Optimal Trade policy in the Presence of DFI and Internal Subsidy Competition

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1. Introduction

The institutional links between trade policy and policies concerning local investment by foreign firms differ widely across countries and across time. Even in federalised countries, trade policy is typically in the hands of the central government. Centralisation of trade policies also is observed when independent countries form customs unions or common markets. On the other hand, the degree of decentralisation of policies governing inward direct foreign investment (FDI) varies greatly. In some economies, any foreign firm wanting to invest must discuss the location, type and financial conditions of its investment exclusively with the central government. At the other extreme are countries like the United States, or groups of countries like the European Union, where investment discussions may bypass the federal authority and are instead held directly with local governments. Under this institutional arrangement, local authorities often court foreign investors quite assiduously, advertising their industrial sites in international newspapers, organising commercial missions abroad or even setting up permanent offices in the main industrialised countries[1]. Indeed, both the forces of centralisation and decentralisation are reflected in coverage by more specialised publications serving the foreign direct investment community[2].   Unavoidably this leads local governments in the same country or group of countries to compete against each other in the hope of attracting foreign firms to their jurisdiction. Their eagerness to compete often is motivated by the belief that FDI can "create jobs" and/or generate tax revenues[3].

Such competition can be a source of concern for the federal government, as it may dissipate some of the rents that would otherwise accrue to the country. In fact, there is evidence some believe that local authorities do indeed compete too keenly from the point of view of the country as a whole[4]. Short of legislating in order to restrain the freedom of its local governments, the best that federal authorities can do is to use their trade policy in order to avoid, or at least minimise, such destructive competition. Intuitively, trade policy can deal with the problem of excessive local bidding for FDI in two ways. One consists of setting high tariffs so as to reduce the "bargaining power" of the multinational enterprise (MNE). Such a policy does not discourage FDI , but it can decrease the level of subsidies that have to be offered to the firm A second consists of lowering the tariff level so as to make the subsidies required to attract FDI prohibitively high. This second policy eliminates subsidy competition by eliminating FDI.

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[1] An example would be the home town of one of the authors, which actively courts foreign investment to Liege, Belgium with its "choose Liege" project on http://www.liege.be. A more focussed policy with offices in both foreign and the home region would be found in the Wales North America Business Chamber, http://www.wnabc.com.

[2] A quick search through recent issues of "FDI Magazine" (at http://www.fdimagazine.com) reveals decentralisation in competition among US cities for Foreign direct investment, and a policy towards FDI driven by regional development agencies (RDA) in the United Kingdom. The degree to which this is a policy tool is emphasised in the discussion of recent changes in RDA structure under the new UK coalition government. Moves towards centralisation also are evidenced: the common investment area that has recently formed for south and eastern Africa is setting policy on foreign direct investment in a more centralised manner than before.

[3] See, for example, the Scottish Government home page, or in particular the Scottish Economic Report for 2002 at http://www.scotland.gov.uk. For a review of the various benefits of DFI, see Lipsey (2002).

[4] See extensive discussion in "How Inept EU Subsidy and Fiscal Rules Penalise European Companies while Foreign Investors Clean Up" in *Management Accounting (London)* 75(7), July/August, 1997 pp. 12-13.

In this paper, we study whether and how trade policies – raising or lowering tariffs in the manner we have just described -- can be used effectively under various degrees of decentralisation of FDI policy, understood as including both tax policy towards the foreign firm and locational choice. Following Brander and Spencer (1987) we set up a very simple model where FDI can increase local levels of employment. There is a single multinational firm considering investment in a country or group of countries. Local authorities can try to attract the foreign firm to invest locally by offering subsidies. Trade policy takes the form of a per unit import tariff/subsidy set by the central government. In choosing the tariff, the federal authorities take into account its effect on the bidding behaviour of its local authorities and on the investment decision of the multinational firm.

We find that if trade and FDI policies are centralised FDI, not surprisingly, occurs only when it raises the country's welfare and is induced through a high tariff with no subsidies paid. Next, we consider an intermediate case where the central authority allocates the investment project to one local authority, which is then free to negotiate with the MNE. Again, all socially desirable FDI occurs and is induced by setting a high tariff in order to prevent the payment of subsidies by the local authority . However, if both FDI and exporting are very efficient, FDI is undesirable for the country as a whole but remains desirable for the local authority. The local authority is, in this case, willing to subsidise the MNE. The central government could still prevent FDI by setting a sufficiently low tariff; however, we show that this is not the optimal policy. Instead, the central government prefers to accept FDI under a high tariff policy that minimises the use of local subsidies. Finally, we study the situation when FDI policy is completely decentralised. The crucial effect of competition between local authorities is that the central government can no longer induce subsidy-free FDI by setting a sufficiently high tariff. In this case, we show that an increase in the tariff can instead *increase* the level of subsidy offered by the local authorities*.* When FDI is relatively inefficient, the central government now finds it optimal to avoid socially undesirable subsidised FDI by setting a sufficiently low tariff.

 Of course, a finding of optimal trade policy that relies on high tariffs to induce subsidy-free FDI is not realistic in a world where many tariffs are bound at low levels*.* To account for this constraint, we next impose maximum tariff levels and discuss the effect of a progressive reduction in these levels on the extent of FDI and on its subsidisation. The effect of caps on tariffs, what we term here "trade liberalisation", depends crucially on the institutional setting we consider. If trade and tariff policies are centralised or a single state bids for the investment, a tightening of the maximum tariff leads to less FDI but higher FDI-inducing subsidies. If there is competitive bidding between local authorities, moderate trade liberalisation affects neither the level of subsidies nor the equilibrium pattern of FDI. On the other hand, more drastic trade liberalisation increases the range of parameters for which subsidised FDI is observed.

There are extensive literatures on trade policy, direct foreign investment, and tax competition. The interface among these three topics has been less researched than each topic individually. The relationship between trade policy and FDI has focussed largely on the "tariff jumping" argument (see, for example, A. Smith (1987), Motta (1992)). A notable exception is Levinsohn (1989) who shows that the possibility of FDI can break the usual equivalence of tariffs and quotas. Another strand of literature has looked at trade policy and tax competition jointly (see, for example, Horst

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(1971), Janeba (1996)), but the tax competition occurs between two different countries who can also set their own trade policy. In contrast, we focus on tax competition *within* a tariff-setting entity**.**

The consideration of competition among several local authorities creates a significant difference between Brander and Spencer's (1987) work and ours. We also make radically different assumptions about he timing of policy and FDI decisions.

The rest of the paper is organised as follows. The basic model is presented in section 2. The baseline case where trade and FDI policies are centralised is solved in section 3. Section 4 discusses a situation of partial decentralisation while section 5 analyses the case of full-fledged bidding between local authorities. Section 6 revisits these three cases in the presence of tariff constraints. Section 7 examines the robustness of our results and proposes some directions for future research.

