's decision which then becomes efficient.[11] Policy competition may even enhance regional welfare when the gains from a more efficient location choice by the MNE more than compensate the subsidy paid so that there is room for a Pareto improvement *via* side payments. Our contribution shows that the positive effects of the introduction of policy competition crucially depend on the nature (public or private) of the domestic incumbent. Notably, we find that the efficiency enhancing feature of policy competition does not hold when the incumbent is a welfare-maximizing public firm. The reason is that the public firm acts as a disciplinary device leading the foreign MNE to the efficient location choice.[12] Therefore, policy competition does not change the location choice of the MNE and, in the presence of trade costs, it becomes inefficient. Furthermore, it may also result in a waste of resources for the region as a whole when the two countries actively compete to attract FDI.[13]

The rest of the paper is organized as follows. In Section 2, we analyze the investment decision of a foreign MNE when the incumbent in the big country is a welfare-maximizing public firm and provide the main results of the model. In Section 3, we discuss the impact of the nature – public or private – of the domestic incumbent and the robustness of our results to some specific issues. Finally, Section 4 summarizes the main conclusions emerging from our work.

2   FDI decision in the presence of a public firm

In this Section, we illustrate the model we set up to analyze the impact of policy competition between countries on the investment decision of a multinational firm when the incumbent in

Ghosh et al. (2015). A related literature analyzes the strategic trade policy in the presence of a domestic public firm and foreign exporters (Pal & White, 1998, 2003; Chang, 2005; Van Long & Stähler, 2009).

[11]This efficiency-enhancing property of tax competition is also highlighted by Fumagalli (2003) in the presence of positive technological spillovers from the investment and by Barros & Cabral (2000) when countries differ in unemployment levels.

[12]The disciplinary role of a public firm in imperfectly competitive markets has already been highlighted in the literature on mixed oligopolies. See, for example, Anderson et al. (1997).

[13]If the location advantage of one of the countries is very large, then policy competition provides an additional tax instrument to the government. However, it would be disputable to label this situation as one of "competition" to attract the investment.

the big market is a welfare-maximizing public firm and the final good can be traded within the region.

We represent policy competition for FDI as a three-stage game characterized by the following sequence of decisions:

- In stage 1, the governments of the two countries simultaneously and irreversibly post bids – lump-sum taxes/subsidies – to attract the foreign investor.

- In stage 2, the foreign multinational decides in which country to locate its production plant to serve the regional markets.

- In stage 3, the foreign multinational and the incumbent public firm compete à la Cournot in the regional markets and payoffs (profits and welfare) are realised.

We solve our three-stage game by backward induction to find its subgame perfect Nash equilibrium in pure strategies.

2.1 The basic set-up

We develop a model in which a firm from a third-country (we will refer to it as firm 1, the MNE or the foreign firm) has to decide in which of two countries to invest in order to provide some final good to the consumers of the whole region.

The markets of the two countries are of unequal size. Namely, following Haufler & Wooton (1999), we assume that there is a single consumer in country A and $n > 1$ identical consumers in country B which represents the "big" market for the final good. Consumers' preferences are such that each of them has linear demand for the commodity, $Q = 1 - p$. Hence, the two firms face total demand $Q_A = 1 - p_A$ and $Q_B = n(1 - p_B)$ in country A and B, respectively. Inverse demands are then given by:

$$p_A(Q_A) = 1 - Q_A \quad \text{and} \quad p_B(Q_B) = 1 - \frac{Q_B}{n}.$$

Prior to entry of the MNE in the region, no production takes place in the small country, whereas the big country already hosts a welfare-maximizing public firm (firm 0) that, for the sake of simplicity, is assumed not to export to the small country.[14] The latter sells the same product as the MNE but it is *less efficient* than the former, i.e., it produces the final good at a higher marginal cost, $c_0 > c_1$, with c_i denoting the constant marginal production cost of firm $i = 0, 1$. In order to simplify the analysis further we set $c_1 = 0$.

The MNE has to incur a fixed cost $F > 0$ to establish a production plant in either country since trade costs associated with exporting from its residence country to the region are assumed to be prohibitively high.[15] As an example, we can think of a German multinational which has to pick one location between Argentina and Chile where to build a production plant with the purpose of servicing the consumers of this Latin American region.

The marginal cost of serving a market depends on the efficiency of the firm and on the location of firms and consumers. When the final good is produced and sold locally, the marginal cost for the firm is equal to $c_i, \ i = 0, 1$; by contrast, when the firm exports the final good to the other country, the marginal cost is higher since it also includes some intra-regional

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[14]The effects of relaxing this assumption will be discussed in Section 3.

[15]In what follows, we assume that the fixed cost F is symmetric across countries and so high that it will never be profitable for the MNE to pay it twice but not so high to make FDI in the favorite country unprofitable.

trade costs, $\tau > 0$. The latter separates the two markets so that consumer prices for the same final good will be different in the two countries.[16] But since the two firms sell a homogeneous good, its consumer price in a given market, in equilibrium, will be the same irrespective of where production takes place.[17] In what follows, production and intra-regional trade costs are assumed not to exceed the consumers' maximal willingness to pay so that $c_0, \tau \in [0, 1]$.

