Fiscal Competition for FDI with Knowledge Spillovers and Trade Costs

Ben Ferrett and Daniel Gravino*

School of Business and Economics
Loughborough University

30 June 2017

Abstract

We develop a model of fiscal competition for foreign direct investment, and show that the decision of multinational firms to locate in the proximity of indigenous firms – which can be thought of as agglomeration – may be the result of the provision of government incentives that aim to capitalise on the potential for knowledge spillovers to indigenous industry. Somewhat different but complementary to existing literature, we also show that fiscal competition may increase the welfare of both winning and losing countries in the auction for the multinational firm when it leads to the relocation of multinationals away from countries that do not have the potential to benefit from knowledge spillovers to countries that do. As trade costs fall and the potential for knowledge spillovers increases, both outcomes become more likely in equilibrium.

Keywords: FDI, fiscal competition, knowledge spillovers, trade costs, firm location
JEL codes: F23, H25, O33, R12

1 Introduction

An abundance of literature supports the hypothesis that knowledge spillovers are one of the more important reasons why governments want to host multinational firms (see, for example, Blomstrom and Kokko, 1998). To capitalise on such benefits, they

*Corresponding author: d.gravino@lboro.ac.uk
are often willing to offer favourable tax rates – or at times even subsidies – to beat the competition of other potential host countries. In fact, a survey carried out with investment promotion agencies in over 45 countries from all regions of the world shows that nearly all countries offer some form of investment incentives (UNCTAD, 2000). Of course, it is possible that governments offer incentives for reasons other than knowledge spillovers; most importantly the creation of "good" jobs. However, it is not difficult to think of cases where the governments of regions with near full-employment offer subsidies to attract multinational enterprises (MNEs). For example, in their study of General Motors' decision to locate its Saturn plant in Tennessee, Bartik et al. (1987) argue that the social efficiency benefits caused by additional labour demand were zero because the county of location did not have particularly high unemployment, such that jobs went to unemployed migrants or displaced workers from other jobs. In such cases, and barring political motives, the rationale for investment incentives may well be knowledge spillovers.

Nonetheless, theoretical analysis of fiscal competition for foreign direct investment (FDI) has generally overlooked governments' incentives to capitalise on the potential for knowledge spillovers, and instead emphasized the roles of market size and structure (see, for example, Haufler and Wooton, 1999; Barros and Cabral, 2000; Bjorvatn and Eckel, 2006). For example, Bjorvatn and Eckel (2006), henceforth BE, study tax/subsidy competition between the governments of two potential host countries of different size in the presence of an immobile indigenous firm in the larger country. By assuming that the profits of the indigenous firm enter its country's welfare function, they show that the government of the country with the indigenous firm is less willing to bid for FDI due to the "market crowding effect" (i.e. the preference of imperfectly competitive firms for locations with relatively few competitors when trade is costly). This result, however, is at odds with empirical cases where governments frequently appear to be keen to attract inward FDI for its perceived benefits to indigenous industry.

In an attempt to capture these effects, we build on BE (2006) by incorporating into their model the potential for one-way knowledge spillovers from the MNE to the indigenous firm if the two firms are located in the same country. Assuming (for simplicity) that countries are symmetric in size, we show that in the absence of fiscal competition the MNE chooses to locate in the country without the indigenous firm. This outcome mirrors the symmetric-country-case in BE (2006), which is driven by the market crowding effect, but it is reinforced by the MNE's desire to limit knowledge spillovers to its rival. However, in contrast to the outcome in BE (2006), we show that the MNE's equilibrium location decision may change when governments compete in taxes/subsidies because, relative to BE, the potential for knowledge spillovers in our model increases the valuation of the FDI project of the country with the indigenous firm and decreases that of the country without the indigenous firm. Thus, in the presence of localised knowledge spillovers from inward FDI, the provision of
investment incentives in the form of favourable taxes or subsidies may be considered to be an important determinant of agglomeration, i.e. the co-location of the MNE and the indigenous firm. We show that as trade costs fall and the potential for knowledge spillovers increases, this agglomeration outcome becomes more likely in equilibrium.

Baldwin and Krugman (2004) also study tax competition for mobile capital in the presence of agglomeration benefits. However, their source of agglomeration benefits, the market linkages of new economic geography, differs from ours, localised knowledge spillovers. In Baldwin and Krugman, agglomeration creates benefits for all mobile capital, which the "core" country is able to capture in tax. In essence, the Baldwin/Krugman model appears equivalent to one of two-way knowledge spillovers, such that the incoming MNE can be taxed. In contrast, the knowledge spillover is one-way (from the MNE to the indigenous firm) in our model, such that a subsidy is needed to attract the MNE. On the basis of this comparison, one may conjecture that the direction of knowledge spillovers is important for whether the MNE is subsidised or taxed in equilibrium.