1. Basic Model

Our model closely follows Brander and Spencer (1987). We consider one home country and one foreign multinational enterprise (MNE). Two goods are consumed in the home economy, good *y*, which can only be produced by the MNE, and a numeraire good, *x*, which is produced locally. The utility function of a representative home consumer takes the form:

$$U(x,y) = x + u(y)$$

In other words, utility is separable in the numeraire good. This means that the marginal utility of income is constant so that consumer welfare can be meaningfully measured as consumer surplus, which is defined as:

$$CS = u(y) - p_y y$$

Where p_y is the price of good *y*.

The MNE can either produce good *y* locally or it can export it from one of its foreign plants. The unit cost of producing the good abroad is assumed to be constant and equal to c^x, giving a profit of $\pi(c^x)$. To produce good *y* locally, the MNE would use local labour *L* in fixed proportion of α_L units of labour per unit of output.

An important feature of the model is that there is unemployment in the home country. Following Brander and Spencer (1987) this is modelled as arising from the fact that the local wage, *w*, is set above its market clearing level. Hence, the profit function of a MNE that chooses to supply the market from local production is:

$$\pi^i = p_y y - w\alpha_L y$$

Solving this maximisation problem one can obtain the levels of output and employment chosen by the MNE as a function of the fixed wage rate of the home country. In other words, $L^i = L^i(w)$ and

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$y = y(w)$. To simplify our analysis, we will find it useful to define the unit cost of local production as $c^i \equiv w\alpha_L$ so that we can write the firm's chosen output as $y(c^i)$ and its corresponding profits and employment levels as $\pi^i = \pi(c^i)$ and $L(c^i)$.

Good *x* is produced by *N* identical firms each using quantities $\frac{L^l}{N}$ of local labour and an industry-specific factor of production *T* which is in fixed supply and fully employed and enjoys a per unit return equal to ρ. This implies that L^n only depends on the fixed wage *w* the fixed number of firms, *N*, and the fixed supply of *T*. In particular, L^n is independent of public policy and production decisions in industry *y*.

In the absence of any tariffs, taxes or subsidies, the welfare of the home country is simply $W^x = CS(c^x) + wL^x$ if good *y* is imported and $W^i = CS(c^i) + wL^i$ if good *y* is produced locally.

Public policy toward direct foreign investment takes the form of a lump sum subsidy, $S > 0$. We think of this subsidy as representing the discounted values of the tax breaks that can be credibly committed to or as the value of infrastructure investments that the public authority has agreed to undertake on behalf of the multinational firm. We will assume throughout that this subsidy cannot be negative and that it does not affect the marginal cost of production of the MNE[5]. The trade policy of the federal government simply consists of setting a unit import tariff or subsidy, *t*.

We will assume throughout that policy makers maximise the welfare of their constituency. Tariff revenues are redistributed to all citizens as a lump-sum transfer. Similarly, any subsidy is financed through a lump-sum tax. National welfare is measured by the corresponding value of the utility function, *U(x,y)*. Since expenditure must equal income, we have:

$$x + p_y^i y^i = w(L^n + L_y^i) + \rho T - S$$

if the firm invests and:

$$x + p_y^x y^x = w(L^n + L_y^x) + \rho T + ty^x$$

If the MNE serves the home market through exports. Substituting these into equation (1), and using $c^i = \alpha_L w$ and the definition of consumer surplus, one obtains:

$$W^i = CS(c^i) + \rho T + wL^n + c^i y(c^i) - S$$

And

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[5] Negative subsidies do not make much sense if we think of *S* in terms of infrastructure. If *S* is related to taxes, then, assuming that the "normal" tax regime is the same at home and abroad, a negative value means that the MNE faces a tax treatment that is worse than the one offered to established (foreign and domestic) firms. Such discrimination might be illegal under local law and would certainly be frowned upon by the WTO. In fact, such behaviour would be banned under the **proposed OECD treaty on FDI**. The assumption that subsidies do not affect marginal cost is made to simplify the solution of the bidding game between local authorities. While it is quite reasonable if *S* represents future tax breaks, one might expect infrastructure investments to possibly lower the marginal cost of production of the firm. The consequences of relaxing both of these assumptions will be discussed in section 7.

$$W^x = CS(c^x + t) + \rho T + wL^n + ty(c^x + t)$$

We will assume that $CS(c^i)$, $\pi(c^i)$ and $y(c^i)$ are continuous and twice differentiable in c^i. We will also assume that the MNE faces a downward sloping marginal revenue function.

Comparing the two equations reveals the traditional trade-off faced by the home country: FDI yields employment benefits equal to $c^i y(c^i)$ but eliminates tariff revenues:

$$\Delta W \equiv W^i - W^x = CS(c^i) - CS(c^x + t) + c^i y(c^i) - ty(c^x + t)$$

or, more simply,

$$\Delta W = \Delta CS + c^i y^i - ty^x$$

If $c^x + t$ exceeds c^i, FDI also leads to lower domestic prices and hence to greater consumer surplus. This benefit of FDI is greater for lower values of c^i. On the other hand, the employment benefits of FDI are not monotonic in c^i: they must be increasing in c^i for c^i close to zero and must be decreasing in c^i for c^i close enough to the choke point where $y^i(c^i) = 0$. Intuitively, since labour is the sole cost of production[6], employment creation tends to be smaller if local production is very inefficient (in other words, either α_L or/and w is large) so that local production is low or if local production is so efficient that only few local workers need to be hired to serve the local market.

The timing of the game differs significantly from the timing in Brander and Spencer (1987), where the tax or tariff rates are set after the MNE has decided whether to serve the home market through FDI or through exports. Instead, we assume, somewhat more traditionally, that local and federal governments can commit to their respective policies before the MNE decides where to locate its production facilities. The reason f or this choice is our focus on internal tax competition. In order to compete for FDI, local authorities must clearly be able to offer credible (incentive packages) to the MNE before investment actually takes place. Moreover, commitment mechanisms do indeed exist. Firstly, the incentive packages can be written into a legally enforceable contract. Secondly, states hoping to ensure a steady flow of job-creating foreign investment cannot afford to destroy their reputation by reneging on previous deals.

We also assume that the federal government moves first, in other words that it anticipates the effects of its trade policy on the policies of local authorities and on the investment behaviour of the MNE. The main justification for this assumption si that local investment packages are individualised and, as such, are determined through more flexible institutional mechanisms than trade policy.

2. A Benchmark: The Fully Centralised Case

In this section we assume that tariffs and subsidies are both set by the central government. IN such a case, the order in which *S* and *t* are determined does not matter.

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[6] This intuition, and thus many of the results in the paper, holds for more complex production functions as long as labour cannot be substituted for too easily.

