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On the FDI–attracting property of privatization

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ON THE FDI-ATTRACTING PROPERTY OF PRIVATIZATION

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Abstract

In the present paper we provide an explanation of why privatization may attract foreign investors willing to enter a regional market. Privatization turns the formerly-public firm into a less aggressive competitor since profit-maximizing output is lower than the welfare-maximizing one. The drawback is that social welfare generally decreases. We also investigate tax/subsidy competition for FDI and put forward its potentially positive role. On the one hand, it may reduce the negative impact on welfare of an FDI-attracting privatization. On the other hand, it may prevent a welfare-reducing investment by the foreign firm. This shows that privatization and fiscal policies may be either alternative or complementary instruments depending on the government's objective (i.e., country's attractiveness for foreign investors and domestic welfare).

Keywords: Foreign Direct Investment; Privatization; Tax/Subsidy Competition

JEL Classification: F23; H73; L33

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1 Introduction

One of the most well documented trends in the world economy over the last decades has been the rise in foreign direct investments (FDI) by multinational enterprises (MNEs). At an aggregate level, the empirical evidence indicates that, due to the existence of trade costs, the growth of FDI in the last 15 years of the 20th century far outpaced that of international trade among industrialized countries.[1] Moreover, 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.), governments at different levels are prone to offer MNEs countervailing incentives to attract their investments. Competition mostly takes place 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 by foreign MNEs can be an issue to the extent that foreign firms investing in a country often operate in the same sector as some incumbent local firm, which is, in some cases, a public enterprise.[3] In recent years, however, parallel to the massive increase in FDI, privatization has become an important tool of industrial restructuring in all parts of the world: *"Since 1990, European governments have sold more than $450 billion worth of state assets in many different sectors, including the banking, insurance, telecommunication and automobile industries. Many countries are also announcing substantial forthcoming privatization"* (Norbäck and Persson, 2005, p. 635). And privatization waves

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

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

[3] For instance, in the Norwegian oil industry, the state-owned Statoil competes with two MNEs, Esso Norge and Norske Shell.

are certainly not confined to the European Union.[4]

The primary aim of our work is to analyze the effects of privatization on attractiveness and welfare of a potentially FDI-receiving country. We also investigate how privatization and tax/subsidy policies may interact when countries compete to attract FDI. To this end, we consider a foreign-owned MNE willing to enter a regional market which is already served by a welfare-maximizing public firm. We define the *attractiveness* of a country as a relative concept: it is a comparison from the foreign firm's perspective between the advantages of investing in that country rather than elsewhere and takes into account both operating profits and taxes paid to or subsidies received from the host country. By *privatization*, we mean a transfer in ownership rights from the government to domestic private investors, which simply translates into a change in the firm's objective function.

The issues we are interested in are related to 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 to the welfare-maximizing behaviour of public firms.[5] More recently, closer attention has been paid to international mixed oligopoly given that the public firm's behaviour is sensitive to the nationality of its private competitor (Fjell and Pal, 1996; Fjell and Heywood, 2002). In particular, some work has been devoted to the analysis of instruments, such as production subsidies, that are alternative to direct public provision (Pal and White, 1998; Sepahvand, 2004); to the study of partial privatization and optimum tariffs (Chao and Yu, 2006); or to make the timing of competition endogenous (Cornes and Sepahvand, 2003; Matsumura, 2003). Other contributions (Norbäck and Persson, 2004; 2005) have studied competition between foreign and domestic private firms as potential buyers of state-owned assets which are sold at an auction during the privatization process.

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. Our theoretical framework builds on the literature about policy competition for FDI. Namely, on those contributions considering imperfect product market competition, country-size asymmetry, and intra-regional trade costs. This strand of the literature grows out of the paper by Haufler and Wooton (1999) (henceforth H&W), which analyzes competition between two countries of unequal size trying to attract a foreign-owned monopolist. Both countries are willing to offer a subsidy to the firm but, in equilibrium, the large country wins the competition for FDI since the firm prefers locating in the big market in order to save on trade costs. Moreover, if the market-size difference is great enough, the large country may be able to levy a positive lump-sum tax on the foreign firm's profit. Bjorvatn and Eckel (2006) modify H&W's set-up by introducing a private firm - in the big country - which competes with the foreign investor on the regional market. As a consequence, the FDI decision is driven by a trade-off between the advantage of locating in the big market (*market size* effect) and the benefit of being a monopolist in the small market (*competition* effect). The intensity of policy competition and the resulting equilibrium policy (i.e., a subsidy or a tax) depend on the relative location advantages offered by the two countries. An interesting result is that aggregate welfare (the sum of regional welfare and the investor's profits) rises whenever the introduction of policy competition changes the investor's location decision. In our model, we follow Bjorvatn and Eckel (2006) and postulate that the big country already hosts an incumbent firm serving the regional market. However, we assume that the competitor of the foreign investor is not a private firm but a welfare-maximizing and relatively inefficient public firm.

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[4] In the 1990s, e.g., Russia privatized its aircraft industry, Colombia its state-owned automobile maker Colombia Automotriz, and Argentina pursued a policy of selective privatization.

[5] See Rees (1984), Bös (1986), de Fraja and Delbono (1989), and Beato and Mas-Colell (1984).

Our main contribution is to show that privatization always makes the big country more attractive from the foreign investor's perspective. In fact, it turns the formerly-public incumbent into a less aggressive competitor for the MNE since profit-maximizing output is always lower than the welfare-maximizing one. Such a result is important for empirical research on this issue since it provides a direction of causality between privatization and FDI. Indeed, the FDI-attracting property of privatization finds support in several empirical studies. Carstensen and Toubal (2004) and Merlevede and Schoors (2005) point out the positive impact of privatization on FDI into the Central and Eastern European transition economies, irrespective of whether privatization sales are opened to foreign investors or not. More specifically, Treviño et al. (2002a,b) focus on the effects of *domestic* privatization. They find a significant positive impact of the value of privatization less FDI in privatized companies on the FDI inflows to seven Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela) during the 1988-1999 and 1988-1992 periods, respectively. Their results confirm the previous contribution by Hartenek (1995) about Argentina, who contends that privatization programs have given foreign companies more opportunities to invest within host Latin American countries. The speculative argument typically used to account for the FDI-attracting property of privatization is that the latter sends a signal of a more favourable economic environment to potential foreign investors. Our simple model puts forward an alternative micro-founded explanation based on market competition: privatization leads the domestic firm to reduce output because of the change in its objective, and leaves larger profit opportunities to foreign investors willing to enter the market.

In spite of that, for the very same reason, consumers are adversely affected and social welfare decreases as well, unless the incumbent firm is too inefficient. This negative effect on welfare may be mitigated in the presence of tax/subsidy competition. Following privatization, the relative advantage to the MNE from investing in the big country increases by so much that the its government can tax away some of the profits without inducing the MNE to prefer investing in the other country. In this way, the government optimally balances attractiveness and welfare in the new international private duopoly setting. Nevertheless, the overall effect of an FDI-attracting privatization is always negative if the domestic firm is efficient enough.

Following an independent line of research, Mukherjee and Suetrong (2009) analyze the relationship between privatization and FDI in a model in which a foreign firm has to decide how to serve another country's market (i.e., FDI or exports) in the presence of a public incumbent. The government is able to strategically manipulate the objective of the domestic firm by changing the weights attached to welfare and profits. By increasing the weight attached to the latter (i.e., by increasing the share of private ownership in the domestic incumbent), the foreign firm may be induced to prefer FDI to exports and this, in turn, may increase welfare. It is well-known from the standard analysis of the second-best theory (Bös, 1986; Lipsey and Lancaster, 1956–1957; Rees, 1984) that this amounts to give to a welfare-maximizing firm the leadership in a Stackelberg game with the foreign firm acting as the follower.[6] In other words, instead of giving to the government the strategic advantage of manipulating the objective function of the domestic firm through partial privatization, the same outcome can be achieved if the government is given the strategic advantage to directly choose the quantity produced by a fully state-owned firm. In our paper, we choose not to give any strategic advantage to the players and firms are assumed to play a simultaneous quantity-setting game.[7]

The rest of the paper is organized as follows. Section 2 presents the main trade-off at work in our model in the simplest possible set-up. In Section 3, we describe the basic two-stage game that will be used to analyze the investment decision of the MNE. In Section 4, we solve the second stage of the game in which market competition between the MNE and the incumbent firm occurs, while in Section 5, we investigate the first stage of the game. Section 6 presents the main results of the paper on the effects of privatization on FDI-attractiveness and welfare. In Section 7, we introduce tax/subsidy competition between countries and analyze the interaction between privatization and policy competition. In Section 8, we discuss the robustness of our results to some specific issues. Finally, Section 9 summarizes the main conclusions emerging from our work. All computations and proofs are gathered in the Appendix.