Our study is also related to Fumagalli (2003) whose setup involves two countries of equal size, each of which contains an indigenous firm. The two indigenous firms have different levels of technology (reflected in different marginal costs), and thus the potential for knowledge spillovers differs between the two host countries. Similar to the model presented in this paper, inward FDI generates a positive externality in the form of knowledge spillovers to the indigenous firm located in the same country but, unlike us, Fumagalli does not allow for a trade cost between the two host countries. Her setup yields a result that is similar to one derived from our model: in contrast to laissez-faire, fiscal competition makes it possible that the MNE will locate in the country where knowledge spillovers are maximised. However, we show that this possibility recedes as trade costs rise because, in our model, agglomeration becomes less attractive as national product markets become more protected. Thus, our setup makes it possible to explore the tension created by the opposing effects that knowledge spillovers and trade costs have on country valuations and the consequent location decision of the MNE.

Our simultaneous consideration of knowledge spillovers and trade costs, which distinguishes our analysis from both Bjorvatn and Eckel (2006) and Fumagalli (2003), calls for a reassessment of the welfare impacts of fiscal competition. The established result that tax/subsidy competition in the form of an auction for a single firm maximises overall world welfare continues to hold. In addition, we derive two new welfare findings. Focussing first on welfare at the regional level (here defined as the welfare sum of the two countries), BE show that fiscal competition increases regional welfare.

\[\text{Note that, in contrast to us, Fumagalli's framework is unsuited to examining the agglomeration/non-agglomeration distinction because both host countries contain an indigenous firm in her model.}\]
only when trade costs are high. In contrast, we show that by introducing knowledge spillovers into the model, it is possible that fiscal competition improves regional welfare even at relatively low trade costs. Second, turning to the welfare of individual countries, Fumagalli shows that if both countries have the potential to benefit from knowledge spillovers from the MNE to indigenous industry, one country (the winner of the FDI under laissez-faire) is necessarily worse off under fiscal competition. In contrast, we show that in a model where only one country has the potential to benefit from knowledge spillovers (e.g. due to differing specialisations of indigenous industries or levels of educational attainment and "absorptive capacity"), both countries may be better off under fiscal competition.

Summing up, we contribute to the existing literature on fiscal competition for FDI by showing how trade costs and knowledge-spillover benefits interact with fiscal policy to determine multinationals' location decisions and the associated welfare outcomes. The remainder of this paper is organised as follows: section 2 describes the model under "laissez-faire" and "fiscal competition"; section 3 discusses welfare issues; and section 4 concludes by discussing a number of policy-relevant results.

2 A Model of Fiscal Competition for FDI

Consider a model with a region consisting of two countries, A and B, which are symmetric in size. Country A hosts the only indigenous and immobile firm in the region and there also exists an MNE that wishes to invest in one of the two countries to serve regional demand. The indigenous firm in country A is entirely owned within that country, whereas the MNE is entirely owned outside the host region. Each firm can export within the region at a per unit trade cost \( t \) in either direction. However, the trade costs associated with serving the region through exports from outside the region are assumed to be prohibitively high so that access to regional consumers requires FDI. Setting up in one of the two countries involves a fixed investment cost, \( F \), which is assumed to be the same in both countries. \( F \) is sufficiently high to ensure that the MNE does not split its production between the two countries by establishing a plant in each.

The MNE produces a good identical to that of the indigenous firm but the two firms' marginal costs of production are assumed to be different. The indigenous firm is less efficient than the MNE such that its marginal cost \( c \in [0,1] \) is greater than that
of the MNE which is equal to zero. However, if the MNE locates in country A, the indigenous firm benefits from a localised one-way knowledge spillover by gaining partial or even total access to the MNE's technology so that its marginal cost is reduced by $\phi c$ to $(1 - \phi) c$, where $\phi \in [0, 1]$. When $\phi = 1$ the knowledge spillover is the strongest possible and the indigenous firm becomes as efficient as the MNE.

After the MNE chooses in which country to invest, the firms play separate Cournot games in each product market. Both firms are assumed to sell in both markets, such that Cournot equilibria are always interior. The inverse demand function for the good in each country is given by $P_i = 1 - Q_i$, where $Q_i$ and $P_i$ are the quantity demanded and price in country $i$. The MNE’s problem is to decide in which country to locate to serve regional demand.

### 2.1 Laissez-Faire Scenario

Initially, we assume a laissez-faire scenario where there is no fiscal competition such that government intervention cannot influence the MNE’s investment location. In this case, the MNE chooses its location solely on the basis of pre-tax profits, and the game involves two stages:

- in stage 1, the MNE decides where to locate; and
- in stage 2, the MNE and the indigenous firm compete à la Cournot to serve regional demand.