If we denote by q_{ij} the quantity of the final good sold by firm i on country j's market so that $q_{0j} + q_{1j} = Q_j$, $j = A, B$, we can write total cost functions of firms 0 and 1 as follows:

$$C_0\left(q_{0B}\right) = c_0 q_{0B}$$

$$C_1\left(q_{1A}, q_{1B}\right) = F + \tau\left(I_A q_{1A} + I_B q_{1B}\right)$$

where $I_j = 0$ if FDI goes to j and $I_j = 1$ otherwise.

The objective of the public firm is to maximize social welfare in B, $W_B\left(q_{0B}, q_{1A}, q_{1B}\right)$, which corresponds to the sum of consumer surplus and firm 0's profits

$$\underbrace{\int_0^{Q_B} p_B(s)ds - p_B\left(Q_B\right)\left(q_{0B} + q_{1B}\right)}_{CS_B(Q_B)} + \underbrace{p_B(Q_B)q_{0B} - C_0\left(q_{0B}\right)}_{\Pi_0\left(q_{0B}, q_{1B}\right)}$$

$$= \int_0^{Q_B} p_B(s)ds - p_B(Q_B)q_{1B} - C_0\left(q_{0B}\right) \tag{1}$$

from which it is evident that W_B increases with the overall quantity sold on the domestic market - due to the lower consumer price - and decreases with the revenues the MNE collects by serving the big market.

The foreign firm is instead interested in maximizing profits whose amount depends on where it locates its production plant:[18]

$$\Pi_1^j\left(q_{0B}, q_{1A}, q_{1B}\right) = p_A\left(Q_A\right)q_{1A} + p_B\left(Q_B\right)q_{1B} - C_1\left(q_{1A}, q_{1B}\right), \quad j = A, B. \tag{2}$$

To find the subgame-perfect Nash equilibrium, we solve the dynamic game by backward induction starting from market competition in stage three.

2.2 Market competition

Suppose that governments have defined in the first stage of the game the lump-sum taxes or subsidies to offer to the MNE and, in the second stage, the latter has decided in which country to locate. In the last stage of the game, the MNE and the public incumbent compete à la Cournot on the big country market.[19] Under the lump-sum assumption, taxes or subsidies do

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[16]Several empirical studies show that the *market segmentation* assumption is consistent with the price-setting behavior of firms even within the European Union, where, in principle, there should be no official barriers to cross-border trade. See, for instance, Head & Mayer (2000), Haskel & Wolf (2001), and Lutz (2004).

[17]In this respect, our model is similar to the "reciprocal dumping" model of Brander & Krugman (1983) whose focus is, however, on the welfare effects of trade.

[18]Throughout the paper, the superscript indicates the country where the MNE invests. In what follows, we will drop the subscript 1 from the expression denoting the MNE's profits in order to ease the notation.

[19]We would get qualitatively similar results by allowing for endogenous timing in the order of moves by firms. Relying on Cournot competition to illustrate our conclusions is a way to facilitate the exposition.

not affect firms' quantity decisions and can be disregarded. Then, the public firm's reaction function is given by:

$$q_{0B} = n\left(1 - c_0\right).$$

We must stress here that the public firm's output choice for its domestic market is independent of the MNE's behaviour; that is, it always produces the same quantity.[20] The consequence of this output strategy is that the public firm runs losses or at most breaks even. Indeed, in the absence of any rival, it behaves as a public monopoly and follows the usual marginal-cost pricing rule, which leads to zero profits. But when the MNE supplies a positive quantity, total output increases and the price decreases below the public firm's marginal cost. In this case, we postulate that lump-sum transfers from country B's residents occur in order to balance the firm's deficit.[21]

Using (2), we easily derive the reaction functions of the MNE, which can be written as

$$q_{1A} = \frac{1 - I_A\tau}{2} \quad \text{and} \quad q_{1B} = \max\left\{n\frac{1 - I_B\tau}{2} - \frac{q_{0B}}{2}, 0\right\}. \tag{3}$$

It is to be noted that the linearity of costs allows the MNE to choose the quantity produced for, say, the market of country A independently of that produced for the market of country B. Straightforward computations yield equilibrium quantities for the two firms.

On the one hand, if the MNE invests in the big country (superscript B), we obtain:

$$q_{0B}^B = n\left(1 - c_0\right), \ q_{1B}^B = \frac{nc_0}{2} \ \text{ and } \ q_{1A}^B = \frac{1 - \tau}{2}.$$

On the other hand, if the MNE invests in the small country, we have:

$$q_{0B}^A = n\left(1 - c_0\right) \geq 0, \ q_{1B}^A = \max\left\{\frac{n\left(c_0 - \tau\right)}{2}, 0\right\} \ \text{ and } \ q_{1A}^A = \frac{1}{2}.$$

By locating in A, the MNE has to incur trade costs to service country B's consumers. Hence, exporting is going to be a viable option to the MNE as long as the cost of supplying the final good to the big country's market does not exceed the production cost of the local public firm.

