Fiscal Competition for FDI when Bidding is Costly

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Abstract

We introduce bidding costs into a standard model of tax/subsidy competition between two potential host countries to attract a monopoly firm’s plant. Such a bidding cost, even if it is infinitesimal, qualitatively alters the resulting equilibrium. At most one country offers fiscal inducements to the firm, and this attenuates the “familiar race to the bottom” in corporate taxes. In general, the successful host country benefits from the resulting absence of active tax/subsidy competition, at the expense of the firm’s owners in the rest of the world.
1. Introduction

Policy activism by governments is a costly, resource-consuming business. Teams of public servants are needed to help governments formulate, and later implement, their decisions. Despite this fact, most (if not all) existing theoretical analyses of the fiscal competition between countries for inward foreign direct investment (FDI) assume that governmental participation in such contests is costless. Government, in this perspective, is a disembodied channel through which transfer payments flow between foreign firms and domestic taxpayers.

We introduce a bidding cost into an otherwise-standard model of the fiscal competition between two host countries for a monopoly firm’s plant. We show that such a cost, even if it is infinitesimal, qualitatively alters the resulting equilibrium. At most, one country offers fiscal inducements to the firm, whereas both were willing to bid for the FDI in the absence of the cost. This attenuates the “familiar race to the bottom” in corporate taxes. In general, the successful host country benefits from the resulting absence of active tax/subsidy competition, at the expense of the firm’s owners in the rest of the world. Finally, we show that when the bidding cost is non-infinitesimal and one of the countries bids for the firm in equilibrium, this may be the “wrong” country from a welfare perspective.

2. Model

Our basic set-up follows Haufler and Wooton (1999). There are two countries, $A$ and $B$, and a single firm, which is entirely owned in the rest of the world. The firm plans to establish a single plant in one of the two potential host countries, from which it will serve both countries’ product markets. We assume that both countries prefer local production (FDI) to imports, and we denote by $V_i$ (where $i \in \{A, B\}$) the value that country $i$ places on the firm’s FDI. FDI can be valued for many reasons, such as the payment of wage premia by foreign firms, the relief of involuntary unemployment, access to training for domestic workers, and technological spillovers to domestic firms.
\( \Pi_i \) denotes the operating (or pre-tax) profit that the firm earns if it locates its production facilities in country \( i \). For both countries, we assume a positive level of operating profits and a positive valuation. We also assume that the valuations and operating-profit levels are common knowledge. We define \( \Gamma = \Pi_A - \Pi_B \) to be country \( A \)'s “geographic advantage”.\(^1\)

We assume throughout that \( V_B > \Gamma > 0 \). The second inequality implies that, in the absence of any fiscal inducements, the firm will choose to locate in country \( A \). The first inequality means that \( B \)'s valuation of the FDI is sufficiently strong to enable it to offset any geographical disadvantage that it faces (otherwise, the firm would locate in \( A \) even if \( B \) were to offer it a subsidy equal to the nation’s valuation of the FDI, \( V_B \)). Thus, if either country bids for the firm alone, it will win the FDI.

Our game has three stages. In stage one, countries \( A \) and \( B \) simultaneously decide whether to bid for the firm with a fiscal (tax/subsidy) offer. Strategy \( N \), where a country chooses not to bid for the firm, is costless while strategy \( Y \), where the firm is offered a bid, incurs an administrative cost. This cost reflects the need to allocate resources within the public bureaucracy to make such a firm-specific offer. If a government has chosen to bid for the firm then it makes its bid in stage two, where its offer can be positive (a subsidy) or negative (a tax). If both governments have chosen to bid for the firm, then they simultaneously make their bids in stage two. Finally, in stage three, the firm locates its plant in the country that offers it the higher post-tax profit and starts production. As is conventional in models of this type, we solve the game backwards and focus on subgame perfect Nash equilibria in pure strategies.