The MNE maximises its profits, and the game is solved by backward induction to isolate its subgame perfect Nash equilibrium (we focus on pure strategies throughout).

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3 Setting the MNE’s marginal cost equal to zero simplifies the notation significantly as it enables us to express the post-knowledge spillover marginal cost of the indigenous firm independently of the MNE’s marginal costs.

4 This has two implications that are generally supported by empirical evidence. First, knowledge spillovers are one-way because MNEs are significantly more productive than exporting and non-exporting firms (see, for example, Helpman et al., 2004). Second, and also supported by empirical evidence, is the assumption that proximity is an important determinant for knowledge spillovers (see, for example, Jaffe et al., 1993).

5 If the MNE invests in A, the two firms’ marginal costs are $(0, (1 - \phi) c)$ on market A and $(t, (1 - \phi) c + t)$ on market B. Alternatively, if the MNE invests in B, the two firms’ marginal costs are $(t, c)$ on market A and $(0, c + t)$ on market B. We can move from the final marginal-cost pair to any of the other three by increasing the MNE’s marginal cost and cutting the indigenous firm’s. Therefore, if the fourth Cournot equilibrium (on market B when the MNE chooses B) is interior, then the other three will be too; and the condition for this is $c + t < 0.5$, which we assume to hold throughout.
Let $\Gamma$, which we term country B’s "geographic advantage", measure the additional pre-tax profits that the MNE earns if it locates in country B rather than country A:

$$\Gamma = \left[ \frac{1}{9} (1 - 2t + c)^2 + \frac{1}{9} (1 + c + t)^2 \right]$$

$$- \left[ \frac{1}{9} (1 + (1 - \phi)c)^2 + \frac{1}{9} (1 - t + (1 - \phi)c)^2 \right]$$

$$= \frac{2}{9} \left[ 2t^2 + \phi c^2 (2 - \phi) + \phi c (2 - t) \right]$$

(1)

**Proposition 1:** In the absence of fiscal competition, the MNE always locates in country B, at a distance from the indigenous firm.

Proof: From equation (1), it is clear that at $c = 0$, $\Gamma = \frac{4}{9} t^2 \geq 0$. Moreover, $\frac{d\Gamma}{dc} > 0$ for all $c \geq 0$. □

This outcome is the result of two forces, which reinforce each other. The first is the MNE’s incentive to avoid proximity to the indigenous firm in order to limit competition in the product market. This tendency to avoid proximity to competitors has been recognized for a long time in location theory and is generally referred to as the "market crowding effect" (see Fujita and Thisse, 2002; Baldwin et al., 2003). The second is the MNE’s incentive to locate its subsidiary in the country where rent erosion due to knowledge spillovers (to its competitor) is minimized; a strategy which has been recognized both theoretically (Fumagalli, 2003; Iammarino and McCann, 2013) and empirically (Shafer and Flyer, 2000; Alcácer and Chung, 2007).

### 2.2 The Fiscal Competition Scenario

In the fiscal competition scenario, the governments of the two countries bid to host the MNE. The game involves three stages:

- in stage 1, the governments simultaneously and non-cooperatively announce their lump-sum tax/subsidy offers for the MNE’s plant;
- in stage 2, the MNE decides where to locate and invests; and
- in stage 3, the MNE and the indigenous firm compete à la Cournot on both countries’ product markets. A tax/subsidy transfer payment occurs between the MNE and the winning country’s taxpayers.
The MNE maximises its after-tax profits and the host countries maximise their levels of social welfare; and, again, the game is solved by backward induction. However, unlike the game in the laissez-faire scenario, the outcome does not only depend on country B’s geographic advantage, $\Gamma$, but also on the governments’ valuations of the FDI project, which determine their willingness to bid.

In equilibrium, country A wins the auction for the MNE if its valuation of the FDI project, $V_A$, is so much higher than that of country B, $V_B$, that it more than makes up for country B’s geographic advantage:

$$V_A > V_B + \Gamma$$

(2)

The bidding for the MNE’s plant is a first-price auction (with complete information and private values) with an important twist. The fact that the countries offer the MNE different levels of pre-tax profits implies that, in general, the auction is not a tie (with the MNE being indifferent concerning the location of its plant) when the two countries post the same bid. Thus, for example, a country that enjoys a geographic advantage (here, country B) appreciates that it can win the FDI with a lower bid than its rival.\footnote{See Ferrett and Wooton (2010) for an extensive discussion of our auction set-up, including its microfoundations and equilibrium properties.}