2 A simple illustration of the attractiveness-welfare trade-off

Consider a region composed by two countries (A and B) of different market size, where demands for a final good are given by

$$Q_A = 1 - p_A \qquad \text{and} \qquad Q_B = n\left(1 - p_B\right)$$

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[6] See also Matsumura (1998) about the limitations of the convex combination approach to identify the objective function of a partially privatized firm.

[7] We get qualitatively similar results if we follow the model by Hamilton and Slutsky (1990) and allow for endogenous timing in the order of moves by firms. We rely on Cournot competition to facilitate the exposition.

with $n > 1$ and Q_j and p_j denoting the total quantity and the price to consumers on country j's market, respectively.

The big country B already hosts a welfare-maximizing public firm producing a non-exportable final good for its domestic residents. A foreign profit-maximizing firm producing the same good is willing to make an investment in the region and has to choose the most profitable country in which to locate its production unit.[8] Its decision depends on the difference in market size, which works in favour of the big country, and on the degree of competition, which favours the small country. We further assume that the public and the foreign firm have the same constant marginal production cost, $c < 1$, and, if investment takes place in B, Cournot competition occurs.

The monopoly profits from investing in the small country are equal to $\Pi^A = \frac{(1-c)^2}{4}$.[9] By contrast, the profits the foreign firm can realize by investing in B are nil since the public firm produces a quantity $Q_B = n(1-c)$ such that price equals marginal cost and there is no room for competitors. In such a situation, the foreign firm always invests in the small country and social welfare in the big country - the unweighted sum of consumer surplus, CS, and domestic firm's profits, Π_0 - is given by $W_B = \frac{n(1-c)^2}{2}$.

Suppose now that the public firm is sold to domestic private investors. Privatization changes the firm's objective from welfare to profit maximization. As a result, if the foreign firm invests in country B, it earns private duopoly Cournot profits equal to $\Pi^B = \frac{n(1-c)^2}{9}$, which exceed the monopoly profits from investing in A as long as $n > \frac{9}{4}$. Hence, privatization increases the attractiveness of the big country as it may now be possible that the foreign firm chooses to invest in B. However, such an FDI-attracting privatization policy always decreases social welfare. Indeed, it is immediate to show that

$$\begin{aligned} W_B^P &= CS^P + \Pi_0^P \\ &= \frac{2n(1-c)^2}{9} + \frac{n(1-c)^2}{9} = \frac{n(1-c)^2}{3} < W_B = \frac{n(1-c)^2}{2}. \end{aligned}$$

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[8] For simplicity, we assume that the foreign firm has some financial constraints preventing it from making more than one investment.

[9] Throughout the paper, we will use the superscript to indicate the country where the MNE locates its production facility.

In what follows, we will extend such a simple model along several lines. We will let the public firm be as efficient as or less efficient than the foreign firm. We will also consider exportable final goods in the presence of intra-regional trade costs. In spite of that, the trade-off for the big country between attractiveness and welfare will generally be at work.

3 The model

We consider a firm from a third-country (we will refer to it as firm 1, the MNE or the foreign firm) which has to decide in which of two countries to invest (i.e., to locate a production plant) in order to provide some final good to the consumers of the whole region. We postulate that the markets of the two countries differ in size and that an incumbent public firm already serves the entire regional market from the big country.

Firstly, we analyze the effects of privatization on the investment decision of the foreign firm and on welfare. To this end, we compare the outcome of two games, which differ depending on whether - before the game starts - the incumbent on the regional market is a public welfare-maximizing or a private profit-maximizing firm. The model can then be described as a two-stage game of perfect information where, in the first stage, the foreign firm decides in which country to locate its production plant, and in the second stage, firms compete in quantities on the two markets.

Secondly, we introduce tax/subsidy competition for FDI between the two countries and analyze how fiscal and privatization policies may affect the investment decision of the MNE and welfare. This is done by introducing a pre-play stage to the two-stage game of perfect information outlined above. In this stage, the two countries post a irreversible offer in terms of lump-sum tax/subsidy to the MNE in order to attract its investment. As before, the analysis of privatization is a comparative statics exercise contrasting the outcome of two three-stage games, one with a public welfare-maximizing firm and the other with a private profit-maximizing firm.

As we will see below, each country's market can be characterized by different competitive structures depending on the location decision of the MNE, on the production choices of the two firms, and on the nature of the incumbent firm.

The basic set-up

The markets of the two countries are of unequal size. Namely, in line with Haufler and Wooton (1999), we assume that a single consumer lives in country A and $n \geq 1$ identical consumers live in country B, which, for $n > 1$, represents the "big" market for the final good. In the *status quo ante*, no production takes place in the small country, whereas a welfare-maximizing public firm (firm 0) operates in the big country.[10]

The incumbent firm and the foreign MNE produce and sell the same product and compete *à la* Cournot on the two markets. In particular, the incumbent firm is assumed to be *less efficient* than the MNE, i.e., it produces the final good at a higher marginal cost, $c_0 > c_1 \geq 0$, with c_i denoting the constant marginal production cost of firm $i = 0, 1$. Moreover, it serves the small market through exports by incurring positive per unit trade costs, $\tau > 0$. The MNE, instead, has to bear 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 compared to trade costs within the region (τ).[11]

The marginal cost of serving a market thus depends on the efficiency of the firm and on its location. When the final good is produced and sold locally, the marginal cost is given by 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 intra-regional trade costs, τ. The latter separate the two markets so that consumer prices for the same final good will be different in the two countries.[12] But since the two firms sell a homogeneous good, its consumer price in a given market will be the same irrespective of where production takes place.[13]

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[10] We do not exclude the symmetric-country case ($n = 1$). By contrast, we do not consider the case where the public firm operates in the small country. This, in fact, leads to the trivial conclusion that the MNE always prefers to invest in the big country with no local competitor.

[11] 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. 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 favourite country unprofitable.

[12] Several empirical studies show that the *market segmentation* assumption is con-

Denoting by q_{ij} the quantity of the final good sold by firm i on country j's market ($i = 0, 1,\ j = A, B$), we can write the total cost functions of firm 0 and firm 1 as follows:

$$\begin{aligned} C_0\left(q_{0A}, q_{0B}\right) &= c_0\left(q_{0A} + q_{0B}\right) + \tau q_{0A} && (1) \\ C_1\left(q_{1A}, q_{1B}\right) &= F + c_1\left(q_{1A} + q_{1B}\right) + \tau\left(I_A q_{1A} + I_B q_{1B}\right) && (2) \end{aligned}$$

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

We assume that firms face the following linear demands in the two markets:

$$Q_A(p_A) = \alpha - p_A \qquad \text{and} \qquad Q_B(p_B) = n\left(\alpha - p_B\right)$$

where $Q_j = q_{0j} + q_{1j}$ and p_j are the total quantity and the price to consumers on country j's market, respectively. Production and trade costs are assumed not to exceed the consumers' maximal willingness to pay, i.e., $c_0, c_1, \tau \leq \alpha$. In addition, to keep our analysis as simple as possible, we normalize firm 1's marginal production cost to 0 ($c_1 = 0$) and set $\alpha = 1$, so that $c_0, \tau \in [0, 1]$.

The incumbent firm

When the incumbent in the big country is a public firm, its objective is to maximize social welfare in B, which corresponds to the unweighted sum of domestic consumer surplus and firm 0's profits:

$$W_B\left(q_{0A}, q_{0B}, q_{1A}, q_{1B}\right) = CS_B\left(Q_B\right) + \Pi_0\left(q_{0A}, q_{0B}, q_{1A}, q_{1B}\right)$$

where

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

and

$$\Pi_0\left(q_{0A}, q_{0B}, q_{1A}, q_{1B}\right) = p_B(Q_B)q_{0B} + p_A(Q_A)q_{0A} - C_0\left(q_{0A}, q_{0B}\right).$$

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sistent with the price-setting behaviour of firms even within the European Union, where, in principle, there should be no official barriers to cross-border trade. See, for instance, Head and Mayer (2000), Haskel and Wolf (2001), and Lutz (2004).

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

The objective function of the public firm can then be rewritten as

$$W_B\left(q_{0A}, q_{0B}, q_{1A}, q_{1B}\right) =$$

$$\int_0^{Q_B} p_B(s)ds - p_B(Q_B)q_{1B} + p_A(Q_A)q_{0A} - C_0\left(q_{0A}, q_{0B}\right) \qquad (3)$$

from which it is evident that welfare in country 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 that same market.