2.3 Investment decision of the MNE

The governments of the two countries compete to attract FDI by the foreign firm. In particular, they can either tax or subsidize both local consumers and the MNE in a lump-sum fashion. We first derive and show the results in the absence of policy competition or, similarly, for

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[20]This is so because the marginal benefit (hence, the optimal choice) of public firm's production does not change with the quantity supplied by the MNE on that market. The welfare-maximizing output choice of the public firm is such that its marginal benefit equals its marginal cost, i.e., $p_B\left(Q_B\right) - p_B'\left(Q_B\right)q_{1B} = C_0'\left(q_{0B}\right)$. The effect of a change in the MNE's output, q_{1B}, on the marginal benefit is given by $p_B'\left(Q_B\right) - p_B'\left(Q_B\right) - p_B''\left(Q_B\right)q_{1B}$ which is nil since $p_B''\left(\cdot\right) = 0$ if demand is linear. Fjell & Pal (1996) show that the slope of the reaction function can be decreasing in the presence of foreign private firms only including domestic private firms, and that the marginal cost of the public firm is higher than the price in equilibrium when there is at least one foreign firm. Such a flat reaction function shows that the public firm has a dominant strategy, as discussed in Amir (1996, p.140).

[21]In Section 3, we discuss the effects of imposing a budget balance requirement. Note also that when the public firm is allowed to export to country A, it may earn positive or negative overall profits so that transfers from domestic residents may not be required.

a situation where the two countries use identical tax/subsidy policies to induce the MNE to invest within their borders.

In order to pick the best location for the investment, the MNE compares its operating profits from FDI in country A or in country B. Namely, it invests in, say, A as long as $\Pi^A > \Pi^B$. When the latter holds with equality, the MNE is indifferent between investing in either country. Straightforward computations yield:

$$\Pi^A = \frac{1}{4} - F \qquad\qquad \text{if} \quad c_0 \leq \tau \tag{4}$$

$$\frac{1}{4} + \frac{n(c_0 - \tau)^2}{4} - F \quad \text{if} \quad c_0 > \tau \tag{5}$$

and

$$\Pi^B = \frac{(1-\tau)^2}{4} + \frac{nc_0^2}{4} - F \tag{6}$$

In general, the investment decision of the MNE is driven by three distinct effects. The "market size" effect is such that, as we let n increase, the relative profitability of investing in the big country increases and investment is more likely to take place there. The "cost" effect reflects the efficiency of the incumbent firm in country B: intuition suggests that the higher c_0, the higher the attractiveness of country B since the MNE faces a weaker competitor on the big market. Finally, the "competition" effect suggests that higher trade costs τ increase the relative profitability of investing in the small country because of the increased distance from the competitor.[22]

From equations (4), (5), and (6), it is possible to identify the threshold value $\tau^\star(c_0, n)$ such that the firm is indifferent between investing in country A and B:

$$\tau^\star(c_0, n) = 1 - \sqrt{1 - nc_0^2} \quad \text{if} \ c_0 \leq \tau \quad (\text{and} = 1 \text{ if } n > \frac{1}{c_0^2})$$

$$\frac{2(nc_0 - 1)}{n - 1} \qquad \text{if} \ c_0 > \tau$$

Figure 1 depicts the threshold value $\tau^\star$ in the space $\{\tau, n\}$ for different values of c_0. When $\tau > \tau^\star$, the MNE invests in the small country A. Moreover, as it is clear from the graph, $\frac{\partial \tau^\star}{\partial n} > 0$ and $\frac{\partial \tau^\star}{\partial c_0} > 0$. There is thus a clear trade-off between the competition effect that works against investing in the big country B and the cost and market size effects that increase the relative attractiveness of country B. In particular, since $c_0' > c_0''$, it is evident that the more efficient the public incumbent is (i.e., the lower c_0), the less attractive the big country B becomes as the location for the multinational firm.

2.4   Policy competition for FDI

We now investigate how the introduction of tax/subsidy competition between the two countries can affect the investment decision of the MNE. We assume that the country receiving FDI can levy a lump-sum tax on the foreign firm's profits or has to offer a lump-sum subsidy in order to induce it to establish a production plant within its frontiers. We denote country j's tax/subsidy by S_j, $j = A, B$.