In expression (2), $V_B$ is the additional consumer surplus that country B enjoys under local production via FDI compared to importing:

$$V_B = \left[\frac{1}{18} (2 - c - t)^2\right] - \left[\frac{1}{18} (2 - (1 - \phi) c - 2t)^2\right]$$

$$= \frac{1}{18} (\phi c - t) (3t - \phi c + 2c - 4)$$

(3)

and $V_A$ is A’s consumer surplus gain from local production following inward FDI plus the change in the profits of its indigenous firm due to inward FDI:

$$V_A = \left[\frac{1}{18} (2 - (1 - \phi) c)^2\right] - \left[\frac{1}{18} (2 - c - t)^2\right]$$

$$+ \left[\frac{1}{9} (1 - 2 (1 - \phi) c)^2 + \frac{1}{9} (1 - 2 (1 - \phi) c - t)^2\right]$$

$$- \left[\frac{1}{9} (1 - 2c + t)^2 + \frac{1}{9} (1 - 2c - 2t)^2\right]$$

$$= \frac{1}{18} (\phi c (20 + 17c (\phi - 2)) - 2t (4\phi c + c - 2) - 9t^2)$$

(4)
In our model, both governments are benevolent social-welfare-maximisers. Inward FDI alters the market price paid by a country’s consumers (both because it eliminates the trade cost from the MNE’s marginal cost and because it changes the realised knowledge spillover), and both countries take account of this welfare effect; in addition, country A also takes account of how inward FDI affects its indigenous firm’s profits.\footnote{Besides consumer-welfare and spillover benefits, other possible motivations for bidding for FDI have been examined in the literature: e.g. wage premia for domestic workers in "good" MNE jobs, including the relief of involuntary unemployment (Haaparanta, 1996); and the net fiscal contribution from the mobile factors associated with inward FDI (Black and Hoyt, 1989).}

Proposition 2 describes the MNE’s equilibrium location under fiscal competition:

**Proposition 2:** Under fiscal competition for the MNE’s plant, country A wins the FDI if and only if $V_A > V_B + \Gamma$ or, equivalently, $\phi > \phi^*$, where $\phi^*$ is the level of knowledge spillovers that would make the MNE indifferent between the two countries if they were both to bid their valuations. (See appendix for explicit definition of $\phi^*$).

While the above proposition gives the MNE’s equilibrium location, it is important to recognise that both countries do not actually bid their valuations in equilibrium. In

![Figure 1: The MNE's Location Decision under Fiscal Competition ($c = 0.15$)](image)
equilibrium, the losing country bids its valuation; and, taking account of the pattern of geographic advantage, the winning country just trumps that losing bid.\footnote{\textsuperscript{8}Thus, for example, the winning country would be able to impose a tax in equilibrium if its geographic advantage were sufficiently strong.}

Assuming (for simplicity) that $c = 0.15$, the proposition is summarized in Figure 1.\footnote{\textsuperscript{9}With $c = 0.15$, our condition for interior Cournot equilibria ($c + t < 0.5$) implies that $t < 0.35$.} It shows that country A wins the auction when trade costs, $t$, are sufficiently low and knowledge spillovers, $\phi$, are sufficiently large. Otherwise country B wins. Note that any point on the horizontal axis, where $\phi = 0$, represents an outcome identical to BE (2006), i.e. the MNE locates at a distance from the indigenous firm when the two countries are the same size. On the other hand, any point on the vertical axis, where $t = 0$, represents an outcome similar to Fumagalli (2003), i.e. the MNE locates in the country where knowledge spillovers would be greatest. This suggests that as $t$ falls and $\phi$ increases, agglomeration (i.e. the co-location of the MNE and the indigenous firm) becomes more likely in equilibrium. To understand the drivers of this result in more detail, we next consider the impact of both trade costs and knowledge spillovers on the two sides of condition (2).

\textit{The trade cost effect}

Consider the case where $\phi = 0.2$. From Figure 1 above, we know that at that level of knowledge spillovers, the MNE is indifferent between locating in either of the two countries in equilibrium if $t \approx 0.14$. This is also reflected in Figure 2, which for ease of exposition assumes $\phi$ to be constant. It shows that for $t < 0.14$, $V_A > V_B + \Gamma$ such that country A wins the auction for the MNE by paying a subsidy of (marginally above) $V_B + \Gamma$.\footnote{\textsuperscript{10}Recall that, while the losing country bids its valuation in equilibrium, the winning country need not pay a subsidy equal to its valuation; it suffices to slightly improve on its rival’s losing offer, adjusted for $\Gamma$. The equilibrium subsidy paid to the MNE is $V_B + \Gamma + \varepsilon$ if country A wins and $V_A - \Gamma + \varepsilon$ if country B wins, where $\varepsilon$ is an infinitesimal amount.} For $t > 0.14$, on the other hand, $V_B + \Gamma > V_A$ such that country B wins the auction for the MNE by paying a subsidy of (marginally above) $V_A - \Gamma$. Thus, country A wins the MNE for sufficiently low trade costs while country B wins the MNE for sufficiently high trade costs. The winning subsidy/tax offer in the equilibrium is depicted as a heavy bold line in Figure 2.\footnote{\textsuperscript{11}Note that, for sufficiently large $t$, B wins the FDI and taxes the MNE in equilibrium. (Although $V_A > 0$ so country A offers a positive subsidy in equilibrium, B’s geographic advantage, $\Gamma$, is so large that $V_A - \Gamma < 0$.)} The winning country’s surplus – representing the difference between its valuation and the equilibrium subsidy it pays – is represented by the shaded areas in figure 2. Note that as the auction for the FDI progressively moves away from being a tie (i.e. as $t$ moves away from the vertical dashed line), so the winning country’s equilibrium surplus progressively grows. This is consistent with our finding in the welfare analysis below that the host
region is more likely to be better off under fiscal competition than under laissez-faire, the further removed is the auction for the FDI from being a tie.