Firms compete on quantities in the two markets. The linearity of costs allows them to choose output for one country's market independently of that for the other. Hence, when it comes to welfare maximization, it is straightforward to show that the public firm's reaction functions are given by:[14]

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

The public firm's output choice for its domestic market is constant and independent of the MNE's quantity decision. On the other hand, its reaction function on the foreign market has the usual downward slope. This follows from the fact that the public firm behaves as a welfare maximizer on the domestic market only, while it seeks to maximize profits on country A's market.

Privatization of the incumbent firm changes its objective function. In particular, we suppose that the government of country B privatizes the public firm by selling all of the shares to domestic investors/residents. Then, if privatization *per se* does not imply a decrease in production costs, the only difference with respect to the before-privatization scenario is the nature of the incumbent firm in B. The privatized firm, indeed, will seek to maximize just its profits, instead of country B's welfare. Hence, it is easy to derive the privatized firm's reaction functions, which are given by:

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[14] In what follows, we will use the superscripts G and P to indicate output choices when the incumbent is a public or a privatized firm, respectively.

$$\begin{aligned} q_{0A}^{P} &= q_{0A}^{G} = \max\left\{\frac{1-c_0-\tau}{2}-\frac{q_{1A}}{2},0\right\} \qquad \text{and} \\ q_{0B}^{P} &= \max\left\{\frac{n\left(1-c_0\right)}{2}-\frac{q_{1B}}{2},0\right\}. \end{aligned}$$

While the public firm acts as a profit maximizer just in country A, the privatized firm maximizes its profits in both markets, so that its output choice for the domestic market is no longer independent of the MNE's behaviour. Namely, quantities of the two firms are strategic substitutes in the two markets. Moreover, the privatized firm always earns nonnegative profits in each country - otherwise, it does not produce for that market.

The foreign firm

The foreign firm is interested in maximizing the profits it may earn from investing in the region. Since the latter depend on where it locates its production plant, the objective function of the MNE can be written as follows:

$$\Pi^{j} \equiv \Pi_{1}^{j}\left(q_{0A},q_{0B},q_{1A},q_{1B}\right) = p_A\left(Q_A\right)q_{1A}+p_B\left(Q_B\right)q_{1B}-C_1\left(q_{1A},q_{1B}\right). \tag{4}$$

Using the total cost function (2) and maximizing (4) with respect to the quantities supplied in the two markets, we easily derive the reaction functions of the MNE

$$\begin{aligned} q_{1A} &= \max\left\{\frac{1-I_A\tau}{2}-\frac{q_{0A}}{2},0\right\} \qquad \text{and} \\ q_{1B} &= \max\left\{n\frac{1-I_B\tau}{2}-\frac{q_{0B}}{2},0\right\} \end{aligned} \tag{5}$$

where $I_A=0$ and $I_B=1$ if FDI occurs in country A, while the reverse is true if FDI occurs in country B.

4 Market competition

The equilibrium outcome of competition on the product market is affected by whether the incumbent in the big country is a public or a privatized firm and by the location choice of the MNE. Therefore, in order to solve the last stage of the game, we have to consider four cases: (a) no privatization and FDI in country A; (b) no privatization and FDI in country B; (c) privatization and FDI in country A; and (d) privatization and FDI in country B.

Different market configurations (private or public monopoly versus duopoly) may arise depending on the values of c_0 and τ. By contrast, the difference in market size, n, has no impact on the structure of the markets.[15]

In what follows, we will solve for equilibrium quantities in the above-mentioned four cases and we will denote by q_{ij}^{zk} the equilibrium quantity produced by firm i $(i = 0, 1)$ for the market of country j when FDI occurs in country k $(j, k = A, B)$ and the incumbent is a public or a privatized firm $(z = G, P)$.

(a) No privatization and FDI in country A

In the presence of a public welfare-maximizing firm in country B, if the MNE invests, i.e., locates its production facility, in the small country, equilibrium quantities are given by:

$$q_{0A}^{GA} = \max\left\{\frac{1-2c_0-2\tau}{3}, 0\right\} \quad \text{and} \quad q_{1A}^{GA} = \frac{1}{3}(1 + c_0 + \tau)$$

in country A,

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

in country B,

where $q_{0A}^{GA} \geq 0$ and $q_{1B}^{GA} \geq 0$ as long as $c_0 \leq \frac{1-2\tau}{2}$ and $c_0 \geq \tau$, respectively.

Since the MNE enters the regional market and produces *in loco*, exporting to the small country becomes less profitable for the public firm. In particular, when production and/or trade costs are too high, the latter stops exporting, thereby leaving monopoly power in the small market to the MNE. However, 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 it whenever the cost of supplying the final good to the big country's market does not exceed the production cost of the local public firm, i.e., for $\tau \leq c_0$. If this were not the case, consumers of the big country will continue to be served by a public monopoly.

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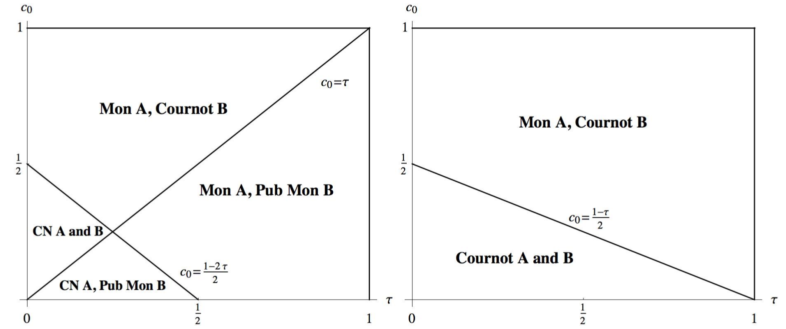
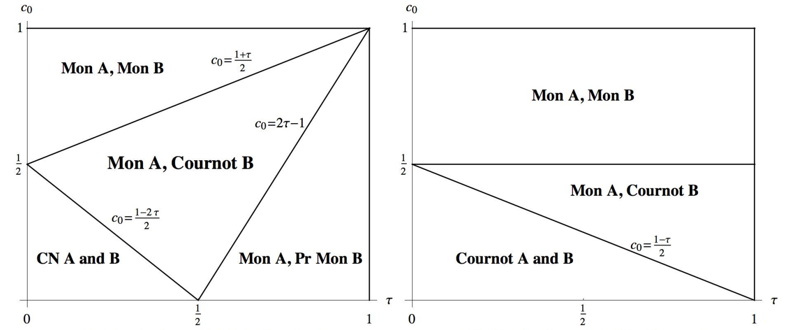
[15] This follows from the assumption that all consumers are identical and thus behave in the same way in equilibrium. An additional consumer buys the good from the two firms in the same proportion as the other consumers did beforehand. Then the market structure is not sensitive to the number of consumers ($n+1$ in our model) and only the level of profits is affected.

Panel (a) of Figure 1 depicts all the possible market configurations in the parameter space (τ, c_0). If, for instance, $c_0 > \tau$ and $c_0 < \frac{1-2\tau}{2}$ simultaneously hold, both firms sell positive quantities in both markets. But if the second condition does not hold, FDI in the small country will drive the public firm out of that market.



(a) No privatization and FDI in Country A

(b) No privatization and FDI in Country B



(c) Privatization and FDI in Country A

(d) Privatization and FDI in Country B

Figure 1: Market configurations

(b) **No privatization and FDI in country** B

If the MNE chooses to invest in the big country, which already hosts a public welfare-maximizing firm, equilibrium quantities are given by:

$$\begin{array}{lll} q_{0A}^{GB} = \max\left\{\frac{1-2c_0-\tau}{3}, 0\right\} & \text{and} & q_{1A}^{GB} = \frac{1}{3}\left(1+c_0-\tau\right) \\ \text{in country } A, & & \\ q_{0B}^{GB} = q_{0B}^{GA} = n\left(1-c_0\right) & \text{and} & q_{1B}^{GB} = \frac{nc_0}{2} \\ \text{in country } B, & & \end{array}$$

where $q_{0A}^{GB} \geq 0$ as long as $c_0 \leq \frac{1-\tau}{2}$.

As in case (a), entry in the regional market by the foreign firm reduces the profitability of exporting to the small country for the incumbent. However, since both firms will incur trade costs to serve country A's market, competition will be milder than before. The public firm will then find it profitable to export for higher values of c_0. Note also that, by locating its production facility in country B, the MNE will always profitably serve both countries' markets despite the competition of the public incumbent.

Panel (b) of Figure 1 represents the two possible market configurations in this case: Cournot competition always occurs on country B's market, while we observe either a monopoly by the foreign MNE or a Cournot duopoly on country A's market.