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[22] As shown by B&E (2006), the latter effect holds also in the case of a private domestic incumbent.
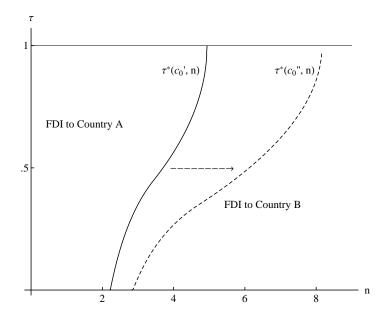
Figure 1: Location choice of the multinational firm absent policy competition for $c_0' > c_0''$

We first need to identify the maximum subsidy each country is willing to offer to the MNE. We define such a subsidy as the welfare gain of receiving the investment, i.e., $S_j^{max} \equiv W_j^j - W_j^k$, for $j, k = A, B$, $j \neq k$, with W_j^k denoting country j's welfare when FDI goes to country k. While welfare in country B consists of consumer surplus and public firm's profits as given by equation (1), welfare in country A simply coincides with consumer surplus as no local firm operates there prior to the MNE's entry on the regional market. Evidently, country A always benefits from FDI as consumer surplus is higher by having the final good produced and sold locally instead of being served through exports. As for country B, we easily show that the same is true. Indeed,

$$W_A^A = \frac{1}{8} \quad \text{and} \quad W_A^B = \frac{1}{8}(1-\tau)^2$$

and

$$W_B^A = \begin{array}{ll} \dfrac{(1-c_0)^2 n}{2} & \text{if} \quad c_0 \leq \tau \\[2mm] \dfrac{n}{8}(2-c_0-\tau)^2 - \dfrac{n}{2}(1-c_0)(c_0-\tau) & \text{if} \quad c_0 > \tau \end{array}$$

$$W_B^B = \frac{n}{8}(2-c_0)^2 - \frac{n}{2}(1-c_0)c_0$$

and it is straightforward to show that $W_j^j > W_k^j$, $\forall j, k = A, B$, $j \neq k$. This allows us to state

Proposition 1 *In the presence of a welfare-maximizing public firm, both countries always benefit from the investment of the multinational.*

Proof. See Appendix. ∎

The intuition for the result in Proposition 1 is the following. Since the public firm always produces the same quantity, the MNE acts as a monopolist on the (constant) residual demand.

Therefore there is no crowding out of domestic production and consumers benefit from a more efficient additional producer if FDI occurs in their own country. This result can be easily extended to the case of a general decreasing individual demand $Q(p)$ allowing therefore for strategic interaction between firms. In such a general framework the reaction function of the public firm is a contraction and therefore the overall effect on country B's welfare is always positive.

As each country is better off by receiving FDI, both of them are willing to offer a positive subsidy to the MNE, which will invest in country j if and only if

$$\Pi^j + S_j^{max} > \Pi^k + S_k^{max}, \quad \text{for} \quad j, k = A, B, \; j \neq k \tag{7}$$

i.e., when profits from locating in j – inclusive of the lump-sum subsidy country j offers – exceed those – subsidy inclusive – from investing in k.

When we evaluate whether and how tax/subsidy competition affects the MNE's investment decision the following result holds.

Proposition 2 *Tax/subsidy competition between countries does not change the investment decision of the multinational.*

Proof. See Appendix. ∎

Such an *irrelevance* result rests on the absence of strategic interaction on both markets which is essentially due to the linearity assumptions in the model and to the fact that the public incumbent has a dominant strategy Amir (1996, p.140). The MNE, indeed, enjoys monopoly power on the small market, whereas the public firm always produces the same quantity for the big market, where the MNE acts as a monopolist on the constant residual demand. When the MNE is indifferent between investing in A or in B, the gain in local profits on A's market from locating in A over B exactly compensates the gain in local profits on B's market from locating in B over A. In addition, each country's welfare gain of receiving the investment is a fixed proportion of the local profit gain for the MNE. Therefore, when local profit gains are equal, the same holds for welfare gains, and since welfare gains represent the maximum subsidy each country is willing to offer to attract FDI, the introduction of tax/subsidy competition does not modify the MNE's investment decision. This result still holds when we generalize the linear setting to incorporate a general non-linear specification of the cost function. In fact, based on the theory of supermodular games (see Amir, 2005, for a survey of supermodular optimization and games), when the objective function is twice continuously differentiable, the slope of the reaction function has the same sign as the second cross-derivative of the objective function. As the demand function is linear, the objective function of the public firm is welfare as defined by equation (1), and $\frac{\partial^2 W(q_0, q_1)}{\partial q_0 \partial q_1} = p''(.) = 0$. So the reaction function of the public incumbent is flat and the firm has a dominant strategy.[23]

From Proposition 2, it immediately follows

Corollary 1 *In the presence of a welfare-maximizing public firm, policy competition to attract FDI is wasteful for the region.*

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[23]Formal proofs of both generalization results for cost and demand functions are available from the authors upon request.

This result has to be qualified since it holds only when the location advantage of the receiving country is not too large and therefore a subsidy has to be paid to the MNE.[24] In general, although one country's welfare is higher when the MNE locates within its borders, policy competition turns out to be just a waste of resources for the region as a whole since it does not change the investment decision of the foreign firm and the host country has to grant the firm a subsidy to win the competition for FDI.