The result that country A becomes more likely to win the auction for the FDI as $t$ falls is driven by the way in which $t$ affects $V_A$, $V_B$ and $\Gamma$. We see from figure 2 that $V_A$ varies less with $t$ than does $V_B + \Gamma$, which is sharply increasing in $t$. Thus, $V_A > V_B + \Gamma$, the condition for country A to win, becomes more likely to hold as $t$ falls. Intuitively, $V_A$ varies relatively little with $t$ because, as $t$ falls, inward FDI benefits A’s consumers less (through market-price reduction) but it also harms A’s indigenous firm less (through the market-crowding effect) – and these two welfare effects push $V_A$ in opposite directions, thus tending to counteract each other. In contrast, $V_B$ is clearly increasing in $t$ because country B’s valuation only reflects the interests of its consumers, and the consumer-surplus gain from inward FDI varies positively with $t$. Moreover, $V_B + \Gamma$ is also increasing in $t$ because, in general, B’s geographic advantage, $\Gamma$, tends to vary positively with $t$ (i.e. falls in $t$ tend to weaken the market-crowding effect of co-location in A).\textsuperscript{12}

\textsuperscript{12}And even on the extremely small interval (near $t = 0$) where $\frac{d\Gamma}{dt} < 0$, the positive effect of $t$ on $V_B$ (i.e. $\frac{dV_B}{dt} > 0$) dominates.
The knowledge spillover effect

For a given level of \( t \), an increase in \( \phi \) reduces the unit production cost of the indigenous firm if the MNE is located in the same country, A. This increases country A’s valuation, \( \frac{dV_A}{d\phi} > 0 \), and decreases that of country B, \( \frac{dV_B}{d\phi} < 0 \). The latter effect is due to the indirect benefit accruing to consumers in country B from the knowledge spillovers to the indigenous firm in country A if the MNE locates in A. On the other hand, country A’s valuation is increasing in \( \phi \) because: (i) the benefit of inward FDI for its consumers is increasing in \( \phi \); and (ii) the profits of the indigenous firm are also increasing in \( \phi \).

Since an increase in the potential for knowledge spillovers increases \( V_A \) and cuts \( V_B \), we conclude that an increase in \( \phi \) increases the likelihood of a win for country A in the FDI auction. This is true even though increasing \( \phi \) has a positive impact on \( \Gamma \) (the other variable on the right-hand-side of condition (2)), because this positive impact on \( \Gamma \) is always smaller than the negative impact that an increase in \( \phi \) has on \( V_B \). Thus, an increase in \( \phi \) increases the value of the left-hand-side of condition (2) and decreases that of the right-hand-side. This leads us naturally to the third proposition:

**Proposition 3:** In the fiscal competition scenario, a larger "technology gap" between
the MNE and the indigenous firm (i.e. a higher c) expands the area in the parameter space where country A wins.

Proof: Since \( \frac{dV_A}{d\phi} > 0 \) and \( \frac{dV_A}{dc} < 0 \), and \( \phi \) enters the indigenous firm’s marginal cost multiplicatively with \( c \), it follows that \( \frac{dV_A}{dc} > 0 \) and \( \frac{dV_B}{dc} < 0 \). Thus, an increase in \( c \) makes \( V_A > V_B + \Gamma \) more likely. \( \Box \)

The proposition is summarized in figure 3. It shows that a higher value of \( c \) rotates the curve along which the fiscal competition for FDI is tied clockwise such that more combinations of \( t \) and \( \phi \) lead the MNE to locate in country A in equilibrium. This happens because higher levels of \( c \) amplify the effect that knowledge spillovers have on the valuations of both countries, suggesting that a higher degree of firm heterogeneity makes the agglomeration outcome more likely under fiscal competition. Given that one expects firm size to vary inversely with production costs, this result is in line with the empirical findings of Brühlhart and Simpson (2016), who conclude that spillover benefits to indigenous industry are more likely to motivate observed corporate subsidy payments in the case of very large FDI projects, as studied by Greenstone et al. (2010), than in the case of smaller ones.