We first need to determine under what conditions the MNE will prefer FDI to exports. In the absence of subsidies, quite trivially, the MNE invests if and only if $c^i \leq c^x + t$. In the presence of subsidies, we cannot avoid comparing profit levels. The MNE invests if and only if:

$$\pi(c^i) - S \geq \pi(c^x + t)$$

Let us define *t** as the optimum tariff/subsidy when FDI is not possible. Hence, *t** is the usual "optimum tariff" of the trade literatgure. Formally, we have:

$$t* = argmax(CS(c^x + t) + ty^x(c^x + t))$$

It is useful to first look at the optimal tariff policy in the absence of any investment-related subsidy. We will take the unit cost of foreign production c^x as given and consider different ranges for the value of local production c^i. To clarify the terminology, we say that FDI is "socially desirable" if it leads to greater country-wide welfare than exports under the optimal tariff *t**.

For $c^i = c^x + t^*$, welfare is higher under FDI than under the best possible trade outcome. As shown in figure 1, this is because FDI results in the same domestic price for good *y* as the best possible trade policy and generates employment benefits ABEF that exceed the tariff revenues ABCD of the optimal trade policy[7]. It is therefore optimal for the government to set $t \geq t^*$ to ensure that the MNE chooses to invest. We can then conclude that FDI is socially desirable and occurs in equilibrium.

In order to consider other values of c^i we need to make an assumption about the shape of the welfare function.

Assumption 1: $CS(c^i) + c^i y(c^i)$ is strictly quasi-concave in c^i for all $c^i \in [0, c_H^c]$, where c_H^c is defined such that $y(c_H^c) \equiv 0$

Lemma 1: If assumption 1 is satisfied and the unit cost of foreign production, c^x is low, then there exist two values, c_L^i and c_H^i such that FDI is socially desirable if and only if $c^i \in [\max(0, c_L^i), c_H^i]$.

Proof: See Appendix

The main intuition behind lemma 1 is straightforward. A decrease in c^i has two effects on domestic welfare under FDI. On the one hand, it increases domestic surplus and, on the other hand, it changes the total employment benefits obtained, i.e. $c^i y(c^i)$. For low enough values of c^i, this second effect becomes negatives so that, if exporting is sufficiently efficient, FDI can eventually

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[7] Formally, consider equation **XXX**. We have $\Delta CS = 0$ and $y^i = y^x$ so that $\Delta W > 0$ if and only if $c^i > t^*$, which must be true for all $c^x > 0$.

become less attractive than exports. If, on the other hand, c^i becomes very large, FDI decreases consumer surplus and only offers small employment benefits as c^i approaches the choke point where $y(c^i) = 0$. The upshot of this lemma is that FDI is socially desirable in an intermediate range of local costs of production.

For the rest of the paper, we concentrate on the case where c_L^i is positive which occurs whenever export costs are low enough. This allows us to reduce the number of cases to be considered without significantly affecting the qualitative results of the paper[8].

Assumption 2: $CS(0) - CS(c^x + t^*) - t^* y(c^x + t^*) < 0$, i.e. c^x is low enough to ensure that $c_L^i > 0$.

The optimal trade policy for the fully centralised case is described in figure 2.A.

For $c^i < c^x + t^*$, FDI is somewhat more efficient than exports, so that a tariff equal to *t** or even somewhat below would be jumped. From Lemma 1 we know that FDI is socially preferred to the best possible export regime as long as $c_L^i \leq c^i < c^x + t^*$ so that the optimal trade policy is to set tariff $t \geq t^s \equiv c^i - c^x$ and the MNE chooses to invest. For $c^i \leq c_L^i$ on the other hand, FDI is socially undesirable. Still, with *t = t**, FDDI would occur since $c^i < c^x + t^*$. The only way for the government to prevent FDI is then to set a low enough tariff, namely $t < t^s \equiv c^i - c^x$. However, departing from the optimal tariff *t** also lowers the attractiveness of the export regime. Which of these two opposing effects dominates? At *t = t**, we have $\Delta CS = 0$ and $y(c^x + t^s) = y(c^i)$ so that $\Delta W > 0 \; iff \; c^i > t^s$…which must be true for all $c^x > 0$. This means that the best enforceable trade regime (i.e. the best tariff that leads the MNE to choose to export) is dominated by the FDI regime. Hence, for all $c^i \leq c_L^i$, FDI occurs in equilibrium even though it is not socially desirable.

Finally, we must consider the case where FDI is quite inefficient, in other words the case where $c^i > c^x + t^*$. Over this range, FDI leads to lower levels of output than export. This means that FDI lowers consumer surplus but yields employment benefits that can be higher or lower than the tariff revenues obtained under the optimal tariff, *t**. We know from lemma 1 that the second effect dominates as long as $c^i \leq c_H^i$. Therefore, the government optimally induces FDI by setting $t \geq t^s \; if \; c^x + t^* < c^i \leq c_H^i$. If $c^i > c_H^i$, the government sets *t=t**, ensuring that the MNE chooses to export.

The previous analysis is summarised in proposition 1. We call FDI "inefficient" if $c^i > c^x$.

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[8] A version of the paper where both cases are considered is available from the authors.

Proposition 1: *With a centralised government, any socially desirable FDI occurs. Whenever FDI is inefficient but socially desirable, it is induced by setting a high enough tariff. High cost, socially undesirable FDI does not occur. However, low-cost undesirable FDI does occur, as it cannot be prevented through a low tariff. In particular, if FDI is very efficient, it occurs in equilibrium even though it is socially undesirable.*

We have so far not allowed for the use of non-negative lump-sum subsidies. Allowing these does not modify the analysis at all: whenever FDI is socially desirable, it is more efficiently induced through a high tariff than through a subsidy. Moreover, positive subsidies cannot help prevent undesirable FDI. Hence, we can state:

Proposition 2: *If trade and FDI policies are centralised and the government is not tariff-constrained, positive subsidies never are observed.*

