Does tax competition make mobile firms more footloose?

Ben Ferrett
Loughborough University

Andreas Hoefele
Loughborough University

Ian Wooton
University of Strathclyde, CEPR and CESifo

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Abstract

Existing formal analyses of fiscal competition for FDI tend to assume a one-shot interaction between governments and MNEs within a static geographical environment. Thus, plants remain permanently wherever they locate initially. In contrast, we present an equilibrium model of plant relocations. We study a repeated competition for FDI in an environment where geography evolves over time and plant investment costs are sunk. We compare equilibrium plant locations over time under laissez-faire and fiscal competition. We show that the MNE’s location choices under repeated fiscal competition are efficient and that, compared to laissez-faire, the MNE’s plant is more likely to relocate over time under fiscal competition. The MNE’s greater propensity to relocate under fiscal competition is due to the fact that, with endogenously determined fiscal inducements, the host governments absorb some of the firm’s relocation costs in their tax/subsidy offers.

Keywords: FDI, dynamic fiscal competition, geographical change, efficiency.

JEL codes:

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1. Introduction

Does fiscal competition generate more observed plant mobility (or “footlooseness”) than would occur under laissez-faire? And, if so, is the resulting mobility “excessive” from a welfare viewpoint?

National governments often give significant tax and other incentives to foreign-owned firms to induce them to establish local production facilities. Yet the lifespan of these plants is often short as the firms concerned subsequently relocate to more advantageous locations for their production. (Technologically, it is relatively “easy” for many firms to move.) For example, in 2007, the German public was outraged when Nokia announced the relocation of its production to Romania, only two years after Germany had won the investment by offering subsidies.¹

We consider investment, production, trade and consumption in a region with an evolving pattern of geographic advantage arising from, for example, different rates of population (and market size) growth, changing production costs or improvements in local infrastructure. With the existence of sunk set-up costs for a firm’s operations (such as building the plant or researching for the optimal location within a country), relocating production is more costly than staying in the initial location. This might create inertia on the part of the firm, such that it chooses to remain in one place despite the host country concerned becoming the relatively less-profitable location over time. Alternatively, if a nation is anticipated to develop a strong geographic advantage in the future, there is the potential that it will attract the FDI during the initial period of time, when it is actually the less-profitable location.

Using the decision of the firm in the absence of fiscal competition as a benchmark, we examine how government policies encourage or hinder relocation of FDI in a changing economic environment.² Our model has two active governments, each making offers of lump-sum taxes/subsidies in an attempt to attract the FDI of a single firm, which is owned in the rest of the world. We consider two time periods, in each of which both governments can make offers to the firm. The firm can choose to relocate at the beginning of the second period.

We extend the existing literature by assuming a second period in which both governments are again active and the firm has the potential to relocate. In contrast, most (but not all) existing formal analyses of fiscal competition for FDI (e.g. Haufler and Wooton, 1999) are “static”, in the sense that they focus on cases where the underlying geography is fixed and the MNE/government interaction is one-shot. Thus, these established models explain plant locations, but not plant relocations.

As our benchmark, we derive the location decisions of the firm over time when the governments do not bid to attract the FDI and, consequently, geographic advantage is the sole determinant of location. We denote this case laissez-faire. We show that, depending on the initial pattern of geographic advantage and the growth disparity between the two nations, the firm might choose one country or the other as its permanent location or it may decide to relocate over time.

¹ Need reference for Nokia example: 2007 or 2008? Another example is Siemens in the north-east of England relocating to Eastern Europe (Haaland and Wooton “Easy Come, Easy Go”).
² Note, importantly, that we assume that the underlying (technological) ability of firms to move (e.g. to coordinate production and sales across national borders) is constant.
We then introduce fiscal competition, where each country makes bids to attract the FDI in order to maximise its domestic welfare. (We assume that local production of the firm’s output is preferred to imports.) We show that the MNE’s location choices under repeated fiscal competition are efficient and that, compared to laissez-faire, the MNE’s plant is more likely to relocate over time under fiscal competition. The MNE’s greater propensity to relocate under fiscal competition is due to the fact that, with endogenously determined fiscal inducements, the host governments absorb some of the firm’s relocation costs in their tax/subsidy offers.