If we look at the implications for aggregate welfare, defined as the sum of the regional welfare (the welfare of the two countries) and the MNE's profits, we easily find that the investment decision of the MNE with policy competition maximizes aggregate welfare. In fact, condition (7) can be rewritten as follows

$$\Pi^j + W_j^j - W_j^k > \Pi^k + W_k^k - W_k^j \ \text{ or}$$
$$\Pi^j + W_j^j + W_k^j > \Pi^k + W_j^k + W_k^k, \ \text{ for } \ j, k = A, B, \ j \neq k$$

In addition, since by Proposition 2 policy competition does not affect the investment decision of the MNE, we can state the following result:

Corollary 2 *In the presence of a welfare-maximizing public firm, the investment decision of the MNE absent tax/subsidy competition is efficient and maximizes aggregate welfare.*

Proof. See Appendix. ■

2.5 Equilibrium policy

The equilibrium policy (subsidy or tax) is the result of an auction where the country making the most attractive offer receives the investment by the MNE.[25] When both countries offer the maximum subsidy to attract FDI, country j wins the auction if condition (7) holds; however, country j needs not actually to pay the maximum subsidy it is willing to offer but just the one which is necessary to out-bid the rival country, which is given by:

$$S_j^* \equiv \Pi^k + S_k^{max} - \Pi^j > 0, \ \text{ for } \ j, k = A, B, \ j \neq k$$

Because of different market size, cost-asymmetry, and the presence of positive costs for intra-regional trade, the MNE may prefer to invest in a country where part of its profits are taxed away in spite of the fact that the other country offers a subsidy. In particular, provided that country k sets its maximum subsidy, country j receives FDI by setting a positive lump-sum tax on the MNE's profits if and only if the following condition holds:

$$\Pi^j - T_j > \Pi^k + S_k^{max}, \ \text{ for } \ j, k = A, B, \ j \neq k \tag{8}$$

If this is the case, the subsidy country k is able to offer to the MNE cannot offset its disadvantage relative to country j. For instance, country B attracts the MNE by taxing its profits when its market is large enough compared to country A's and the public firm is very inefficient. When the public firm instead represents a fierce competitor for the big market, country A receives FDI even if it taxes away part of the MNE's profits.

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[24]If the location advantage of one country over the other is very large, there would be no real competition between countries and policy competition becomes in fact an additional instrument to tax the foreign MNE.

[25]See the Appendix for a formal proof. The simultaneous auction equilibrium outcome is equivalent to the equilibrium of a policy competition game where the two governments of the two countries post bids à la Bertrand.

When country j represents the most attractive location for FDI without offering any subsidy and despite the fact that country k offers its maximum affordable subsidy, so that condition (8) holds, country j wins the auction by taxing away part of the MNE's profits and the equilibrium lump-sum tax is given by:[26]

$$T_j^* \equiv \Pi^j - \left(\Pi^k + S_k^{max} \right) > 0, \quad \text{for} \quad j, k = A, B, \ j \neq k$$

Figure 2 depicts the equilibrium policy resulting from competition between governments to attract FDI. The figure depicts the spaces of parameters $\{n, \tau\}$ where countries A or B win the competition by taxing or by subsidizing the foreign firm. Evidently, the introduction of such a policy instrument can leave a country better off to the extent that the latter can extract part of the foreign firm's profits. By contrast, if a country has to pay a subsidy to attract the MNE, which would have invested there anyway absent policy competition, only the MNE will be better off.
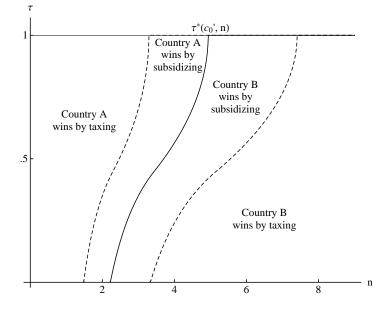

Figure 2: FDI decision with tax/subsidy competition

3   The impact of the nature of the domestic incumbent

This Section discusses how the nature of the incumbent in the big country's market affects the results in terms of FDI choice by the foreign firm and aggregate or regional welfare.

The result in Proposition 1 crucially depends on the nature of the incumbent firm: if it is a public firm, the country hosting it would always benefit from the additional investment of a multinational enterprise. This result contrasts with the one by B&E (2006) according to which the big country *"benefits* [from FDI] *if trade costs and the size of its market are not too large"* (Lemma 2, p. 1897). Their theoretical framework differs from ours in that the

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[26]In such a situation, i.e., when the relative advantage for the foreign firm of investing in country j is so large that country k can never succeed in attracting FDI, we can regard the lump-sum tax as an *entrance fee* that country j charges the firm for establishing its production plant there.

big country hosts a *private* incumbent firm. When trade costs are sufficiently high, the local private firm prefers keeping the MNE as far as possible and the big country does not benefit from receiving FDI as the gain in consumer surplus would not compensate for the loss in the local firm's profits.[27]