3. Decentralisation Without Tax Competition

In this section, we consider a country with *N* independent local authorities. The federal government sets the trade policy of the country but FDI related subsidies are only offered at the local level. Still, we consider here the case where *only one* of the local governments will be trying to attract the MNE. There are three reasons for proceeding in this way. First, this is a useful point of reference that allows us to separate the effect of the *externalities* that investment in one state generates for the other states from the effect of *bidding competition* between the states. Secondly, it is an appropriate model for federal countries where FDI enquiries are "allocated" to a specific region by the central government. This is not an uncommon policy. Belgium, for example, used to operate mostly this way. Typically, enquiries went through diplomatic channels to the central government, which then decided whether this opportunity would be for the "Flemish" or the "Walloon" region of the country, at which stage negotiations with the regional, provincial, or communal authorities could proceed. Interestingly, Belgium is now extremely decentralised, so that its two main regions would normally be trying to attract the same MNE's. China has followed a policy that has vascillated between larger and smaller local control of approval of foreign investment projects, even within the limited number of economic zones in which FDI has been permitted in the past. Indeed, central ministries in Beijing still have the right to grant approval rights to local governments in the areas under their jurisdiction (see China Law Blog http://www.chinalawblog.com/2001/05/china_fdi_now_for_a_bit_of_goo.html) for sufficiently large investment projects. The right to grant tax breaks to FDI has also been centralised, so that different regions could be favoured. For example, central and western areas have been given the right to allow tax incentives recently, while this right has been reduced for coastal areas. (see also same blog). India, too, has modified its policy over time from a system of industrial licensing, largely controlled by the centre and including locational restrictions, to one of largely decentralised policies at the state level. Finally, it also provides a good approximation for cases where, because of

heterogeneity across states, one of the *N* states is significantly more attractive to the MNE than the others. Indeed, studies of the determinants of FDI in a variety of countries suggest that this might not be an uncommon case, as local infrastructure and labour market conditions tend to play a large role in the decision of where to locate (see http://www.oecd.org/dataoecd/57/23/1922648.pdf , including notable historical dominance of Guandong among eastern provinces where FDI permitted over a long period. Similarly, the abundance of natural resources in inland regions in China suggests FDI ventures involving mining (see articles regarding Rio Tinto recently in financial times) would naturally be situated in areas local to the relevant resources.

Let us call the lone bidding state "state 1". To define the welfare function of state 1, we assume that all employment benefits accrue to its residents. We then proceed as in section 2 to obtain the difference between the welfare of the state with FDI or export:[9]

$$\Delta W_1 = W_1^i - W_1^x = \frac{\Delta CS - ty^x}{N} + c^i y^i$$

Comparing this equation to the equation obtained in section 3 for the country as a whole allows us to identify two discrepancies between state 1's incentives to attract the MNE and the effect of FDI on the welfare of the entire country or set of states:

$$\Delta W - \Delta W_1 = \frac{N-1}{N}(\Delta CS - ty^x)$$

The employment effects of FDI are not an issue. Since state 1 fully appropriates such benefits, they appear identically in ΔW_1 and ΔW. There are, however, two sources of externalities. Firstly, whenever FDI leads to a lower or higher price for good *y* than exports (in other words, whenever $c^i < or > c^x + t$), the corresponding benefits or costs to consumers are spread equally across the *N* states. Secondly, the loss of tariff revenues due to tariff jumping is share evenly between the *N* states as well. In both cases, state 1 will then only consider *1/Nth* of the effect of FDI on national welfare.

We can now determine when state 1's incentives to attract the MNE are excessive or insufficient from the point of view of the country as a whole. If $c^i \geq c^x + t$, then, the price of *y* is higher under FDi and both externalities are negative. Hence, we have $\Delta W - \Delta W_1 < 0$ and state 1's incentives to attract FDI are excessive. If, on the other hand, $c^i < c^x + t$, then the consumer surplus externality is positive while the tariff revenue externality is negative. If $c^x + t$ is high enough, there will be positive values of c^i for which the consumer surplus externality dominates so that state 1's incentives to attract the MNE are "federally" insufficient. We define this critical value as $c_D^i < c_x + t$.

Lemma 2: *Under Assumption 2, $c_D^i < 0$ so that local incentives to attract FDI always are excessive from the point of view of the country as a whole.*

Proof: See Appendix[10]

As shown in figure 2B, lemma 2 already allows us to determine the optimal trade policy of the federal government for a broad range of values of c^i.

Whenever unsubsidised FDI is socially preferable to importing the good at the topimal tariff, *t**, the optimal policy consists of setting a tariff high enough to ensure that the MNE would decide to invest, even in the absence of any subsidy. Given such a trade policy, the local authority does not offer any subsidy, since the MNE will invest anyway. In other words, a high tariff is used to induce desirable FDI without the payment of any subsidy. Hence, for all $c^i \in [c_L^i, c_H^i]$, we have $t > t^s \equiv c^i - c^x, S = 0$ and the MNE chooses to invest.

For $c^i \in [0, c_L^i[$, subsidy-free FDI is socially undesirable. However, since the local authority's incentives to attract the MNE are socially excessive there is now a range of c^i, defined as $[c_z^i, c_L^i[$, for which the local authority is willing to subsidize FDI even though export is preferable for the country as a whole. The federal government can only try to prevent this inefficient and subsidy-wasting FDI by setting a tariff low enough that attracting the MNE becomes prohibitively expensive for state 1. We saw in section 3 that, with centralisation, such a policy could not be optimal because the decrease in tariff required to prevent FDI made social welfare with exports lower than with subsidy free FDI. The same conclusions must hold even more strongly in the current case because local subsidies force the trade policy authority to depart even more from *t=t** in order to convince the MNE to choose the export route. Since lower tariffs cannot usefully prevent undesirable FDI, the federal government can only use its trade policy to help minimise the social cost of FDI. Again, this is done by setting a high enough tariff to induce subsidy-free investment. Hence, the optimal trade policy still involves setting $t > t^s = c^i - c^x$ and leads to socially undesirable, but possibly locally desired, FDI without subsidy.

Finally, we must consider the upper range of c^i where FDI is socially undesirable. For $c^i > c_H^i$, FDI is socially undesirable but, at least for values close enough to c_H^i, it is locally desirable. Since $c_H^i > c_x + t^*$, FDI would not happen without subsidies if the federal government chose *t**. The relevant question then is whether the local authority is ever willing to pay a big enough subsidy to induce FDI at *t=t**. The following lemma shows that, in fact, over this range of values of c^i, local authorities never offer a subsidy large enough to convince the MNE to invest rather than export.

Lemma 3: *There is a range of $c^i > c_H^i$ for which the local authority would prefer FDI to exports even though exports would make the country as a whole better off. However, the local authority never is willing to offer a large enough subsidy to actually trigger FDI.*

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[10] Again, a version of the paper where the case of high unit cost of exports is fully treated is available from the authors.

Proof: See appendix.

We can now summarise the analysis of this section in a proposition.

Proposition 3: *For $c^i \in [c_L^i, c_H^i]$, FDI is socially and locally desirable and is induced by setting a high enough tariff to ensure that no subsidies are paid to the MNE. There is a range $[c_z^i, c_L^i[$ for which FDI is locally desirable but socially undesirable. Over this range, the optimal trade policy is to set the tariff high enough that FDI occurs but the MNE does not receive any subsidy. For $c^i \in [0, c_z^i[$, FDI is neither socially nor locally desirable but it cannot be prevented in a manner that remains socially desirable. The optimal trade policy is again to set a tariff high enough so that FDI occurs in a subsidy-free manner. For $c^i \in]c_H^i, c_H^{iL}]$, FDI is socially undesirable but locally desirable. Since the local subsidy is too small to induce tariff jumping the federal authority sets t=t* and the MNE serves the market through exports. Finally, for $c^i \in]c_H^{iL}, c_H^i]$ FDI is both locally and socially desirable but can be avoided by setting t=t*.*

Figure 2B compares the equilibrium pattern of export and FDI for the fully centralised case and the case of one bidding state. Strikingly, the ranges over which FDI or exports are observed, the equilibrium tariff and the equilibrium level of subsidy are the same in the two settings. This reflects the power of high tariff policies to induce subsidy free FDI whenever FDI is socially desirable as well as the ineffectiveness of low-tariff policies to avoid socially undesirable FDI.