In our model geographical change is necessary to explain plant relocations over time. In contrast, with fixed geography, King et al. (1992, 1993) explain relocation on the basis of ex ante uncertainty and ex post disappointment: the MNE doesn’t know a given location’s characteristics for sure before locating there, and might move away after investing if conditions turn out to be worse than it expected. (However, given the amount of effort that MNEs and their agents typically put into ex ante research, such pre-investment ignorance is perhaps implausible.) Our model, however, can explain plant relocations in the absence of uncertainty or surprises, and we view this as a positive contribution.

The remainder of the paper is organised as follows. The next section describes our model. Sections 3 and 4 solve the model under laissez-faire and fiscal competition respectively. Section 5 compares those two cases and discusses our main result and, finally, section 6 concludes.

2. Model

**Dimensions:** Our model contains two countries, one firm, and two periods. The countries, denoted by A and B, together form a regional product market for the good in question and compete against each other for inward FDI. There is a single firm within the industry, the MNE (multinational enterprise), which is entirely owned outside the host region (i.e. countries A and B, considered together) in the rest of the world. We assume that the host region is surrounded by prohibitive trade barriers, so that the MNE must produce within the host region in order to serve its consumers. (We will also assume that there is a non-prohibitive trade cost for trade between A and B.) There are two periods in our model, labelled 1 and 2: As detailed below, the countries compete in bids for the MNE’s investment during both periods; and the MNE may relocate its production between the periods.

**Parameters:** Our key modelling innovation (relative, e.g., to Haufler and Wooton, 1999) is that the geography of the region changes over time, between the two periods. Specifically, we let \( m_t \) denote the size (population) of country B in period \( t \). In contrast, the size of A remains constant over time and is normalised to 1. Thus, \( \mu_t \equiv m_t - 1 \) denotes country B’s “market-size advantage” in period \( t \) (which may be negative). The market size of country B might change over time for a variety of demographic/economic/border-related reasons: e.g. population growth, emigration, immigration, real income growth, and geographic expansion (e.g. the unification of B with a country previously in the rest of world, as when the Berlin Wall fell or the EU enlarges). [Can we also let production cost changes affect \( \mu \)?]

We assume that inward FDI creates a welfare gain for the host country over importing the good from the other country in the region. Let \( S_L \) and \( S_F \) denote, respectively, the per-capita levels of welfare in a country under local (FDI) and foreign (imported) production. Thus, we
denote by $V = S_L - S_F$ the per-capita welfare gain from local production, and we assume that $V > 0$. This might arise because the intra-regional trade cost means that the market price is lower (and consumer surplus higher) under local production, or it may be that inward FDI offers a wage premium for local workers. The fact that local production offers an aggregate welfare gain to the host country, which is $m_t V$ in the case of country $B$ in period $t$, is central to motivating the countries to bid for inward FDI.

The MNE earns per-capita variable profits of $\pi_L$ on local sales and $\pi_F$ on foreign (export) sales, where $\omega \equiv \pi_L - \pi_F > 0$ due to the intra-regional trade cost. Thus, $\omega$ measures the profit premium from local sales.\(^3\) Therefore, the MNE’s total variable profits in period $t$ are $\pi_L + m_t \pi_F$ if production is located in $A$, and $m_t \pi_L + \pi_F$ if production is located in $B$.

Country $B$’s “geographic advantage” in period $t$, the variable-profit premium that it offers to the MNE over country $A$, is $\omega m_t$.

For the MNE, building a plant in either country entails a sunk (capital) cost of $F$, and (for simplicity) we assume that, once a plant has been established, its capital does not depreciate over time.\(^4\) There is also a per-period fixed cost of operating a plant, $C$, and we assume that it is sufficiently large that the MNE will only ever operate one plant, even if it owns two. The parameter $C$ thus plays a background role in our model: it exists only to generate “sufficiently large” increasing returns to scale in production, and it plays no role otherwise.

Finally, $\delta \in [0,1]$ is the discount factor, which is common across both host countries and the MNE. Here, $\delta = 1$ implies that equal weights are placed on payoffs in the two periods, whereas $\delta = 0$ means complete myopia.

**Sequence of moves under fiscal competition (FC) and solution strategy:** When the countries compete for the MNE’s production, our model contains two auctions, which are conducted sequentially and are separated by the change in geography between periods 1 and 2.

**Sequence of Moves**

**Period 1:**
- Countries $A$ and $B$ announce their lump-sum fiscal (tax/subsidy) offers for the MNE’s production.
- The MNE chooses its initial plant location and invests.
- The MNE produces and a tax/subsidy is paid to/by the winning country.