The nature of the incumbent firm is also relevant for the efficiency of MNE's location choice, i.e., the effect on aggregate surplus and regional welfare. Our result in Corollary 2 shows that absent policy competition the investment choice of the MNE is efficient. However this is only true when the incumbent is a public firm while it does not hold with a private incumbent, as shown by B&E (2006). In the latter case, in fact, imperfect competition between private firms may distort the choice of the MNE resulting in an inefficient location of the investment from the aggregate surplus perspective. The presence of a public firm, instead, acts as a disciplinary device leading the foreign MNE to the efficient location choice. Given the efficiency result in Corollary 2, policy competition cannot increase aggregate surplus and any change in the allocation of resources is just a transfer from countries to the MNE, or *vice versa*.[28]. This efficiency-enhancing role of tax competition is instead possible when the domestic incumbent is a private firm (B&E (2006), Proposition 5). As a consequence, whenever the location advantage is not too different between the two countries so that a tax is paid by the foreign firm in equilibrium, the welfare of the region (the sum of the two countries' welfare) can increase only if the domestic firm is private (B&E (2006), Proposition 6). If the domestic firm is public, on the other hand, tax competition is always wasteful from the perspective of regional welfare as highlighted by Corollary 1.

So far we have assumed that the public firm does not export to country A.[29] If we remove this assumption, the relevance of the nature (public or private) of the incumbent firm for the outcome of the policy competition for FDI becomes even more evident.

First of all, since its objective function is to maximize the welfare of country B, the public firm will behave as a *profit maximizer* on the market of country A. As a consequence, the result of Proposition 1 that not only country A, but also country B always benefit from FDI is reinforced. Now country B enjoys not only a larger consumer surplus but also an increase in the profits that the public firm earns on the market of country A. In fact, when locating in country B, the MNE is a weaker competitor on the market of country A.

This result has also consequences on the equilibrium outcome of the policy competition. When the public firm exports to country A, the willingness of country B's government to subsidize the MNE is higher because the welfare gain from FDI increases as explained above. In addition, the maximum subsidy the government of country A is willing to offer decreases because the presence of another firm reduces the benefit of the location of the MNE within its borders. Therefore the overall effect can be summarized in the following Proposition:

Proposition 3 *In the presence of a welfare-maximizing public firm which does export to the small country, tax/subsidy competition increases the attractiveness of the big country.*

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[27]A similar reasoning applies when the market of the big country is larger enough compared to the one of the small country.

[28]Therefore, in the presence of any transaction cost, policy competition results in a pure waste of resources since aggregate welfare would be reduced.

[29]This assumption may also be justified when arbitrage is possible. If consumers – or other economic agents – take advantage of arbitrage opportunities then the difference of the price in the two markets cannot exceed the trade cost. Therefore $p_A \leq p_B + \tau \leq c_0 + \tau$ and therefore the public incumbent incountry B will never find profitable to export to country A. However in markets such as utilities and the like it is not possible to buy the final good or service in a country and sell it to the other country, and therefore the public firm may find profitable to sell in country A absent any arbitrage constraint.

Proof. See Appendix. ■

Proposition 3 sharply contrasts with the finding by B&E (2006) that policy competition increases the attractiveness of the small country. They highlight the fact that, in the presence of a private incumbent, there is a trade-off between consumer surplus and profits that decreases the willingness of the big country to subsidize the MNE. Our result emphasizes the relevance of the nature of the incumbent firm for the outcome of the policy competition for FDI. It may also cast light on the different incentives for big and small countries to deviate from tax agreements and start a subsidy competition. While small countries may benefit from policy competition in the presence of foreign private incumbents, the big country would prefer policy competition only when the incumbent is its own public firm.

Another assumption that one can call into question is the absence of a *budget constraint*, i.e., a break even condition, in the public firm's welfare maximization problem. Indeed, we have assumed that country B's government can impose lump-sum taxes on domestic consumers to subsidize public firm's production in the same way as it subsidizes the MNE to attract FDI. In reality, however, public firms may be required to balance their budget in order to avoid the use of distortionary taxation to cover their deficit. If we introduce such a break even condition for the public firm, its maximization problem turns out to be equivalent to a problem where the public firm's objective function is a weighted average of welfare and profits. As a consequence, the behavior of the public firm is somehow halfway between an unconstrained welfare-maximizer and a profit-maximizer firm. The public firm would therefore produce a smaller quantity than in the original set-up, thereby increasing the attractiveness of country B.

4   Conclusions

In this paper, we have highlighted the relevance of the nature of the incumbent firm for the outcome of policy competition for FDI between two countries of asymmetric size. We have shown that when the incumbent in the big market is a public rather than a private firm, both countries always benefit from receiving the investment of the MNE. In particular, differently from B&E (2006), when the MNE locates in the big country, the gain in consumer surplus of domestic residents is always greater than the loss in profits for the domestic firm.