4. Decentralisation with Tax Competition

We now consider the case of decentralised FDI policy with all *N* states bidding to attract the MNE. This case closely approximates the situation in a growing number of countries. While the US has a long tradition of states independently promoting themselves in the international business world, The trend towards greater "regionalisation" has brought such independent bidding behaviour to countries like Spain, Belgium and India or groups of countries like the European Union.

We will solve for the perfect equilibria of the tariff-subsidy-FDI game in three steps. First, we will determine the equilibria of the intra-state bidding game. We will see that the type of equilibrium that emerges depends crucially on the relative ranking of the three types of "critical" subsidies. The second step will be to analyse how this ranking is affected by changes in the relative values of c^i, c^x and *t*. We will then be able to characterise the optimal trade policy of the federal government.

4.1 Equilibria of the bidding game

We must define three kinds of limit subsidies. S_{max} is the maximum subsidy that a given state is willing to pay to have the MNE locate on its territory rather than serve the market through exports. Hence, we have

$$S_{max} = \frac{CS(c^I) - CS(c_x + t) - ty(c_x + t)}{N} + c^I y(c^I)$$

S^s, on the other hand, is the maximum subsidy that a state is willing to pay to "steal" the MNC away from another state given that the MNE will invest in one of the N states. We have:

$$S^s = wL^y = c^I y^I$$

This expression says that, since FDI will occur anyway, the resulting loss of tariff revenue and the loss or gain in consumer surplus will occur whether the state wins or loses the bidding war. Hence, employment benefits are the only thing at stake. It is worth noting that:

$$S^s > S_{max} \iff \Delta W < \Delta W_i$$

In other words, a state i is willing to pay more to steal FDI away from another state than to induce FDI in the first place if and only if individual states have socially excessive FDI incentives. Finally, we define S_{min} as the minimum subsidy required to induce FDI. In other words,

$$S_{min} = \pi(c_x + t) - \pi(c^I)$$

Assumption 3: S_{max} and $S^s = c^I y(c^I)$ are quasi-concave in c^I for all $c^I \in [0, c_c]$ where c_c is such that $y(c_c) = 0$ [11].

To solve the bidding game, we must rank these three critical values of *S* for all values of c^I. This ranking is shown in figure 3, which is based on the following lemma:

Lemma 4: *The relative positions of* $S_{max}(c^I)$, $S^s(c^I)$ *and* $S_{min}(c^I)$ *are such as described in figure 4. In other words:*

a. $S^s(c^I) > S_{max}(c^I) \forall c^I \in [0, c_c]$

b. $S_{max} \geq 0 \forall c^I \in [c_{LL}^I, c_{HH}^I]$ *and* $S_{max} < 0 \forall c^I \in [0, c_{LL}^I[\cup [c_{HH}^I, c_c]$, *with* $c_{LL}^I < c_L^I < c_H^I < c_{HH}^I$.

c. $S_{min}(c^I)$ *is increasing in* $c^I \forall c^I \in [0, c_c]$

d. $S_{min}(c^x + t) = 0 \forall t$

e. *There exists one and only one value of* $c_f \in [c_L^I, c_H^I]$ *such that* $S_{min}(c^I) = S_{max}(c^I) > 0.$

Proof: See Appendix

We can now determine the equilibrium of the bidding game for all values of c^I:

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[11] Again, this assumption is satisfied for many demand functions, including linear functions.

1. First consider $c^I \in [0, c^x + t^*]$ so that $S_{\min} < 0$. This means that FDI occurs regardless of the level of subsidy offered by the states. Since FDI occurs anyway, the relevant maximum subsidy is S^s, in other words, the maximum subsidy a state is willing to offer to "steal" the firm away from another state. Hence, the equilibrium subsidy is $S^* = S^s$ and FDI occurs.

2. For $c^I \in]c^X + t^*, c_c]$ we have $S_{\min} \geq 0$. Moreover, $S^s > S_{\max}$ (in other words, $\Delta CS < ty(c_x + t)$): since the net effect of FDI on tariff revenues and consumer surplus is negative, states are willing to bid more to "steal" the MNE from another state than to attract it to the country in the first place.

   a. For $c_I \in]c^x + t, c_f]$, we have $S_{\min} \leq S_{\max} < S^s$. Let us now determine what the highest equilibrium bid must be. Clearly, this bid cannot be lower than $S_{\max}$ because then it would be optimal for any state to bid $S_{\max}$. The highest equilibrium bid cannot belong to $[S_{\max}, S^s[$ either. Given such a bid, the MNE will invest in the country anyway, hence a state will always be willing to bid up to S^s. Of course, bidding beyond S^s always is a dominated strategy. Hence, the only possible highest equilibrium bid is S^s. We must of course check that there actually exists an equilibrium characterised by this highest bid. There are, in fact, many since – given that at least one state bids S^s -- every other state is indifferent among bids that are smaller than or equal to S^s. Therefore, over this range, FDI occurs in equilibrium and a subsidy of S^s is paid to the MNE.

   b. Define c_{ms} as the value of c^I such that $S_{\min} = S^s$. Then, for $c^I \in]c_f, c_{ms}]$, we have $S_{\max} < S_{\min} \leq S^s$. Over this range, two kinds of equilibria can arise. One type is characterised by a highest bid of S^s and triggers FDI, while the other type features a highest bid below $S_{\min}$ so that the home market is served through exports. In the first type of equilibrium, every state bids S^s and FDI occurs. If at least one other state bids S^s then FDI will occur anyway so that state i is willing to bid up to S^s for a shot at stealing the MNE away from the other state(s). In the second type of equilibrium, every state bids below $S_{\min}$ so that FDI does not occur. If every other state bids below $S_{\min}$ then state i is no longer willing to bid above it since $S_{\max} < S_{\min}$.

   c. For $c^I > c_{ms}$, $S_{\min} > \max(S^s, S_{\max})$. Bidding below $S_{\min}$ is a dominant strategy for every state so that FDI is not observed in equilibrium.