(c) Privatization and FDI in country A

Privatization changes the behaviour of the incumbent firm on the big country's market. In the presence of a privatized profit-maximizing firm in country B, if the MNE invests in the small country, equilibrium quantities are given by:

$$\begin{array}{lll} q_{0A}^{PA} = q_{0A}^{GA} & \text{and} & q_{1A}^{PA} = q_{1A}^{GA} \\ \text{in country } A, & & \\ q_{0B}^{PA} = \max\left\{\frac{n\left(1-2c_0+\tau\right)}{3}, 0\right\} & \text{and} & q_{1B}^{PA} = \max\left\{\frac{n\left(1+c_0-2\tau\right)}{3}, 0\right\} \\ \text{in country } B, & & \end{array}$$

where, as before, $q_{0A}^{PA} \geq 0$ as long as $c_0 \leq \frac{1-2\tau}{2}$. In addition, $q_{0B}^{PA} \geq 0$ and $q_{1B}^{PA} \geq 0$ if and only if $c_0 \leq \frac{1+\tau}{2}$ and $c_0 \geq 2\tau - 1$, respectively.

While no change occurs on country A's market, the incumbent firm, following privatization, may no longer find it profitable to compete with the MNE even on its domestic market. For low production costs, the privatized incumbent will keep producing on both markets. For intermediate production costs, it will stop exporting to the small market - just like a public incumbent would have done anyway. But if production costs are large enough, the privatized incumbent will be induced to exit both markets, where it will be replaced by the foreign MNE. In spite of that, if trade costs are sufficiently high relative to the incumbent's productions costs, investing in A may prevent the MNE from serving country B, thereby leaving monopoly power on that market to the privatized firm.

Panel (c) of Figure 1 illustrates the different possibilities. If, for instance, $c_0 > \frac{1+\tau}{2}$, FDI in the region ensures monopoly power to the foreign firm in both markets. By contrast, for any $c_0 < 2\tau - 1$, investing in A makes exporting unprofitable for the privatized firm but ensures it monopoly on the big country's market.

(d) **Privatization and FDI in country B**

If the MNE, following privatization, chooses to invest in the big country, equilibrium quantities are given by:

$$\begin{array}{llll} q_{0A}^{PB} = q_{0A}^{GB} & \text{and} & q_{1A}^{PB} = q_{1A}^{GB} & \text{in country } A, \\ q_{0B}^{PB} = \max\left\{\frac{n\left(1-2c_0\right)}{3}, 0\right\} & \text{and} & q_{1B}^{PB} = \frac{n\left(1+c_0\right)}{3} & \text{in country } B, \end{array}$$

where $q_{0A}^{PB} \geq 0$ and $q_{0B}^{PB} \geq 0$ as long as $c_0 \leq \frac{1-\tau}{2}$ and $c_0 \leq \frac{1}{2}$, respectively.

As in case (c), entry of the relatively more efficient MNE in the regional market makes domestic production less profitable for the privatized firm. Due to the presence of positive trade costs, such an argument is even stronger for exports. Hence, if the privatized firm is not efficient enough, it will be forced to stop production in order to avoid losses, and the MNE will behave as a monopolist on both markets.

Panel (d) of Figure 1 depicts the possible market configurations in this last case.

5 Investment decision of the MNE

Moving backwards in the game tree, we now turn to the analysis of the FDI choice by the foreign MNE. At this stage, the latter chooses in which country to locate its production plant with the purpose of serving the whole regional market. The MNE knows whether it will face a public or a privatized incumbent and anticipates market configurations and equilibrium profits arising in the last stage of the game.

In order to take its investment decision, the MNE compares its profits from investing in country A and B. Whenever $\Pi^A = \Pi^B$, the MNE is indifferent between investing in either country, and the gain in profits on A's market of locating in A over B exactly compensates the gain in profits on B's market of locating in B over A. Indeed:

$$\Pi^A = \Pi^B \Longleftrightarrow \pi_A^A + \pi_B^A = \pi_A^B + \pi_B^B \Longleftrightarrow \pi_A^A - \pi_A^B = \pi_B^B - \pi_B^A$$

where π_j^k stands for the MNE's profits on j's market when FDI goes to country k $(j, k = A, B)$.

When the two countries have the same market size $(n = 1)$, the presence of an incumbent firm - although less efficient than the MNE - is a strong disincentive to invest in country B. Intuitively, as there exist positive trade costs separating the two markets, the MNE prefers to locate as distant as possible from its competitor. In particular, when the incumbent is a public welfare-maximizing firm, the foreign firm will always invest in country A.

In general, however, the investment decision of the foreign MNE is driven by three effects. The *market size* effect captures the relative asymmetry between the two countries' markets: a larger n increases the relative profitability of investing in the big country and FDI is more likely to take place there. The *cost* effect reflects the efficiency of the incumbent firm: as intuition suggests, the higher c_0, the higher the attractiveness of country B since the MNE faces a weaker competitor on the big market. The *competition effect* is related to τ. Bjorvatn and Eckel (2006, p. 1896) claim that *"the higher are the trade costs, the more protected are the national markets from international competition, and the more important is the competition argument in favour of location in* [the small country]*"*. But this is not always true in our model. Higher trade costs, indeed, can increase the relative profitability of investing in the big country. If the incumbent is inefficient enough and/or country B's market is sufficiently larger than country A's one, the MNE may prefer to locate as close as possible to consumers in B since the profit loss in B from investing in A would exceed that in A from investing in B. Therefore, the effect of τ on the FDI decision is ambiguous and depends on the values of c_0 and n and on the market configurations prevailing in the two countries.

Figure 2 illustrates the investment decision of the MNE in the parameter space (τ, c_0) for selected values of the size-asymmetry parameter n (i.e., $n = 1, 2, 3$) when the incumbent is a public welfare-maximizing firm. It essentially defines, for a given n, the values of the parameters c_0 and τ such that the MNE chooses to invest in one of the two countries anticipating market configurations and equilibrium profits arising in the last stage of the game. The bold line in the central and in the right panel of the Figure identifies the indifference condition, i.e., the locus where $\Pi^A = \Pi^B$.[16]

First of all, it is evident that an increase in market asymmetry, i.e., a larger n, raises the profitability of locating a production plant in B. As for the cost effect, the more inefficient the incumbent firm, the more profitable investing in B: for given values of $n > 1$ and $\tau \in [0, 1]$, indeed, as we let c_0 increase from zero, the MNE eventually prefers locating in B over A. Finally, the competition effect crucially depends on the market configurations resulting from the FDI choice. Consider, for example, the right panel of Figure 2 - which depicts a situation where the difference in market size is sufficiently large ($n = 3$) - and take a value of c_0 just below 1/2 and $\tau = 0$. In this case, Cournot competition always occurs in both markets and the competition effect works in the intuitive direction suggested by Bjorvatn and Eckel (2006). The same occurs when trade costs are sufficiently high. For intermediate values of τ, instead, the competition effect is such that higher trade costs make country B relatively more attractive. This happens in spite of the fact that investing in A would guarantee monopoly profits to the MNE on that market. But the consequent profit loss on the big market gets larger for higher trade costs and eventually exceeds the gain on the small one. Hence, the foreign firm prefers to locate as close as possible to consumers in the big country.

While the effects of privatization on the attractiveness of country B will be discussed in the next Section, it is easy to show that, with a

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[16] The indifference locus has been derived - and then plotted - by comparing profits from investing in A and in B for each of the possible market configurations. See the Appendix for details.

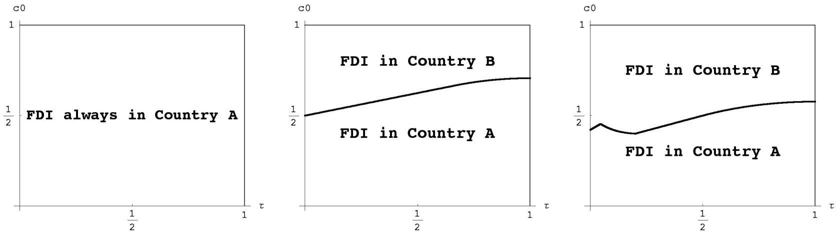

Figure 2: FDI decision with a public incumbent in B for $n = 1, 2, 3$

privatized incumbent, the impact of n, c_0 and τ on the FDI decision are qualitatively equivalent to the case of a public incumbent. In fact, the larger the asymmetry in market size and/or the lower the efficiency of the incumbent firm, the more profitable will be to invest in B. Similarly, the sign of the competition effect is related to the market structure arising from the location choice.