This result may explain why governments have different or changing attitudes towards FDI in different sectors of their domestic economies. Let us take the example of China, the leading country, among developing and transition economies, in terms of FDI inflows in 2014 and 2015.[30] In recent years, the Chinese government has actively started to encourage FDI in industries like energy production where the public sector enjoys almost a monopoly, accounting for more than 90% of the gross industrial output in 2011, up from the 85% in 1998. On the other hand, the incentives for FDI in car manufacturing have been reduced (notably, FDI in this sector is no longer "encouraged" but simply "permitted") to avoid "excessive investment" in an industry which has experienced a large drop in the public sector market share, which has decreased from 67% in 1998 to less than 45% in 2011.[31]

So, in the presence of a public incumbent in the large country, both governments are always ready to offer a subsidy to attract FDI. However, when the public firm does not export to the small country, tax/subsidy competition turns out to be *irrelevant* to the investment decision

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[30]See UNCTAD (2016).
[31]See The Wall Street Journal (2011) and Fan et al. (2013).

of the foreign firm. The consequence is that policy competition is wasteful for the region and the MNE is the only beneficiary of it. Moreover, contrary to B&E (2006), the location choice of the MNE in the presence of a public incumbent is always Pareto efficient and there is no need to introduce policy competition to restore efficiency.

When the public firm exports to the small country, policy competition increases the attractiveness of the big country. In this case, indeed, there is an extra-benefit from receiving FDI for the big country because the public firm will have to face a weaker competitor on the small market.

To sum up, the result provided by B&E (2006) according to which policy competition may be beneficial because it induces an efficient location choice is not general and it is sensitive to the particular features of the market. The present paper provides theoretical evidence that the nature – public or private – of the firm matters. Moreover, the potential benefits of introducing tax/subsidy competition between countries vanish if the incumbent in the big market is a welfare-maximizing firm.

Appendix

Proof of Proposition 1. If the MNE invests in country B, its production for that market is larger than in case of FDI in A. Since the public firm's output for country B's market is fixed, the MNE's larger quantity fully translates into an increase in total output which lowers price, and country B's welfare is larger because:

(*i*) consumers benefit from the lower price on the total quantity that is produced if the MNE invests in A; hence, given that the loss in public firm's profits simply represents a neutral transfer to consumers, there is a net gain in welfare due to the lower price for the MNE's quantity;

(*ii*) consumers also benefit from the larger quantity produced by the MNE.

■

Proof of Proposition 2. To show this result we rely on the properties of a monopoly with linear cost and demand. In fact, when the public firm does not export to country A, there is no strategic interaction between firms since the MNE enjoys monopoly power on the small market and acts as a monopolist on the constant residual demand in the big market. The residual demand in B is given by:

$$Q_{ResB} = n\left(1 - p_B\right) - n\left(1 - c_0\right) = n\left(c_0 - p_B\right) \implies p_B = c_0 - \frac{Q_{ResB}}{n}$$

Absent tax/subsidy competition, if the MNE is indifferent between A and B, the gain in local profits from FDI to A is equal to the gain in local profits from investing in B. In the presence of tax/subsidy competition, instead, the indifference condition is given by (7) holding with equality.

Since the public firm always produces the same quantity in B, any change in its own profits is a neutral transfer to consumers. Then, any change in welfare due to the investment decision of the MNE is entirely measured by the change in the consumer surplus on the residual demand, i.e., $S_B^{max} \equiv W_B^B - W_B^A = CS_{ResB}^B - CS_{ResB}^A$, where CS_{ResB}^j stands for the consumer surplus on the residual demand in country B's market when the MNE invests in

country $j = A, B$. So, from (7), the indifference condition with tax/subsidy competition can be rewritten as follows:

$$\pi_A^A - \pi_A^B + CS_A^A - CS_A^B = \pi_B^B - \pi_B^A + CS_{ResB}^B - CS_{ResB}^A \tag{9}$$

and we can easily show that when $\Pi^A = \Pi^B$ then (9) holds true because

$$CS_j^j - CS_j^k = \frac{1}{2} \left(\pi_j^j - \pi_j^k \right), \ \forall j, k = \{A, ResB\}, \ j \neq k$$

Consider now a monopoly market with linear (inverse) demand, $p = a - bq$ and cost, $C(q) = cq$, so that the equilibrium quantity and price are $q^* = \frac{a-c}{2b}$ and $p^* = \frac{a+c}{2}$. We analyze the change in consumer surplus and profits due to a change in c by assuming that marginal costs fall to zero. The new equilibrium quantity and price are $q^{**} = \frac{a}{2b}$ and $p^{**} = \frac{a}{2}$, respectively.

The change in consumer surplus has two components:

(i) the effect of the price reduction on the initial quantity: $\Delta_1 CS = (p^* - p^{**}) q^* = \frac{c(a-c)}{4b}$;

(ii) the effect of the increase in quantity: $\Delta_2 CS = \frac{1}{2} (p^* - p^{**}) (q^{**} - q^*) = \frac{1}{2} \frac{c^2}{4b}$.