This analysis can be summarised in the following proposition:

Proposition 4: *The equilibrium subsidies offered by the states and the FDI behaviour of the firm are as follows. If the unit cost of local production is sufficiently low (in other words, $0 \leq c^I < c_F$) each state bids S^s and FDI occurs. If the unit cost of local production is sufficiently high (in other words, $c^I \geq c_{ms}$) FDI does not occur and no subsidy is paid in equilibrium. For intermediate levels of the unit cost of local production (in other words, $c_F \leq c^I < c_{ms}$), there are two equilibria, one involving a subsidy equal to S^s and FDI, and the other leading to exports and, therefore, no subsidies.*

The equilibrium pattern of FDI and subsidies is shown in figure 4. FDI occurs as the unique equilibrium outcome over the lower range of values of c^I. Since this range necessarily extends beyond $c^I = c^x + t$, one can conclude that FDI can (for *t>0*) be observed even though it entails significantly higher costs of production than exports. If FDI is somewhat less efficient, there are two equilibria, one involving FDI and the other involving exports. For still higher values of c^I, the unique equilibrium outcome is export. Whenever FDI is an equilibrium outcome, the MNE receives a subsidy S^s equal to the employment benefits it generates.

For the rest of the analysis, it will be convenient to only consider one of the two kinds of equilibria that arise over the interval $]c_F, c_{ms}]$. We focus on the equilibria without FDI. There are two reasons for this. Firstly, all states are better off in that equilibrium so that one might believe that they will manage to coordinate on it[12]. Secondly, the multiplicity of equilibria obtained is an artefact of the complete simultaneity of bidding by all states. If one were to consider instead a sequential auction where the MNE asks each state in turn to make its bid before choosing a location and where previous bids are known to all payers, the equilibrium outcome would be that all states bid below S_{min} so that the MNE does not invest[13]. In that sense, the equilibrium without FDI is more robust to small changes in the modelling of the bidding game[14].

4.2 Optimal Trade Policy

In order to determine the optimal trade policy of the central government we must first establish whether equilibrium FDI and its accompanying subsidies are socially excessive or insufficient. We define the social benefits from FDI, net of "competitive" subsidies, S^s, as

$\Delta W_N = \Delta W - S^s = CS(c^I) - CS(c^x + t^*) - t^* y(c^x + t^*)$. Clearly, ΔW_N is decreasing in c^I. This is because the "competitive" subsidy, S^s completely dissipates the employment benefits of FDI so

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[12] It is worth noting, however, that some have found little reason to think that players would generally coordinate on Pareto dominant equilibria (See Fudenberg and Tirole, 1991, pp. 20-22 for example).

[13] We thank Michael Riordan for pointing this out.

[14] We have available a version of the analysis where we have picked the other type of equilibrium. The general nature of the results is not affected.

that c^I only affects the equilibrium price and, thus, consumer surplus. Hence, under our maintained assumption 2 that $CS(0) - CS(c^x + t^*) - t^*y(c^x + t^*) < 0$, ΔW_N is always negative. This means that subsidised FDI is always socially undesirable. This situation is represented in figure 5.

Interestingly, since the equilibrium subsidies compete away all employment benefits, all states have the same equilibrium welfare regardless of whether or not they manage to attract the MNE. This means that the effect of FDI on local welfare is just *1/Nth* the effect of FDI on national welfare. In this sense, local and national desire to attract FDI are perfectly aligned *ex post*. On the other hand, *ex ante* competition for employment benefits leads the states into a bidding war that can lead to welfare-reducing subsidised FDI. We can then state the following proposition to summarise the argument in the text:

Proposition 5: *Under assumptions 1 and 2, and for t=t*, there tends to be excessive FDI. For low values of c^I (in other words, $c^I < c_F(t^*)$), subsidised FDI occurs in equilibrium although it is harmful both socially and locally. Very cost-inefficient FDI (in other words, $c^I > c_F(t^*)$) is also socially and locally undesirable, but it never occurs in equilibrium.*

We can now determine the optimal trade policy of the central authority. It is important to underline at the outset a crucial difference between the case of inter-state competition and the case of decentralisation without competitive bidding. In the latter, subsidies were never paid in equilibrium because FDI could always be induced subsidy-free by raising the tariff sufficiently. Inter-state competition makes such a powerful strategy ineffective: if the tariff is set so that FDI would occur even in the absence of subsidies the states still compete to attract the firm and are willing to offer subsidies up to S^s to win the bidding war.

Indeed, for high levels of c^i, increasing the tariff could actually trigger undesirable FDI. This is illustrated in figure 6, which is drawn for an arbitrary initial tariff *t*. First notice that $S^s = c^i y(c^i)$ does not depend on the tariff. On the other hand, both S_{min} and S_{max} do. An increase in *t* shifts S_{min} downwards since it makes the investment option more attractive to the firm. Since

$$S_{max} = \frac{1}{N}[CS(c^i) - CS(c^x + t) - ty(c^x + t)] + c^i y(c^i) \text{ and}$$

$t^* \equiv \arg\max[CS(c^x + t) + ty(c^x + t)]$ an increase in *t* shifts S_{max} down if and only it *t<t** and up if and only if *t>t**. Hence, for *t>t** we have $\dfrac{dc_F}{dt} > 0$ so that an increase in the tariff actually enlarges the range of values of c^i for which undesirable subsidised FDI occurs. In other words, for a value of c^i a little above $c_F(t)$, a higher tariff could actually change the equilibrium from one with no FDI to one where socially undesirable subsidised FDI occurs. For *t>t**, on the other hand, the effect of a tariff increase on c_F is a priori ambiguous since both the S_{min} and S_{max} curves shift down. Still, it is possible to show that the net effect of an increase in *t* on c_F is again positive.

Lemma 5: $\dfrac{dc_F}{dt} \geq 0 \forall t$

Proof: See appendix

The question then is whether trade policy is on any use at all in avoiding some of the socially undesirable FDI or, at least, in reducing the excessive subsidies paid to the MNE.

If $c^i \geq c_F(t^*)$ the optimal policy clearly is to set $t=t^*$ and allow the market to be served through imports. We now look at the case where $c^i < c_F(t^*)$. Over this range, setting $t=t^*$ would actually trigger undesirable subsidised FDI. Let us first focus on the upper part of that range. One can show that, for c^i close enough to $c_F(t^*)$, setting a tariff slightly below t^* would improve welfare. This slightly lower tariff is enough to shift c_F to the left so that FDI is no longer an equilibrium in the immediate neighbourhood of $c_F(t^*)$. Moreover for a small change in tariff, the effect on welfare with exports is negligible so that the new export equilibrium must be preferred to the old FDI equilibrium. Intuitively, a small change in tariff has avoided the payment of a discrete subsidy. More formally, we have $\dfrac{dc_F}{dt} > 0$ and

$$\frac{dW^x}{dt}(t = t^*) = 0$$

By the definition of t^* as the traditional "optimal" subsidy. Hence, since we had $\Delta W(c_F(t^*)) < 0$, a switch from FDI to exporting must be socially beneficial.