3. **Analysis**

The payoff matrix for the two countries is given in Table 1. If a country does not bid for the firm, it gets nothing if the firm decides to locate in the other country, while it gains its valuation of the FDI if it is chosen to be the production location. The payoffs in \((N, N)\) thus follow from our assumption that \( A \) has the geographic advantage \((\Gamma > 0)\), so the firm locates in \( A \) in the absence of bids from either country. Should a country choose to bid for the firm, it will have to pay the cost, \( c > 0 \), regardless of

\(^{1}\) The higher profit offered by country \( A \) would arise, for example, if both countries had the same production costs but shipping goods between them was costly and \( A \) had the larger domestic market.
its success in attracting the firm. A successful bid will result in the winning country getting its valuation of the FDI less the total cost of its bid, the sum of the bidding cost and the transfer made to the firm (positive in the case of a subsidy and negative for a corporate tax).²

### Table 1. Payoff matrix ($V_B > \Gamma > 0$)

<table>
<thead>
<tr>
<th>Country A</th>
<th>Country B</th>
<th></th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>N</td>
<td>0</td>
<td>$V_B - \Gamma - c$</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>0</td>
<td>-c</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>$V_A + \Gamma - c$</td>
<td>$V_B - V_A - \Gamma - c$</td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
<td>$V_A + \Gamma - V_B - c$</td>
<td>-c</td>
</tr>
</tbody>
</table>

In $(Y, N)$, where $A$ bids for the firm but $B$ does not, $A$ will win the firm with any bid that falls just short of a tax equal to its geographic advantage of $\Gamma$. Consequently, its best bid will be just such a tax. In $(N, Y)$, $B$ must offer a subsidy of (just above) $\Gamma$ in order to offset its geographic disadvantage and win the firm. Given that we assume that $B$’s valuation of the FDI exceeds its geographic disadvantage ($V_B > \Gamma$), it will be prepared to do this. $(Y, Y)$ is the case where both countries compete for the firm’s plant. Who wins the auction depends upon national valuations of the FDI and $A$’s geographic advantage. Given its assumed geographic advantage, $A$ wins the competition even if it has a lower valuation of the FDI as long as $V_A + \Gamma > V_B$. It would then attract the firm with a bid of (just above) $V_B - \Gamma$, while $B$ would unsuccessfully bid its valuation of $V_B$. If, however, $B$’s valuation of the FDI is sufficiently strong to overcome both its geographic disadvantage and $A$’s valuation, then its bid of (just above) $V_A + \Gamma$ will succeed while $A$’s bid of $V_A$ will fail.

The three panels of Figure 1 illustrate the bidding outcomes that can arise in equilibrium. We continue to restrict our discussion to values of geographic advantage such that $V_B > \Gamma > 0$. The panels

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² This formulation for social welfare is consistent with quasi-linear preferences. See Ferrett and Wooton (2010, Appendix).
are distinguished from each other by the relative valuations that $A$ and $B$ make of the FDI. In panel (a), $A$ has the higher valuation, $V_A > V_B$; in panel (c), the reverse is true, $V_A < V_B$; while the countries share the same valuation, $V_A = V_B$, in the middle case, illustrated in panel (b).

In all three cases $(N, N)$ is an equilibrium if and only if both $c > \Gamma$ and $c > V_B - \Gamma$. These inequalities correspond to the best responses of $A$ and $B$, respectively, to a choice of $N$. The intuition is straightforward. Given its geographic advantage, $A$ will attract the firm if neither country bids. By making a bid, $A$ can extract a tax of $\Gamma$; however, doing so is not worthwhile if the bidding cost exceeds this. In contrast, $B$ will only attract the FDI if it actually bids to offset its geographic disadvantage, receiving in the process a net surplus of $V_B - \Gamma$; therefore, it is not worthwhile for $B$ to bid alone for the firm if the bidding cost exceeds this.

$(Y, N)$ is an equilibrium if and only if $\Gamma > c$ ($A$’s best response) and $\Gamma > V_B - V_A - c$ ($B$’s best response). The first condition ensures that the tax that $A$ can raise from its unopposed bid for the firm exceeds the bidding cost. The second condition ensures that the surplus $B$ would make in a subsidy competition for the firm is less than the bidding cost, making it unwilling to enter such a competition. This condition is guaranteed to hold if $V_A \geq V_B$ and, consequently, the entire region above the 45° line of each of panels (a) and (b) of Figure 1 has $(Y, N)$ as the equilibrium. This region is reduced when $V_A < V_B$, which is illustrated in panel (c).