6 The effects of privatization

In this Section we compare the outcome of the game with a public incumbent and the one of the game with the privatized firm.

Firstly we will look at the effect on the attractiveness of the country: does privatization increase MNE's profitability of investing in country B? The answer is unambiguous and given in Proposition 1.

Secondly, we will look at the effects on Country B's consumer surplus and welfare. Do consumers benefit from privatization? What is the overall effect on welfare? Proposition 2 deals with these issues.

In general, privatization decreases the importance of the cost effect relative to the market size effect in driving the investment decision of the MNE. On the big market, the privatized firm produces as long as its profits are nonnegative and it clearly represents a much weaker competitor for the MNE than the public firm, which either runs losses or realizes zero profits from sales. In the small country, instead, privatization does not affect the intensity of market competition. Hence, the cost effect is less likely to discourage the MNE from investing in the big country than before privatization, and higher values of n dramatically increase the attractiveness of country B because of the market size effect. In particular, if the privatized firm is too inefficient ($c_0 > \frac{1}{2}$), the MNE always invests in the big country as this allows it to be a monopolist on both markets and to serve the relatively large market without incurring any trade costs.

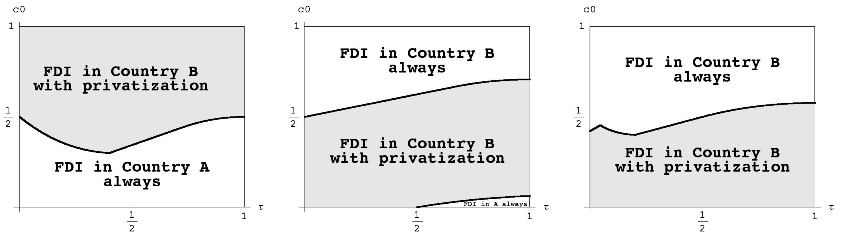

Figure 3: Impact of privatization on the FDI decision for $n = 1, 2, 3$

Figure 3, shows the effect of privatization on the investment decision of the MNE. The grey areas represent the parameter space (τ, c_0) where privatization changes the decision of the MNE and induces it to invest in country B. The impact of privatization on the attractiveness of the big country is evident from this Figure and consistent with our discussion above, so that we can state

Proposition 1 *Privatization always increases the attractiveness of the big country.*

Privatization of the formerly-public firm makes it more likely that the MNE invests in country B rather than A. This is because, following privatization, the incumbent firm produces a lower output and becomes a weaker competitor for the MNE. However, in spite of its FDI-attracting property, privatization does not necessarily make the big country better off. On the contrary, whenever the domestic firm is able to compete with the MNE and remains on the market after privatization (i.e., when $c_0 < 1/2$), welfare always decreases as Figure 4 clearly shows. This allows us to state

Proposition 2 *An FDI-attracting privatization decreases social welfare whenever the privatized firm stays in the market. Privatization may increase welfare only if it resolves in shutting down the (very inefficient) public firm.*

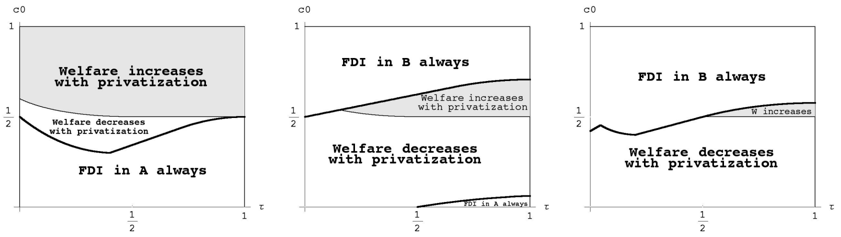

Figure 4: Impact of privatization on country B's welfare for $n = 1, 2, 3$

The intuition behind Proposition 2 is that when privatization induces the MNE to invest in the big country, the increase in profits for the incumbent firm can never compensate for the loss in consumer surplus of domestic residents. Hence, social welfare in the big country decreases. This happens despite the fact that the privatized firm remains entirely in the hands of domestic residents. Indeed, if we allow for the possibility of foreign acquisition, the welfare-reducing impact of an FDI-attracting privatization will be even stronger unless country B's government is able to sell the firm at a value which fully reflects its future profit earnings. It is thus evident that the decision of privatizing the public firm entails a trade-off for the big country between attractiveness and welfare.

7 Policy competition for FDI

In this Section, we extend the game theoretic description of the FDI choice by introducing a pre-location stage in which the government of the two countries simultaneously and independently offer to the MNE a tax/subsidy package to which they are subsequently committed.[17] The MNE then makes her location choice on the basis not only of the (pre-tax) profits but also of the fiscal policies of the competing countries. In the last stage of the game the MNE and the incumbent compete on the two markets, profits are realized, and taxes or subsidies are paid. We solve our three-stage games with a public and with a private incumbent, respectively, and then perform a comparative statics exercise to analyze the relationship between privatization and fiscal policies.

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[17] The assumption of government commitment may be justified on the ground of credibility. It prevents the trivial result in which the MNE does not invest in the region in order to avoid the full seizure of its profits.

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 fiscal policy by S_j, $j = A, B$. The equilibrium policy will be a lump-sum tax when the host country already represents the favourite location for the MNE in the absence of policy competition; otherwise, it will be a lump-sum subsidy which makes the MNE prefer a country to the other.

To analyze policy competition, we first need to identify the maximum subsidy each country is willing to offer to the MNE. We define such a subsidy as the country's 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 $(j, k = A, B)$. While welfare in country B consists of consumer surplus and public firm's profits as given by (3), 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.

When countries compete to attract FDI, the MNE will invest in country j if and only if

$$\Pi^j + S_j^{max} > \Pi^k + S_k^{max}, \quad \text{for} \quad j, k = A, B,\ j \neq k \tag{6}$$

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. Note, however, that 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.

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.[18] When both countries offer the maximum subsidy to attract FDI, country j wins the auction if condition (6) holds; however, country j need not actually 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:[19]

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[18] See the Appendix for a formal proof. The simultaneous auction equilibrium outcome is equivalent to the one under Bertrand price competition for FDI between the two countries.

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

We now investigate how the interaction of fiscal and privatization policies affects the attractiveness of the big country. Figure 5, which is drawn for the case $n = 2$, is useful to illustrate the impact of tax/subsidy competition and privatization both on the investment decision of the MNE and on welfare of country B. First of all, it suggests that policy competition allows the big country to reduce the negative impact on welfare of an FDI-attracting privatization. We summarize this result in

Proposition 3 *Tax/subsidy competition decreases the negative impact of an FDI-attracting privatization on social welfare.*

The intuition is simple. Privatization dramatically increases the attractiveness of the big country. Hence, it is extremely beneficial for the MNE to invest there instead of investing in the small country. This, in turn, implies that country B can tax away part of the profit gain from investing there (without changing the FDI decision of the foreign firm), thereby increasing welfare above the before-privatization level.[20]

Figure 5 also shows that, after privatization, tax/subsidy competition enlarges the parameter space (τ, c_0) where the MNE chooses to invest in the small country. This is because the big country's gain from receiving FDI is lower than before privatization, which translates into a less generous fiscal policy to attract FDI. This allows us to claim

Proposition 4 *Following privatization, tax/subsidy competition increases the attractiveness of the small country.*

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[19] 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, country j wins the auction by taxing away part of the MNE's profits. In such a situation, the lump-sum tax represents an *entrance fee* that country j charges the firm for establishing its production plant there.

[20] Policy competition, however, does not prevent country B's welfare to decrease as a result of an FDI-attracting privatization when countries are symmetric ($n = 1$). In such a situation, indeed, country B is always willing to offer a subsidy (in equilibrium) which lowers its net-of-subsidy welfare below the corresponding level before privatization.

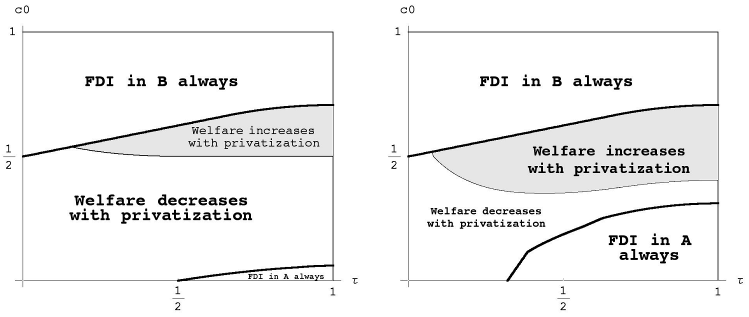

Figure 5: Impact of privatization and tax/subsidy competition for $n = 2$

After privatization, the big country is less eager to attract FDI than it was before. Hence, the small country will represent a more attractive location for the investment and can even succeed in hosting the MNE by taxing away part of its profit gain from investing there. Intuitively, the net effect on country B's welfare of receiving FDI can now be negative since the gain in consumer surplus could not be sufficiently high to counteract the loss in domestic firm's profits. This implies that the big country may be willing to tax the MNE in order to discourage it from investing there and to protect the domestic industry from foreign competition. Such a result puts forward an argument for the *protectionist* role of tax/subsidy competition for FDI. Moreover, it is consistent with the finding by Bjorvatn and Eckel (2006) according to which the big country may gain from not receiving FDI when its market size is relatively large. However, our conclusions are more general than theirs in that the privatized firm in the big country can be either as efficient as or less efficient than the foreign MNE.