Similarly, we can define two components of the change in profits:

(i) the profit increase on the initial quantity: $\Delta_1 \pi = cq^* - (p^* - p^{**}) q^* = \frac{c}{2} q^* = \frac{c(a-c)}{4b}$;

(ii) the profits on the quantity increase: $\Delta_2 \pi = (q^* - q^{**}) p^{**} = \frac{ca}{4b}$;

and it is immediate to check that the following relations hold:

$$\Delta_2 \pi = \Delta_1 CS + 2\Delta_2 CS \quad \text{and} \quad \Delta_1 \pi = \Delta_1 CS \implies \Delta CS = \frac{1}{2} \Delta \pi$$

In order to apply this result to our framework, let $c = \tau$, $a = 1$ and $b = 1$ for country A's market, and $a = c_0$ and $b = \frac{1}{n}$ for country B's market residual demand. ■

Proof of Corollary 2. When the MNE chooses to invest in, say, country A in the absence of policy competition, it must be that $\Pi^A > \Pi^B$. The irrelevance result stated in Proposition 2 further suggests that

$$\Pi^A + S_A^{max} > \Pi^B + S_B^{max} \iff \Pi^A > \Pi^B$$

where $S_A^{max} \equiv W_A^A - W_A^B$ and $S_B^{max} \equiv W_B^B - W_B^A$. Therefore, if we follow B&E (2006) and define aggregate welfare as the sum of the two countries' welfare and the MNE's profits, it is straightforward to obtain

$$W_A^A + W_B^A + \Pi^A > W_A^B + W_B^B + \Pi^B \iff \Pi^A > \Pi^B$$

which completes the proof. ■

Equilibrium of the policy-competition-for-FDI game

The policy-competition-for-FDI game is equivalent to a Bertrand-competition game in prices between countries A and B and it is characterized by a multiplicity of equilibria. Denoting by j the country that receives FDI by the foreign firm and by k the other country $(j, k = A, B, \ j \neq k)$, the equilibrium can be generally defined as follows:

$$S_k^* (S_j) = \epsilon, \ \text{with} \ \epsilon \in \left(0, S_k^{max}\right)$$

$$S_j^* (S_k) \ \text{such that} \ \Pi^j \left(S_j^*\right) = \Pi^k \left(S_k^{max}\right)$$

and the proof is a straightforward application of the Bertrand-competition solution.

Suppose that condition (7) holds, so that for country j to win the competition for FDI, it has to pay a positive subsidy to the foreign firm. If this is the case, the equilibrium strategy pair of the two countries is given by:

$$S_k^* (S_j) = \epsilon, \ \text{with} \ \epsilon \in \left(0, S_k^{max}\right)$$

$$S_j^* \left(S_k^{max}\right) \equiv \Pi^k + S_k^{max} - \Pi^j > 0$$

For country k, any bid $\epsilon \in \left(0, S_k^{max}\right)$ is a best reply to country j's equilibrium strategy since k's payoff is always nil. Indeed, it can never attract the foreign investor even by offering its maximum subsidy. For country j, any other bid $S_j' (\cdot) < S_j^* \left(S_k^{max}\right)$ is not an equilibrium strategy since country k will have the opportunity of attracting FDI by offering the foreign firm S_k^{max}, which would imply $\Pi^k \left(S_k^{max}\right) > \Pi^j \left(S_j'\right)$. By contrast, any other bid $S_j' (\cdot) > S_j^* \left(S_k^{max}\right)$ is not a best reply to $S_k^* (S_j)$ because it leaves some extra-money on the table, i.e., to the foreign firm.

Suppose instead that condition (8) holds, so that the profit gain from investing in country j is so large that country j can win the competition for FDI by levying a positive lump-sum tax on the foreign firm's profits in spite of the fact that country k offers its maximum subsidy. In this case, the equilibrium strategy pair of the two countries is given by:

$$S_k^* (S_j) = \epsilon, \ \text{with} \ \epsilon \in \left(0, S_k^{max}\right)$$

$$T_j^* \left(S_k^{max}\right) \equiv \Pi^j - \left(\Pi^k + S_k^{max}\right) > 0$$

As before, any bid $\epsilon \in \left(0, S_k^{max}\right)$ is country k's best reply to country j's equilibrium strategy since k's payoff is always nil. For country j, any other bid $T_j' (\cdot) > T_j^* \left(S_k^{max}\right)$ is not an equilibrium strategy since country k will have the opportunity of attracting FDI by offering the foreign firm S_k^{max}, which would imply $\Pi^k \left(S_k^{max}\right) > \Pi^j \left(T_j'\right)$. By contrast, any other bid $T_j' (\cdot) < T_j^* \left(S_k^{max}\right)$ is not a best reply to $S_k^* (S_j)$ because it leaves money to the foreign firm.

Proof of Proposition 3. When the MNE invests in country B rather than in country A, it becomes a weaker competitor on the small market and the public firm always enjoys larger profits there. Thus, country B can offer a subsidy which enhances its attractiveness relative to A. In fact, the new indifference condition for the MNE becomes:

$$\pi_A^A - \pi_A^B + CS_A^A - CS_A^B = \pi_B^B - \pi_B^A + CS_{ResB}^B - CS_{ResB}^A + \pi_{0A}^B - \pi_{0A}^A \tag{10}$$

where the RHS of (10) is larger than in (9) and bigger than its LHS when $\Pi^A > \Pi^B$. ∎

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