Putting everything together, we note that in the laissez-faire scenario the MNE locates in country B for all values of \( c \), \( t \) and \( \phi \). However, the opposing effects that both knowledge spillovers and trade costs have on the countries’ valuations of the FDI project may induce the MNE to co-locate alongside the indigenous firm in country A when governments compete in taxes/subsidies. Furthermore, we note that the agglomeration outcome is more likely the bigger the technological gap between the MNE and the indigenous firm.

3 Welfare Analysis of Fiscal Competition

When multinational firms’ location decisions are influenced by fiscal competition, an important question is whether the use of publicly financed subsidies is efficiency enhancing. And even if fiscal competition does lead to a more efficient outcome, an important distributional issue remains: how are the net benefits from fiscal competition distributed, and might some players lose? We seek to answer these questions by comparing the equilibrium outcome under fiscal competition with that under laissez-faire.

World Welfare

Let world welfare be the sum of consumer surplus in countries A and B plus the profits earned by the indigenous firm and the MNE.
**Proposition 4:** Under fiscal competition, the MNE chooses the efficient location for its plant, where “efficient” means world-welfare-maximizing.

Proof: The condition for FDI in country A to be world-welfare-maximising is identical to that for the MNE to locate in A in fiscal-competition equilibrium, i.e. \( V_A > V_B + \Gamma \).

The intuition is as follows. If fiscal competition does not change the MNE’s location decision (relative to the laissez-faire scenario), then consumer surplus in both countries, as well as the profits of the indigenous firm, remain unchanged. The only factor that changes is the tax (or subsidy) paid by (or to) the MNE. Because from a world welfare perspective, taxes (and subsidies) simply represent a transfer payment from one world player to another, fiscal competition thus has no impact on world welfare in the case of no change in the MNE’s location decision. On the other hand, if fiscal competition does change the MNE’s location decision, then it must be world-welfare-improving. For example, if fiscal competition prompts the MNE to change its location from B under laissez-faire to A, then this relocation will increase world welfare if \( V_A > V_B + \Gamma \), where the L.H.S. is the welfare gain from inward FDI to country A and the R.H.S. is the total loss of consumer surplus and pre-tax profits to country B and the MNE; and this is also the condition, (2) above, for relocation from B to A to occur in equilibrium under fiscal competition. Thus, we conclude that fiscal competition is world-welfare-maximising, and may be strictly world-welfare-improving.

This result is not particularly remarkable because it is consistent with the well-established result that an auction for a single firm leads to the efficient location (see, for example, Ferrett and Hoefele, 2015, Proposition 1; Bjorvatn and Eckel, 2006, Proposition 5). However, fiscal competition need not necessarily be Pareto improving: while some players must gain (at least weakly), others might lose in strict terms.

**Country A’s Welfare**

**Proposition 5:** Relative to the laissez-faire scenario where the MNE locates in B, fiscal competition increases country A’s welfare if it wins the MNE, \( \phi > \phi^* \), but otherwise leaves country A’s welfare unchanged.

This follows from the discussion above. By condition (2), we know that country A wins the auction for the MNE if and only if \( V_A > V_B + \Gamma \). In this case, A pays a subsidy of (just above) \( V_B + \Gamma \) and, relative to laissez-faire, thus enjoys a welfare gain of \( V_A - (V_B + \Gamma) \).\(^{13}\) If, on the other hand, country B wins the fiscal competition for

\(^{13}\)See the shaded area in the L.H.S. of Figure 2.
Figure 4: Welfare Impacts of Fiscal Competition \((c = 0.15)\)

the MNE, both consumer surplus in A and the profits earned by its indigenous firm remain unchanged from those under laissez-faire. Thus, when country B wins, fiscal competition does not affect country A’s welfare.

Country B’s Welfare

Proposition 6: Relative to laissez-faire, fiscal competition increases country B’s welfare if: (i) \(\Gamma > V_A\) or \(\phi < \phi'\) (explicitly defined in the appendix), such that country B retains the MNE’s plant and taxes it; and (ii) \(\phi > \phi''\equiv \phi''\) such that the relocation of the MNE to country A in equilibrium reduces the price on country B’s product market. Otherwise, country B’s welfare falls.

There are two distinct ways in which fiscal competition might benefit country B. Firstly, if fiscal competition leaves the MNE’s location unchanged as B (i.e. \(V_B + \Gamma > V_A\)), then B’s winning fiscal offer (in response to A’s losing bid of \(V_A\)) is \(V_A - \Gamma\). Thus, if B’s geographic advantage is sufficiently strong (i.e. \(\Gamma > V_A\)), it is able to retain the MNE’s investment and tax it. In this case, B’s welfare rises by its level of tax revenue. Alternatively, if B retains the MNE’s plant with a subsidy payment
in equilibrium (i.e. $V_B > V_A - \Gamma > 0$), then B’s welfare falls by the amount of the subsidy payment.