One can also establish that this policy of setting t low enough to avoid subsidised FDI becomes less attractive for lower values of c^i -- in other words, for values further to the left of $c_F(t^*)$. This conclusion is based on a two-part argument. On the one hand, for a lower value of c^i the decrease in t required to prevent FDI is larger so that the corresponding trade regime is less attractive. ON the other hand, because competitive bidding dissipates employment benefits, social welfare in the FDI equilibrium increases as c^i decreases[15].

Turning now to the lower part of the range, one can show[16] that setting a tariff low enough to avoid FDI is not desirable: the required tariff would be so low (indeed, negative) that the central government prefers to tolerate the undesirable FDI. Since W^x, W^i and the level of tariff below which FDI occurs are all continuous in c^i, we can conclude that there is a critical value of c^i, defined as c_s^i so that the central government prefers to discourage FDI through a low tariff for $c^i > c_s^i$ but prefers not

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[15] We have $W^i = CS(c^i) + c^i y(c^i) - S^s = CS(c^i)$ which is decreasing in c^i.

[16] At $c^i = 0$ the highest tariff avoiding subsidised FDI is t^0 such that

$$\pi(c^x + t^0) + \frac{1}{N}(CS(c^x + t^0) + t^0 y(c^x + t^0)) = \pi(0) + \frac{CS(0)}{N}.$$ (*note: in original the last zero is "o"*)At

$t^0 = -c^x$ the LHS is smaller than the RHS. Since the LHS is decreasing in t, this implies that $t^0(c^i = 0) < -c^x$. But $W^x(t < -c^x) < W^x(c^x) = S(0) - c^x y(0) < W^i(0) = CS(0)$.

to interfere with FDI for $c^i \leq c_s^i$. We can now summarise these results in a proposition and in figure 7.

Proposition 6: *Define* $t^0(c^i)$ *such that* $c^i = c_F(t^0)$. *If FDI is very efficient, i.e.* $c^i < c_s^i$, *the optimal trade policy is to set* $t \geq t^0$ *so that subsidised FDI occurs even though it is neither socially nor locally desirable. For less efficient FDI, i.e.* $c^i \in]c_s^i, c_F(t^*)]$, *the optimal trade policy is to set* $t = t^0 < t^*$, *i.e. to lower the tariff to the point where the local authorities are no longer willing to offer high enough subsidies to induce undesirable FDI. Finally, for very inefficient FDI, i.e.* $c^i > c_F(t^*)$, *the central government sets t=t* and the home market is served through imports.*

Figure 8 shows the optimal tariff as a function of c^i. We have $t^0(c_F(t^*)) = t^* - \varepsilon$ as the federal government lowers its tariff just enough to discourage subsidised FDI. Since c_F is an increasing function of *t*, $t^0(c^i)$ which is the tariff just sufficient to discourage FDI at c^i must decrease as c^i decreases.

5. Comparing Institutional Regimes

In this section we briefly compare the equilibrium pattern of FDI, levels of tariffs and levels of subsidies that prevail with tax competition to those observed under the fully centralised solution[17].

Let us compare figures 2 and 7. In the benchmark case, FDI occurs for all $c^i \leq c_H^i$. With decentralised bidding, FDI occurs for all $c^i \leq c_S$. Our first task is therefore to rank c_F and c_S.

Lemma 6: $c_S < c^x + t^* < c_H^i$. *In other words, the range of c^i for which FDI occurs under the optimal trade policy is smaller with competitive bidding than with centralisation.*

Proof: See Appendix.

Since FDI occurs for all $c^i \leq c_H^i$, under centralisation and for all $c^i \leq c_S$ under competitive bidding we can conclude that the range of c^i for which FDI occurs under the optimal trade policies is larger with full centralisation or non-competitive bidding than with competitive bidding. A rough intuition for this result is that competitive bidding makes FDI socially less desirable because FDI induces the payment of positive subsidies. Since, for high c^i, the government can effectively avoid such undesirable FDI by setting a low tariff, the equilibrium range of FDI is curtailed.

Since no subsidies were ever paid in the centralised setting, competitive bidding clearly leads to higher levels of equilibrium subsidies. The comparison of tariffs is less straightforward, and is illustrated in figure 8. The two equilibrium tariff schedules are quite different. For high values of c^i, it is optimal to set the "optimal" tariff, *t**, under both centralisation and competitive bidding. For

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[17] Remember that the equilibrium FDI pattern and equilibrium tariffs and subsidies are the same under the fully centralised setting and the decentralised setting without bidding.

values lower than c_H^i, the centralised solution is to start inducing FDI by a tariff $t \geq t^s$ where $\pi(c^x + t^s) = \pi(c^i)$, in other words $t^s = c^i - c^x$. For values lower than c_F but greater than c_S the optimal tariff under competitive bidding is t^0 ???? $\pi(c + t^0) - \pi(c^i) - S^s$. Clearly, we have $t^0 < t^s$ for all $c^i > 0$. Finally, for $c^i \geq c_S$ the optimal trade policy with competitive bidding is to induce FDI by setting $t \geq t^0$. Hence, we can conclude that for $c^i \geq c_S$ the optimal tariff under centralisation or non-competitive bidding always is at least as large as the optimal tariff under competitive bidding. For lower values of c^i, the lower bound of the optimal tariff is strictly greater with centralisation or non-competitive bidding.

7 Tariff Constraints

We saw that, in the absence of internal tax competition, using high tariffs to induce desirable FDI is a very powerful policy option. In the current context however, this is an option that might no longer be available to most governments. Under the GATT and the WTO, many tariffs have been bound to levels that are, on average, so low that they seem unlikely to trigger much "tariff jumping" FDI. In this section, we quickly revisit our previous analysis under the assumption that the federal government is limited in setting $t \leq t_{max} < t^*$. For each of the three institutional settings discussed in sections 3, 4 and 5, we briefly discuss how the optimal trade and FDI occurs as well as the size of the equilibrium subsidies paid to the MNE.

7.1 Fully Centralised Case and Non-Competitive Bidding

Let us begin with the fully centralised setting. The implications of bounding tariffs below *t** are quite straightforward. They are the result of two opposing effects. On the one hand, as the maximum allowed tariff is below *t**, the export option is now less desirable for the home country. This effect increases the range for which FDI is socially desirable. On the other hand, for relatively high values of c^i, some socially desirable FDI must now be induced through costly subsidies rather than through high tariffs. This effect tends to decrease the desirability of FDI.