8 Other Issues

In this Section, we discuss the robustness of our results to some specific issues in order to check to what extent they depend on the assumptions of the model.

Firstly, privatization does not entail any *efficiency gain* in our set-up.[21] In spite of that, the fundamental trade-off between attractiveness and welfare is robust to the inclusion of efficiency gains. Suppose that the highest possible efficiency gains are achieved by privatization and the incumbent becomes as efficient as the MNE. It is then easy to show that for high values of c_0 and τ, privatization with full efficiency gains increases welfare but induces the MNE to invest in the other country, while the opposite occurs for low values of the two parameters. Attractiveness and welfare may simultaneously increase only for intermediate values. Furthermore, if we focus on consumer surplus only, the result is even stronger: for any value of the parameters, privatization increases the attractiveness of country B only if the market price increases and consumers are worse off.[22]

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[21] As a matter of fact, the empirical evidence in this respect is mixed and the

Secondly, we have implicitly left out the possibility that consumers - or other economic agents - take advantage of *arbitrage opportunities.* If arbitrage were possible, instead, firms would be constrained in their output choices. The arbitrage constraint would affect competition just in the small country's market before privatization. The public firm, indeed, would behave less aggressively on that market - where it will never export to. As a result, the relative profitability of investing in the small country increases. But this, in turn, implies that privatization will be more effective in improving the attractiveness of the big country.

Thirdly, one can call into question the absence of a *budget constraint*, i.e., a break even condition, for the public firm. Public firms, indeed, 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, the public firm's maximization problem turns out to be equivalent to a problem where the objective function is a weighted average of welfare and profits. As a consequence, the firm's behaviour is somehow halfway between an unconstrained welfare maximizer and a profit maximizer. In particular, the firm behaves either as in our original set-up or less aggressively than before, thereby increasing the attractiveness of the big country. For this reason, privatization becomes

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variance of the results is substantial (see Cuervo and Villalonga, 2000). On the other hand, there is general agreement on the fact that liberalization processes and increased competition enhance firms' efficiency. See, for example, the meta-reviews of Villalonga (2000), Megginson and Netter (2001), and Willner (2001).

[22] We can also show that the latter result is robust to a departure from our linear cost and demand setting and is valid whenever Cournot equilibrium exists and is unique.

a weaker instrument to attract FDI, and in such a sense, the break even requirement can be viewed as a - milder - alternative to privatization.

Finally, we let firms compete in quantities - that are strategic substitutes - on the two markets. It is thus fair to wonder what happens when the two firms' products are *strategic complements*. To this end, we consider a differentiated products duopoly with linear demand in both markets where firms compete on prices.[23] Straightforward computations yield upward-sloping reaction functions for the MNE and for the public - and the privatized - firm. Both firms will always be active in the two markets as long as their products are sufficiently differentiated. Moreover, the FDI decision of the MNE will now also depend on the degree of product differentiation. In particular, the relative gain from investing in B increases with market-size asymmetry only when trade costs are high enough compared to the latter. In spite of that, it is possible to show that privatization always make it more profitable for the MNE to invest in country B even in a model with strategic substitutes.

9 Conclusions

Several empirical studies about Latin America and Central and Eastern Europe have put forward the FDI-attracting property of privatization and, in particular, of domestic privatization programs. The main speculative argument is that potential foreign investors interpret privatization as a signal of a more favourable economic environment.

In this paper, we provide an alternative micro-founded explanation of why privatization may attract foreign investors interested in entering a regional market. By changing the objective of the incumbent firm in the big country, privatization turns the formerly-public firm into a less aggressive competitor for the MNE since profit-maximizing output is lower than the welfare-maximizing one. This, in turn, translates into larger profit opportunities for foreign competitors. The drawback is that social welfare generally decreases. This *attractiveness-welfare trade-off* has been illustrated in a simple model where we isolate the main forces driving our results. Then, we have extended our analysis to account for intra-regional exports in the presence of positive trade costs, relative inefficiency of the incumbent firm in the big market, and the possibility of lump-sum tax/subsidy competition between the two countries to attract FDI. We have found that the attractiveness-welfare trade-off resulting from an FDI-attracting privatization policy is still at work in our extended set-up. Moreover, the possibly negative impact on welfare may be mitigated in the presence of tax/subsidy competition since the big country now has an instrument to tax away part of the MNE's profit gain from investing there.

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[23] See Hindriks and Claude (2006) for a mixed oligopoly model with differentiated products where firms compete either in prices or in quantities.

To sum up, the presence of a public firm (although relatively inefficient) is a strong disincentive for a foreign firm to invest in the country even if the latter represents a large market for its product. However, privatization *per se* is not necessarily good news from the big country's perspective as it might attract FDI while decreasing welfare. If this were the case, the possibility of competing in fiscal policies may be an improvement to the extent that it endows the big country with an instrument which it can use either to protect its local producers from foreign competitors or to extract part of the rents the foreign firm earns by locating there.

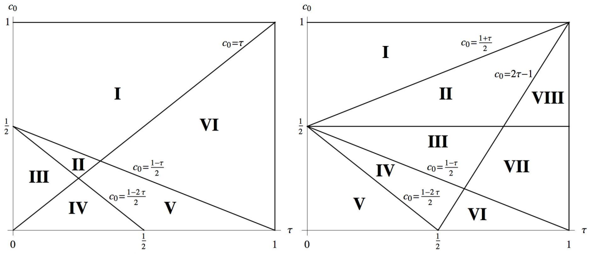
Our findings thus shed light on the relationship between privatization and fiscal policies aimed at attracting FDI. Privatization may represent an alternative policy instrument that the government uses to improve the attractiveness of a country for foreign investors. On the other hand, fiscal policies might help reducing (or preventing) the negative impact on domestic welfare of an FDI-attracting privatization. This substitutability/complementarity relationship between the two policies raises the empirical testable prediction that privatization may be more effective in attracting FDI in regions where tax competition is more intense. This appears to be a promising task for future research.

Appendix

FDI choice and market configurations

Depending on the values of c_0 and τ, on whether FDI goes to country A or B, and on the nature of the incumbent in B, different market configurations may arise. We have depicted them in the parameter space (τ, c_0) with the four panels of Figure 1. In order to determine the investment decision by the MNE, we superimpose the two top panels -

in the case of a public incumbent - and the two bottom panels - in the case of a privatized incumbent - respectively. This is shown in Figure 6. Tables 1 and 2 then summarize the market configurations corresponding to the different regions identified in the two panels of Figure 6.



(a) Public incumbent (b) Privatized incumbent

Figure 6: FDI choice and market configurations

	FDI in *A*		FDI in *B*	
Region	Country *A*	Country *B*	Country *A*	Country *B*
I	MNE monopoly	Cournot	MNE monopoly	Cournot
II	MNE monopoly	Cournot	Cournot	Cournot
III	Cournot	Cournot	Cournot	Cournot
IV	Cournot	Public Monopoly	Cournot	Cournot
V	MNE monopoly	Public Monopoly	Cournot	Cournot
VI	MNE monopoly	Public Monopoly	MNE monopoly	Cournot

Table 1: Regions and market configurations with a public incumbent

Investment decision with a public incumbent

Table 3 shows the values of equilibrium profits and welfare in the big country when FDI goes to country *A* or *B* and the incumbent is a public firm.