For $(N, Y)$ to be an equilibrium, we clearly require $\Gamma + c < V_B$; otherwise $B$ would gain nothing from the FDI after paying for a bid to offset its geographic disadvantage. In addition, $A$ has to be deterred from bidding and this requires a sufficiently high bidding cost such that $V_B - V_A > \Gamma - c$.

Where this frontier appears in the diagram depends upon the relative size of the countries’ valuations of FDI. In panel (b), $V_A = V_B$ and the boundary is the 45° line. The boundary shifts to the right when $A$ has the relatively higher valuation and to the left when $B$ benefits more.

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$^3$ If $V_B - V_A > \Gamma + c$, then $B$’s valuation premium is sufficiently large to make it worthwhile for $B$ to enter (and win) a subsidy competition with $A$. Thus, in panel (c), $(Y, N)$ is not an equilibrium in the triangle above the 45° line with its apex at $V_B - V_A$ on the $\Gamma$ axis.
In all three panels of Figure 1 we see that, whenever \((N, N)\) is an equilibrium, this equilibrium is unique. As \(\Gamma > 0\), \(A\) will attract the FDI. Moreover, from panel (b), we see that if \(V_A = V_B\) then there exists a unique pure-strategy Nash equilibrium for every \(c, \Gamma > 0\) (barring knife-edge cases on the inter-regional boundaries). If \(V_A < V_B\), as in panel (c), then a pure-strategy Nash equilibrium (PSNE) always exists, but it may not be unique. In particular, there exists a region where both \((Y, N)\) and \((N, Y)\) are equilibria. In that region, the bidding competition resembles a game of chicken. By contrast, if \(V_A > V_B\), as in panel (a), then it is possible that no pure-strategy Nash equilibrium exists.

Our central result in Proposition 1 arises because a country that loses a bidding war for the firm (and therefore does not have to pay the subsidy that it offered) nonetheless does have to pay the bidding cost. Thus, such a losing country will exit the subsidy competition.

**Proposition 1** Costly bidding qualitatively changes the outcome of the bidding game. When there is no cost to making a bid, it is a dominant strategy on the part of both countries to bid for the firm and hence \((Y, Y)\) is the unique equilibrium. In contrast, when \(c > 0\), \((Y, Y)\) never arises in equilibrium and the firm receives at most one bid for its FDI. If the bidding cost is sufficiently large, neither country will make a bid.

**Proof** To check that \((Y, Y)\) is the dominant strategy equilibrium when bidding is costless, substitute \(c = 0\) into the cells of Table 1. A country then is not any worse off from placing a losing bid and always gains if its bid is successful. Thus countries will always be prepared to bid in equilibrium. This is not the case when \(c > 0\). In that case, it is straightforward to verify that the country that would lose the subsidy competition in \((Y, Y)\) would prefer to deviate to \(N\). ■

4. **Welfare Issues**

For ease of analysis, we focus first on the case where the bidding cost, \(c\), is infinitesimal. This is because, in practice, the cost of making a bid for inward FDI is likely to have only a small impact on social welfare in comparison to the benefits to a country of a successful bid to attract the firm. However, the existence of a bidding cost of any magnitude is sufficient to deter one of the countries
from bidding. As a result, the familiar “race to the bottom” is attenuated with consequent impact on the welfare of the bidding nation and the firm’s after-tax profits.

**Proposition 2** While the introduction of an infinitesimal, yet strictly positive, bidding cost does not change the equilibrium location of the firm, which remains efficient, it causes discrete changes to the payoffs to the players such that the winning country gains at the expense of the firm’s owners, while the losing country is unaffected.