Secondly, even if B loses the FDI to A under fiscal competition, then it is still possible for country B to gain from fiscal competition. This gain to B occurs if the agglomeration of production in country A produces a spillover to A’s indigenous firm that is sufficiently large to result in a fall in the equilibrium price on B’s product market. Noting that the relocation of the MNE from B to A increases its unit cost of serving market B by $t$ but cuts that of A’s indigenous firm by $\phi c$ and that the Cournot equilibrium price depends on the sum of marginal costs, it follows that the MNE’s exit reduces the market price in B if $\phi c > t$ or $\phi > \phi^* \equiv \frac{t}{c}$. The condition $\phi > \phi^*$ is thus equivalent to $V_B < 0$—i.e. inward investment into B harms its consumers by leading to an increase in its market price.

In the shaded area of Figure 4, $V_B < 0$ ($\phi > \phi''$) and, unsurprisingly therefore, country A wins the fiscal competition for FDI ($\phi > \phi^*$). Thus, in that shaded area, both host countries benefit from fiscal competition. This contrasts with the finding of Fumagalli (2003) that fiscal competition always harms one of the host countries (specifically, the host of the FDI under laissez-faire). The key, relevant distinction between our model and Fumagalli’s is that only one of our competing countries, A, contains an indigenous firm. Thus, when country A wins the FDI, agglomeration replaces non-agglomeration in our model; whereas in Fumagalli, the MNE is always co-located alongside an indigenous firm (since both host countries contain one). Moreover, if the spillover benefits of agglomeration in A are sufficiently strong in our model, then the country, B, that loses the FDI in the move from laissez-faire to fiscal competition ends up better off (despite the fact that trade costs now apply to all of its consumption).

**MNE’s Welfare**

*Proposition 7: With fiscal competition, the MNE’s after-tax profits (“welfare”) increase if the level of knowledge spillovers, $\phi$, is greater than $\phi'$ but less than $\phi''$.*

Intuitively, if the multinational locates in country B, its after-tax profits rise compared to laissez-faire if it gets subsidised ($V_A - \Gamma > 0$ or $\phi > \phi'$) but fall if it gets taxed ($V_A - \Gamma < 0$ or $\phi < \phi'$). On the other hand, if the multinational relocates to country A under fiscal competition, its after-tax profits rise only if country B’s valuation (which

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**Footnotes:**

14 In Figures 4 and 5, $\Delta w_A$, $\Delta w_B$, $\Delta w_m$ and $\Delta W$ represent, respectively, the changes in the welfare of country A, country B, the MNE’s owners and the world as a whole.

15 Moreover, because fiscal competition causes the MNE to change its equilibrium location, the world as a whole gains ($\Delta W > 0$). However, as we show below, the gains to the host region come partially at the expense of the MNE’s owners ($\Delta w_m < 0$).
itself determines the size of the subsidy paid by host country A, $V_B + \Gamma$) is positive: specifically, $V_B > 0$ or $\phi < \phi'$. However, if country B attaches a negative value to inward FDI (i.e. $V_B < 0$ or $\phi > \phi''$), then country A wins the auction for FDI with a subsidy that is lower than the relocation-induced fall in the MNE’s pre-tax profits ($\Gamma$), leaving the MNE’s owners worse off under fiscal competition. Recalling that the fiscal competition is tied at $\phi = \phi^*$, it is noteworthy from Figure 4 that the MNE is more likely to gain from fiscal competition, the closer is the auction to being a tie.

**Regional Welfare**

Let regional welfare be equal to the sum of the welfare of the two countries.

Proposition 8: Relative to the laissez-faire scenario, fiscal competition decreases regional welfare when the potential for knowledge spillovers, $\phi$, is higher than $\phi'$ but less than $\phi''$, where $\phi''$ is that level of $\phi$ which makes fiscal competition regional-welfare-neutral when country A wins the auction for FDI. Otherwise, regional welfare falls.