When FDI goes to *A*, the MNE behaves as a monopolist on that market - producing $q_{1A}^{A} = \frac{1}{2}$ - if the public firm does not export to *A* or as a duopolist otherwise. Hence, the price to consumers in *A* is given by $p_A = \frac{1}{2}$ or $p_A = \frac{1+c_0+\tau}{3}$, respectively. In *B*, the public firm behaves as a public monopoly if the MNE does not export to *B* or as a duopolist

	FDI in A		FDI in B	
Region	Country A	Country B	Country A	Country B
I	MNE Monop.	MNE Monop.	MNE Monop.	MNE Monop.
II	MNE Monop.	Cournot	MNE Monop.	MNE Monop.
III	MNE Monop.	Cournot	MNE Monop.	Cournot
IV	MNE Monop.	Cournot	Cournot	Cournot
V	Cournot	Cournot	Cournot	Cournot
VI	MNE Monop.	Privatized Monop.	Cournot	Cournot
VII	MNE Monop.	Privatized Monop.	MNE Monop.	Cournot
VIII	MNE Monop.	Privatized Monop.	MNE Monop.	MNE Monop.

Table 2: Regions and market configurations with a privatized incumbent

otherwise, implying $p_B = c_0$ or $p_B = \frac{c_0+\tau}{2}$, respectively. When FDI goes to B, instead, the MNE always behaves as a duopolist on that market due to the presence of the incumbent public firm. Hence, the price to consumers in B is always given by $p_B = \frac{c_0}{2}$. In A, the MNE behaves as a monopolist - producing $q_{1A}^B = \frac{1-\tau}{2}$ - if the public firm does not export to that country or as a duopolist otherwise, implying $p_A = \frac{1+\tau}{2}$ or $p_A = \frac{1+c_0+2\tau}{3}$, respectively. Straightforward computations allow us to derive profits of the MNE from investing in A or in B and the corresponding welfare in the two countries. Then, profit and welfare differentials for the different regions of the left panel in Figure 6 can be easily determined by using Table 3.

FDI in A		
Market in A, B	$\Pi^A + F$	W_B^A
Mon, CN	$\frac{1}{4} + \frac{n\left(c_0-\tau\right)^2}{4}$	$\frac{n\left(2-c_0-\tau\right)^2}{8} - \frac{n\left(1-c_0\right)\left(c_0-\tau\right)}{2}$
CN, CN	$\frac{\left(1+c_0+\tau\right)^2}{9} + \frac{n\left(c_0-\tau\right)^2}{4}$	$W_B^A\left(Mon, CN\right) + \frac{\left(1-2c_0-2\tau\right)^2}{9}$
CN, Pub Mon	$\frac{\left(1+c_0+\tau\right)^2}{9}$	$\frac{n\left(1-c_0\right)^2}{2} + \frac{\left(1-2c_0-2\tau\right)^2}{9}$
Mon, Pub Mon	$\frac{1}{4}$	$\frac{n\left(1-c_0\right)^2}{2}$

FDI in B		
Market in A, B	$\Pi^B + F$	W_B^B
Mon, CN	$\frac{(1-\tau)^2}{4} + \frac{nc_0^2}{4}$	$\frac{n\left(2-c_0\right)^2}{8} - \frac{n\left(1-c_0\right)c_0}{2}$
CN, CN	$\frac{\left(1+c_0-\tau\right)^2}{9} + \frac{nc_0^2}{4}$	$\frac{n\left(2-c_0\right)^2}{8} + \frac{\left(1-2c_0-\tau\right)^2}{9} - \frac{n\left(1-c_0\right)c_0}{2}$

Table 3: Profits and welfare from FDI in A or in B with a public incumbent

Investment decision with a privatized incumbent

Table 4 shows the values of equilibrium profits and welfare in the big country when FDI goes to country A or B and the incumbent is a privatized firm.

Following privatization, the MNE's behaviour on the small market is the same as in the presence of a public firm. But the way firms compete in the big country changes. When FDI goes to A, the privatized firm behaves as a monopolist - producing $q_{0B}^{PA} = \frac{n(1-c_0)}{2}$ - if the MNE does not export to B or as a duopolist otherwise, implying $p_B = \frac{1+c_0}{2}$ or $p_B = \frac{1+c_0+\tau}{3}$, respectively. However, since the privatized firm does not want to run losses, the MNE can enjoy monopoly power in B (even by investing in A): whenever $c_0 > \frac{1+\tau}{2}$, the privatized firm indeed shuts down and the MNE sets the monopoly price $p_B = \frac{1+\tau}{2}$ and sells the quantity $q_{1B}^{PA} = \frac{n(1-\tau)}{2}$. When FDI goes to B, instead, the MNE always behaves either as a duopolist or as a monopolist - producing $q_{1B}^{PB} = \frac{n}{2}$ - on that market, where the incumbent privatized firm produces as long as it earns nonnegative profits. Hence, the price to consumers in B is given by either $p_B = \frac{1+c_0}{3}$ or $p_B = \frac{1}{2}$. Straightforward computations allow us to derive profits of the MNE from investing in A or in B and the corresponding welfare in the two countries. Then, profit and welfare differentials for the different regions of the right panel in Figure 6 can be easily determined by using Table 4.

Proof of Proposition 1. This result follows from an intuitive and straightforward argument. First of all, notice that public and privatized firm behave identically on country A's market. On the domestic market, however, the privatized firm is a less aggressive competitor than the public firm, so that the MNE faces a larger residual demand. Hence, independently of where FDI goes to, local profits in B are higher when the incumbent is the privatized firm. This, in turn, implies that the gain in profits from investing in B over A is always bigger than in the presence of the public firm. ■

Proof of Proposition 2. To understand and prove such a sufficient condition, we can compare the worst situation - in terms of country B's welfare - before privatization with the best one after. Before privatization, when FDI goes to A, the worst it can happen is to have a public monopoly serving the domestic market. As the public firm al-

FDI in A		
Market in A, B	$\Pi^A + F$	W_B^A
Mon, CN	$\frac{1}{4} + \frac{n\left(1+c_0-2\tau\right)^2}{9}$	$\frac{n\left(2-c_0-\tau\right)^2}{18} + \frac{n\left(1-2c_0+\tau\right)^2}{9}$
CN, CN	$\frac{\left(1+c_0+\tau\right)^2}{9} + \frac{n\left(1+c_0-2\tau\right)^2}{9}$	$W_B^A\left(Mon, CN\right) + \frac{\left(1-2c_0-2\tau\right)^2}{9}$
Mon, Mon	$\frac{1}{4} + \frac{n(1-\tau)^2}{4}$	$\frac{n(1-\tau)^2}{8}$
Mon, Priv Mon	$\frac{1}{4}$	$\frac{n(1-\tau)^2}{8} + \frac{n\left(1-c_0\right)^2}{4}$

FDI in B		
Market in A, B	$\Pi^B + F$	W_B^B
Mon, Mon	$\frac{(1-\tau)^2}{4} + \frac{n}{4}$	$\frac{n}{8}$
Mon, CN	$\frac{(1-\tau)^2}{4} + \frac{n\left(1+c_0\right)^2}{9}$	$\frac{n\left(2-c_0\right)^2}{18} + \frac{n\left(1-2c_0\right)^2}{9}$
CN, CN	$\frac{\left(1+c_0-\tau\right)^2}{9} + \frac{n\left(1+c_0\right)^2}{9}$	$\frac{n\left(2-c_0\right)^2}{18} + \frac{\left(1-2c_0-\tau\right)^2}{9} + \frac{n\left(1-2c_0\right)^2}{9}$

Table 4: Profits and welfare when FDI occurs either in A or in B with a privatized incumbent

ways produces the same quantity in B, every market configuration in which the MNE produces a positive quantity for that market increases welfare since the gain in consumer surplus always exceeds the loss in public firm's profits. For the same reason, after privatization, the best situation is to have Cournot duopoly on both countries' markets. This is so also because the privatized firm can never be a monopolist on the foreign market.

We divide our proof in two steps: first, we isolate the *pure privatization* effect on country B's welfare; then, we consider the *FDI-switch* effect on the privatized firm's profits.

(i) When the incumbent firm is efficient enough (namely, $c_0 < \frac{1}{2}$), the total quantity produced for the big country's market by a public monopoly, $Q_B^{0M} = n\left(1 - c_0\right)$, is greater than that supplied by a private duopoly, $Q_B^{PD} = \frac{n}{3}\left(2 - c_0\right)$. Then, the sum of consumer surplus and incumbent firm's profits on the domestic market is always smaller after privatization. Therefore, the pure privatization effect is negative for any market configuration when $c_0 < \frac{1}{2}$.

(ii) The FDI switch from A to B following privatization leads to a profit loss on the domestic market and a profit gain on the foreign market for the privatized firm. The overall effect turns out to be

> negative because of the *cost* and of the *market size* effects. To see this, suppose that countries are symmetric so that the market size effect disappears. If the MNE invests in B rather than A, the privatized firm's profits are lower because the gain on the foreign market does not compensate for the loss on the domestic market. Introducing market-size asymmetry makes such an argument even stronger since the loss occurs in the bigger market.