**Proof** With infinitesimal $c$, the efficiency claim is clear from Figure 1: country $A$ is the efficient location in panels $(a)$ and $(b)$, while country $A$ is efficient in panel $(c)$ iff $\Gamma > V_B - V_A$. However, the players’ payoffs in the efficient equilibrium differ qualitatively from the case where bidding is costless, where $(Y, Y)$ is the dominant strategy equilibrium. As we showed in Proposition 1, at most one country will bid for the firm when $c > 0$. With infinitesimal $c$, this sole bidding country is the one that would win a subsidy competition for the firm. Secure in the knowledge that it faces no competition for the firm, this winning country can reduce its bid relative to the subsidy-competition case (by an amount equal to the losing country’s valuation) while still retaining the investment, thereby reducing the firm’s after-tax profits to the level available in the losing country whose bid is now zero. ■

We turn next to the case where $c$ is non-infinitesimal. For simplicity and brevity, we restrict ourselves here to the case where $V_A = V_B$, i.e. Figure 1$(b)$, although our results will generalise to $V_A \neq V_B$. Within this context, we can show:

**Proposition 3** If the bidding cost is non-infinitesimal and one of the countries bids for and wins the firm in equilibrium, then this might be the “wrong” country from a welfare perspective. Nevertheless, the host region can benefit from the presence of bidding costs even if such an equilibrium results.

**Proof** In Figure 1$(b)$ world welfare is higher in $(Y, N)$ than in $(N, Y)$. Nevertheless, $(N, Y)$, the “wrong” outcome, exists as an equilibrium. Given $V_A = V_B$, the joint welfare of countries $A$ and $B$ in the absence of bidding costs is $\Gamma$, where $A$’s winning bid is $V_B$ –
Thus, the host region always benefits from the presence of bidding costs if the resulting equilibrium is \((Y, N)\): given \(V_A = V_B\), this requires \(V_B + \Gamma - c > \Gamma\) or \(c < V_B\), which holds whenever one of the countries bids for the firm in equilibrium. Moreover, the host region might benefit from bidding costs even if the resulting equilibrium is \((N, Y)\): this requires \(V_B - \Gamma - c > \Gamma\) or \(\Gamma < (V_B - c)/2\), which holds towards the bottom of the \((N, Y)\) region in Figure 1(b).

The first result in Proposition 3 is intriguing: When one of the countries bids for the firm in equilibrium in Figure 1(b), why isn’t it always country \(A\)? It is clear that \(B\)’s best response to \(Y\) is always \(N\), given that \(B\) would lose a subsidy competition for the firm. However, \(A\)’s best response to \(N\) is \(Y\) only if \(\Gamma > c\): \(A\) will host the firm whether or not it bids, so the tax revenue it collects from bidding must exceed the bidding cost.

The reason why the countries might prefer the equilibrium with bidding costs to that where \(c = 0\) is that the presence of such costs prevents subsidy competition from arising in equilibrium. Moreover, as Proposition 3 shows, this gain to the host region, which comes at the expense of the firm’s owners in the rest of the world, might be large enough to outweigh the welfare costs associated with the “wrong” location.

5. Conclusion

We have shown that the introduction of a bidding cost into a familiar model of tax competition for FDI results in a profound change in the outcome of the game. Our result turns on the fact that, irrespective of their success in attracting the FDI, bidding countries face real costs from taking part in the contest. Thus a country that expects to lose the competition has a disincentive to make a bid.

We highlight a parallel and a contrast between our analysis and that of Stiglitz (1987). He studies a market-entry game, where two identical firms simultaneously choose whether to pay a sunk cost to enter the Bertrand market for a homogeneous good. This is a game of chicken where only one firm will enter in equilibrium, even if the sunk entry cost is infinitesimal. If both firms were to enter, then price would be driven down to marginal cost in Bertrand competition and losses would result. In
common with Stiglitz, we have shown that an infinitesimal bidding (or entry) cost is enough to eliminate rivalry – in our case, the tax war between countries. We find that the losing country will optimally choose to avoid the competition if bidding is costly.

There are some contrasts between our welfare results and those in Stiglitz, where an infinitesimal sunk entry cost leads a monopoly to replace a Bertrand duopoly. We find that efficiency survives the presence of infinitesimal bidding costs. However, the distribution of welfare is sharply altered by the presence of a bidding cost; specifically, the successful host gains at the expense of the firm’s owners, who are assumed to reside in the rest of the world.

References


Figure 1 Equilibria when bidding is costly