More precisely, if $c^i \leq c^x + t_{max}$, FDI occurs without subsidy. The only effect of a bound tariff is to reduce the lower range of c^i for which FDI is socially undesirable by reducing the desirability of the best possible trade regime. For $c^i > c^x + t_{max}$ FDI can now only be induced through a subsidy. For values of c^i close to $c^x + t_{max}$, the subsidy required is smaller than the loss of welfare in the trade regime due to the lower tariff. Hence, FDI still occurs but is subsidised. For larger values of c^i, however, the subsidy required to induce FDI is substantial enough to make it undesirable. In particular, one can show that for c^i close enough to c_H^i, export is now preferred to FDI so that the government sets $t = t_{max}$ and the home market is served from abroad. Hence, we can conclude that:

Proposition 7: *A reduction in the maximum tariff allowed below the level of the optimal tariff t* reduces the range of values of c^i for which FDI is observed in equilibrium and increases the range over*

which equilibrium FDI is socially desirable. For intermediate values of c^j, FDI still occurs but the tariff reduction leads to the payment of positive subsidies to the MNE.

We can now turn to non-competitive bidding. The main difference with respect to the fully centralised case is that for the range of c^i for which FDI no longer occurs unless subsidies are paid (in other words, $c^i > c^x + t_{max}$) the decision of whether or not to trigger FDI is now in the hands of the local authority, which has socially excessive incentives to attract FDI. Still, one can again show that the local authority never wants to pay a subsidy of the size required to attract socially undesirable FDI so that the two institutional settings produce identical outcomes.

7.2 Decentralisation With Competitive Bidding

With decentralisation and inter-state competition, tariff constraints have only a limited impact for two reasons. First, the federal government could not use high tariffs to induce subsidy-free FDI in any case. On the contrary, they only "active" trade policy arose for high values of c^j, wehre the federal government chose to set its tariff just low enough to avoid FDI. Secondly, the subsidies offered by local authorities only reflect the employment benefits of FDI and are therefore independent of the tariff level.

Still, tariff constraints do affect eh equilibrium pattern of FDI, subsidies, and tariffs. Refer again to figure 8. Since $t_{max} < t^*$ and $\frac{dc_F}{dt} > 0$, the upper range of c^i for which local authorities are willing to offer a subsidy sufficient to induce FDI shrinks. However, as long as the maximum tariff is not too low, the equilibrium pattern of FDI and exports is unchanged. This is because, for $c^i > c^i_S$, the central government avoids FDI anyway by setting a low enough tariff (in other words, $t = t^s$). Hence, as long as t_{max} is not too low, its only effect is to force lower equilibrium tariffs over the uppermost range of c^i. If, on the other hand, t_{max} were to fall below $t^0(c_S)$ then, for values close enough to c_S, the federal government would prefer subsidised FDI to importing at such a low tariff. Hence, drastic trade liberalisation will increase the range of values for which subsidised FDI is observed.

Proposition 8: *With decentralisation and competitive local bidding, lowering the maximum tariff below t* only affects the range of values of c^i for which FDI occurs in equilibrium if the maximum tariff is substantially below t*. At this point a further tightening of the tariff constraint increases the range over which equilibrium FDI is observed.*

8 Discussion and Conclusions

We have considered a simple model where a MNE must decide whether to serve a given market through FDI or through export. FDI would increase local employment, which is valued positively by the local authorities. The MNE's decision is affected by three factors: the height of the import tariff, the relative cost of production under export and FDI, and the level of FDI subsidy offered by the host country. Three distinct institutional arrangements are considered. In all three cases, policy makers

are assumed to commit before the MNE chooses its mode of entry. In the "cully centralised" case, the central government sets both the tariff and the FDI subsidy. In equilibrium, any desirable FDI occurs and is induced by setting high tariffs. If FDI is very efficient, however, it occurs in equilibrium even though it yields lower welfare for the host country than exports. We then consider a setting where trade policy is set at the federal level while FDI subsidies are offered by one of N possible states that make up the country or group of countries. This case is meant to approximate situations where subsidy competition between local authorities is weak. Again, all socially desirable FDI is induced through high tariffs but there is now a range for which socially undesirable FDI is induced by setting a high tariff in order to avoid the payment of subsidies by the local state authority. Finally, we analyse a fully decentralised situation where the N local authorities can offer subsidies in order to attract the MNE to their confines. Since there is no differentiation among states in this setting, this case is meant to approximate situations where subsidy competition is intense. The crucial difference is that high tariffs can no longer deter the payment of subsidies to the MNE. In fact, the central government can now best fight undesirable FDI by setting a low tariff in order to make the FDI-inducing subsidy too high for the local authorities. Still, socially undesirable subsidised FDI can occur in equilibrium.

Since "high tariff" policies might be unrealistic in a WTO world, we also analyse the effect of tariff constraints on the equilibrium pattern of FDI, subsidies, and tariffs. If trade and tariff policies are centralised or competition between local authorities is weak, a tightening of the maximum tariff leads to less FDI but higher FDI-inducing subsidies. If competition between local authorities is intense, lowering the bound on tariffs does not affect the level of subsidies but it increases the range of parameters over which FDI is observed.

Although we mostly used a fairly standard trade model, two of our assumptions deserve further comment. We assumed that the local authorities could not use negative subsidies. While this makes a lot of sense when S is interpreted as the cost of public works, it is not as compelling if one thinks of S as the discounted sum of tax breaks granted to the MNE. Fortunately, allowing for negative subsidies would not change our results drastically. It would not affect eh case with competitive bidding at all since equilibrium subsidies are uniquely determined by the non-negative employment benefits derived from FDI. In the fully centralised case, negative subsidies would enable the government to avoid socially undesirable low-cost FDI. Finally, with decentralisation but no competitive bidding, negative subsidies would be irrelevant since local incentives to attract FDI are socially excessive in any case[18].

We also assumed that subsidies were paid in a lump sum manner, in other words without affecting the local marginal cost of the MNE. Subsidies that lower the marginal cost of production of the MNE would have the additional advantages of increasing local consumer surplus and increasing the employment generated through FDI. Since the first of these two benefits is not fully appropriated by the local authority that pays the subsidy, local incentives to attract FDI could more easily be socially

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[18] Negative subsidies could emerge,, in a somewhat perverse way, over the ranges where FDI is discouraged by setting ahigh tariff. Since a lump-sum tax is a more efficient tool than a unit tariff in squeezing surplus out of the foreign firm, the optimal policy would to set $t=0$ and prevent FDI by using $S<0$. Even if we allow for such policies, the ranges over which FDI occurs in equilibrium would not be greatly affected.

insufficient than in our analysis. We do not, however, expect that our qualitative results would be greatly affected.

An interesting, but formidable, task for future research would be to extend this analysis to a two-country framework. This would, for example, allow for the analysis of trade and FDI relationships between a federalised country (or group of countries) and a more centralised economy. Extending our model to the case of several MNEs and modelling the local bidding competition as a multi-lateral bargaining process in which trade policy affects the "bargaining power" of the parties would also be of some interest.

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