To sum up, both the *pure privatization* and the *FDI-switch* effects have a negative impact on country B's welfare, and the condition $c_0 < \frac{1}{2}$ ensures that the privatized firm stays in the market if the MNE invests in B. This completes the proof. ■

Proof of Proposition 4. Since the privatized firm's reaction function is downward sloping, any increase in the MNE's output in B reduces the privatized firm's quantity with a negative effect both on its profits and on country B's consumer surplus. From the FDI-switch effect (Proof of Proposition 2), we know that if the MNE invests in B rather than A, the gain in privatized firm's profits on the foreign market does not compensate for the loss on the domestic market. This is enough to conclude that $\Pi^A + S_A^{max} > \Pi^B + S_B^{max}$ when $\Pi^A = \Pi^B$. ■

Equilibrium of the policy-competition-for-FDI game

The policy-competition-for-FDI game is equivalent to a competition à la Bertrand where countries A and B compete in prices 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:

$$\begin{aligned} &S_k^* \left(S_j\right) = \epsilon, \text{ with } \epsilon \in \left(0, S_k^{max}\right) \\ &S_j^* \left(S_k\right) \text{ such that } \Pi^j \left(S_j^*\right) = \Pi^k \left(S_k^{max}\right) \end{aligned}$$

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

Suppose that condition (6) 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 were the case, the equilibrium strategy pair of the two countries is given by:

$$\begin{aligned} &S_k^*\left(S_j\right) = \epsilon, \text{ with } \epsilon \in \left(0, S_k^{max}\right) \\ &S_j^*\left(S_k^{max}\right) \equiv \Pi^k + S_k^{max} - \Pi^j > 0 \end{aligned}$$

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 $S_k^*\left(S_j\right)$ because it leaves some extra-money on the table, i.e., to the foreign firm.

The same argument applies when 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:

$$\begin{aligned} &S_k^*\left(S_j\right) = \epsilon, \text{ with } \epsilon \in \left(0, S_k^{max}\right) \\ &T_j^*\left(S_k^{max}\right) \equiv \Pi^j - \left(\Pi^k + S_k^{max}\right) > 0 \end{aligned}$$

References

Barba Navaretti, Giorgio, Venables, Anthony J., with Barry, Frank G., Ekholm, Karolina, Falzoni, Anna M., Haaland, Jan I., Midelfart, Karen H., Turrini, Alessandro, 2004. Multinational Firms in the World Economy. Princeton University Press, Princeton, NJ.

Beato, Paulina, Mas-Colell, Andreu, 1984. The marginal cost pricing rule as a regulation mechanism in mixed markets. In: Marchand, Maurice, Pestieu, Pierre, Tulkens, Henry (Eds.), The Performance of Public Enterprises. Volume 33 of Studies in Mathematical and Managerial Economics. Elsevier Science B.V., Amsterdam, NL, pp. 81–100.

Bjorvatn, Kjetil, Eckel, Carsten, 2006. Policy competition for foreign direct investment between asymmetric countries. European Economic Review 50, 1891–1907.

Bös, Dieter, 1986. Public Enterprise Economics: Theory and Applications. Volume 23 of Advanced Textbooks in Economics. North Holland, Amsterdam, NL. 2nd edition.

Brander, James, Krugman, Paul, 1983. A reciprocal dumping model of international trade. Journal of International Economics 15, 313–321.

Carstensen, Kai, Toubal, Farid, 2004. Foreign direct investment in central and eastern European countries: a dynamic panel analysis. Journal of Comparative Economics 32, 3–22.

Chao, Chi-Chur, Yu, Eden S. H., 2006. Partial privatization, foreign competition, and optimum tariff. Review of International Economics 14, 87–92.

Cornes, Richard C., Sepahvand, Mehrdad, 2003. Cournot Vs Stackelberg Equilibria with a public enterprise and international competition. SSRN Working Paper Series.

Cuervo, Alvaro, Villalonga, Belen, 2000. Explaining the variance in the performance effects of privatization. Academy of Management Review 25, 581–590.

de Fraja, Giovanni, Delbono, Flavio, 1989. Alternative strategies of a public enterprise in oligopoly. Oxford Economic Papers 41, 302–311.

Fjell, Kenneth, Heywood, John S., 2002. Public Stackelberg leadership in a mixed oligopoly with foreign firms. Australian Economic Papers 41, 267–281.

Fjell, Kenneth, Pal, Debashis, 1996. A mixed oligopoly in the presence of foreign private firms. Canadian Journal of Economics 29, 737–743.

Hamilton, Jonathan H., Slutsky, Steven M., 1990. Endogenous timing in duopoly games: Stackelberg or Cournot equilibria. Games and Economic Behavior 2, 29–46.

Hartenek, Guillermo, 1995. Privatization as a catalyst for FDI: The case of Argentina. In: Organisation for Economic Co-operation and Development (OECD), Foreign Direct Investment: OECD Countries and Dynamic Economies of Asia and Latin America. OECD, Paris, 89–106.

Jonathan Haskel, Wolf, Holger, 2001. The law of one price - a case study. Scandinavian Journal of Economics 103, 545–558.

Haufler, Andreas, Wooton, Ian, 1999. Country size and tax competition for foreign direct investment. Journal of Public Economics 71, 121–139.

Head, Keith, Mayer, Thierry, 2000. Non-Europe. the magnitude and causes of market fragmentation in the EU. Weltwirtschaftliches Archiv 136, 284–314.

Hindriks, Jean, Claude, Denis, 2006. Strategic privatization and regulation policy in mixed markets. The Icfai Journal of Managerial Economics 2, 7–26.

Lipsey, Richard G., Lancaster, Kelvin, 1956–1957. The general theory of second best. The Review of Economic Studies 24, 11–32.

Lutz, Matthias, 2004. Pricing in segmented markets, arbitrage barriers, and the law of one price: Evidence from the European car market. Review of International Economics 12, 456–475.

Markusen, James R., 1995. The boundaries of multinational enterprises and the theory of international trade. Journal of Economic Perspectives 9, 169–189.

Markusen, James R., Venables, Anthony J., 1998. Multinational firms and the new trade theory. Journal of International Economics 46, 183–203.

Matsumura, Toshihiro, 1998. Partial privatization in mixed duopoly. Journal of Public Economics 70, 473–483.

Matsumura, Toshihiro, 2003. Stackelberg mixed duopoly with a foreign competitor. Bulletin of Economic Research 55, 275–287.

Megginson, William L., Netter, Jeffry M., 2001. From state to market: A survey of empirical studies on privatization. Journal of Economic Literature 39, 321–389.

Merlevede, Bruno, Schoors, Koen, 2005. How to catch foreign fish? FDI and privatization in EU accession countries. Working Paper 785. William Davidson Institute at the University of Michigan Business School.

Mukherjee, Arijit and Suetrong, Kullapat, 2009. Privatization, strategic foreign direct investment and host-country welfare. European Economic Review 53, 775–785.

Norbäck, Pehr-Johan, Persson, Lars, 2004. Privatization and foreign competition. Journal of International Economics 62, 409–416.

Norbäck, Pehr-Johan, Persson, Lars, 2005. Privatization policy in an international oligopoly. Economica 72, 635–653.

Oman, Charles P., 2001. The perils of competition for foreign direct investment. In: Organisation for Economic Co-operation and Development (OECD), Foreign Direct Investment Versus Other Flows to Latin America: Finance and Investment. OECD, Paris, pp. 63–84.

Pal, Debashis, White, Mark D., 1998. Mixed oligopoly, privatization, and strategic trade policy. Southern Economic Journal 65, 264–281.

Rees, Ray, 1984. Public Enterprise Economics. Palgrave Macmillan, London, U.K. 2nd edition.

Sepahvand, Mehrdad, 2004. Public enterprise strategies in a market open to domestic and international competition. Annales d'Économie et de Statistique 75–76, 135–153.

Treviño, Len J., Daniels, John D., Arbelaez, Harvey, 2002a. Market reform and FDI in Latin America: An empirical investigation. Transnational Corporations 11, 29–48.

Treviño, Len J., Daniels, John D. and Arbelaez, Harvey, Upadhyaya, Kamal P., 2002b. Market reform and foreign direct investment in Latin America: Evidence from an error correction model. The International Trade Journal 16, 367–392.

Villalonga, Belen, 2000. Privatization and efficiency: differentiating ownership effects from political, organizational, and dynamic effects. Journal of Economic Behavior & Organization 42, 43–74.

Willner, Johan, 2001. Ownership, efficiency, and political interference. European Journal of Political Economy 17, 723–748.

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