The proposition is summarized in figure 5. It shows that fiscal competition increases regional welfare in two (shaded) areas: first, when $\phi < \phi'$, or $V_A - \Gamma < 0$, as this
enables the government of country B to retain the MNE with a tax; and second, when $\phi > \phi''$ or $V_A > 2V_B + \Gamma$, as this implies that country A's surplus from winning the fiscal competition exceeds the loss B suffers when the MNE exits.\footnote{A's surplus is $V_A - V_B - \Gamma$ and B's loss is $V_B$. Note that $V_A - V_B - \Gamma > V_B$ rearranges to $V_A - \Gamma > 2V_B$.} There exists an intermediate area in the $(\phi, t)$ parameter space where fiscal competition is regional-welfare-decreasing because subsidy competition between the two governments is close to being a tie, i.e. around $\phi = \phi^*$; in this case, the fiscal competition might be thought of as being "intense" or "closely fought". These results contrast with the findings of BE (2006) who show that fiscal competition increases regional welfare only for high levels of $t$, which implies that the decline in trade costs observed over the past two decades makes it less likely that fiscal competition will improve regional welfare.\footnote{WTO (2008) reports an overall downward trend in trade costs in the last half century, including traditional trade costs (such as tariff and non-tariff barriers) as well as transport and communication costs.}

### 4 Concluding Remarks

This paper analyses the location outcomes and welfare effects of fiscal competition for FDI in the presence of localised knowledge spillovers. We show that in the absence of government intervention, the multinational firm’s optimal strategy is to locate at a distance from the indigenous firm in order to limit the market crowding effect and to minimize the knowledge spillover to its competitor. However, governments may cause a switch in the multinational’s location decision by offering financial incentives – in the form of subsidies or beneficial tax rates – to the MNE. This is largely the result of the way in which the potential for knowledge spillovers pushes the two countries' valuations of the FDI project in opposite directions: with spillovers, the valuation of the country with the indigenous firm is increased, while that of the other country falls. This outcome suggests that 	extit{agglomeration} may, in part, be the result of the provision of government incentives, particularly if competing countries’ other characteristics are similar. Thus, besides simplicity, an important justification for our assumption that country sizes are equal is that it creates a framework where agglomeration will not occur for purely private reasons under laissez-faire. In turn, this enables us to bring out clearly the potential role of fiscal activism in facilitating industrial agglomeration.

In line with existing literature, our study also shows that fiscal competition is world-welfare-maximising because it directs investment to where it is valued most. However, we add to existing literature on the welfare impacts of fiscal competition in two ways. First, in contrast to BE (2006), who show that fiscal competition increases regional welfare only when trade costs are relatively high, we show that regional welfare also rises under fiscal competition at low levels of trade costs if knowledge spillovers are
sufficiently strong – since, in that case, consumers in both countries benefit from spillovers to the indigenous firm. Second, in contrast to Fumagalli (2003), whose model shows that fiscal competition necessarily harms the country that would host the FDI under laissez-faire, we show that this is not the case when one potential host country cannot benefit from knowledge spillovers while the other one can (possibly due to differing industrial specialisations). Taken together, these observations suggest that for sufficiently low trade costs and high spillovers, fiscal competition may not only increase regional welfare but also improve that of all the individual competing countries.

Finally, we make two points on the practical applicability of these results. First, we note that the novel results obtained from this study are more relevant to situations where governments compete to host highly productive firms (which MNEs often are). This is because, for a given spillover rate (our parameter φ), a larger technology gap between the MNE and the indigenous firm increases the willingness of the country containing the established firm to bid for the FDI, while it reduces the other country’s willingness to bid. Second, we note that the decline in trade costs observed over the past two decades (WTO, 2008) and the likely increase in firms’ absorptive capacities (associated with higher levels of educational attainment, training and worker mobility) make an agglomeration outcome that improves the welfare of all countries in the host region seem more likely.

References


Appendix

Explicit definitions for $\phi^*$, $\phi'$ and $\phi'''$ follow.

*Explicit definition for $\phi^*$*. Let $\phi^*$ be that level of knowledge spillovers that makes the MNE indifferent in equilibrium between locating in country A or B when there is fiscal competition for FDI; i.e. $V_A = V_B + \Gamma$. This is given by:

$$
\phi^* = \frac{1}{22c} \left( 22c^2 - 8c + 4ct - \sqrt{308c^2t^2 + (8c - 22c^2 - 4ct)^2} \right).
$$

*Explicit definition for $\phi'$*. Let $\phi'$ be that level of knowledge spillovers that makes fiscal competition welfare-neutral (because fiscally neutral) from country B’s perspective when the MNE locates in country B; i.e. $V_A - \Gamma = 0$. This is given by:

$$
\phi' = \frac{1}{21c} \left( 21c^2 - 6c + 2ct - \sqrt{c^2 \left( (2 - 7c)^2 + 18t \cdot (7c - 6) + 361t^2 \right)} \right).
$$

*Explicit definition for $\phi'''$*. Let $\phi'''$ be that level of knowledge spillovers that makes fiscal competition regional-welfare-neutral when the MNE locates in country A. This requires $V_A > 2V_B + \Gamma$ and is given by:

$$
\phi''' = \frac{1}{23c} \left( 23c^2 - 10c + 6ct - \sqrt{c^2 \left( (10 - 23c)^2 + 2t \cdot (115c - 4) + 289t^2 \right)} \right).
$$