**Period 2:**
- Countries $A$ and $B$ announce their revised fiscal offers for the MNE’s production.
- The MNE chooses whether to relocate its production, perhaps establishing a second plant.
- The MNE produces and a tax/subsidy is paid to/by the winning country.

We assume that both the host countries and the MNE aim to maximise the present discounted value of their payoffs (social welfare and post-tax profits, respectively). For the host

\[^3\] Our assumptions that $V$ and $\omega$ are both positive require that variable production costs be “sufficiently similar” in $A$ and $B$.

\[^4\] We briefly consider the effects of allowing for depreciation, which are intuitive, below.
countries, social welfare is given by the “wider” benefits from local production (as captured by $V$ at the per-capita level) less any subsidy payment to the MNE. We assume that the host countries announce their offers simultaneously in each period and that these offers are irreversible within a period (but can, of course, be changed between periods\(^5\)).

Our game is one of complete information, and we assume that the change in $B$’s geography between periods 1 and 2 is anticipated (although we do consider the consequences of relaxing this assumption when discussing our results). Our solution concept is subgame perfect Nash equilibrium in pure strategies, and we compare the MNE’s equilibrium location choices under FC and laissez-faire (LF).

3. Laissez-faire (LF)

Under LF, the governments refrain from setting taxes or subsidies in either period, and the MNE decides its location solely on the basis of profits. The location pattern in this case is the benchmark for our later analysis of fiscal competition.

The MNE’s equilibrium locations under LF are depicted in Figure 1 below, where (for example) the label $AB$ means that the MNE produces in $A$ in period 1 and in $B$ in period 2.

Figure 1: Equilibrium Locations under Laissez-Faire

\[^5\text{In section 4.2, we consider what happens if the host countries and the MNE can make binding commitments at the start of period 1.}\]
3.1. Derivation of MNE’s equilibrium locations under LF

We denote by \( \Pi_{ij} \) the difference between the present discounted value of the MNE’s profits when it chooses location profiles \( ij \) and \( AA \). Thus, by definition, \( \Pi_{AA} \equiv 0 \). Furthermore, we have

\[
\begin{align*}
\Pi_{AB} &= \delta(\omega \mu_2 - F) \\
\Pi_{BA} &= \omega \mu_1 - \delta F \\
\Pi_{BB} &= \omega(\mu_1 + \delta \mu_2)
\end{align*}
\]

Note that \( F \) appears only in the top two expressions as the MNE builds only one plant over the course of the game in both \( AA \) and \( BB \).

To interpret Figure 1, begin by thinking about the MNE’s location choice in period 2, which depends on \( \mu_2 \) (country B’s size advantage in period 2). If the MNE produced in \( A \) in period 1, it will prefer \( B \) to \( A \) in period 2 iff \( \Pi_{AB} > \Pi_{AA} = 0 \): \( \mu_2 > F/\omega \). However, if the MNE produced in \( B \) in period 1, it will prefer \( B \) to \( A \) in period 2 iff \( \mu_2 > -F/\omega \) (i.e. \( \Pi_{BB} > \Pi_{BA} \)). These two inequalities determine the positions of the two horizontal inter-regional boundaries in Figure 1. The latter inequality is clearly the less demanding, and this makes intuitive sense: the MNE is “more likely” to choose \( B \) in period 2 if it previously chose \( B \) in period 1 because continuing to produce in \( B \) requires no further sunk-cost outlay (whereas moving to \( B \) from \( A \) does). Indeed, the MNE might optimally remain in \( B \) in period 2 even if \( B \) ends up smaller than \( A \) (i.e. \( \mu_2 < 0 \)). Moreover, it is clear that \( B \) will always (i.e. regardless of the MNE’s location in period 1) be chosen in period 2 if \( \mu_2 \) is “sufficiently large” (specifically, \( \mu_2 > F/\omega \)).

Therefore, to determine the MNE’s location profile over time, there are three cases to consider:

- **Case 1**: \( \mu_2 > F/\omega \). Here, the MNE always chooses \( B \) in period 2, and thus its overall location profile is either \( AB \) or \( BB \), depending on whether \( \Pi_{BB} \geq \Pi_{AB} \). \( BB \) is chosen iff \( \mu_1 > -\delta F/\omega \).

- **Case 2**: \( \mu_2 < -F/\omega \). This is the converse of case 1 above, where \( B \) ends up so small that \( A \) always hosts the production in period 2. Overall, \( BA \) is chosen over \( AA \) iff \( \mu_1 > \delta F/\omega \).

- **Case 3**: \( F/\omega > \mu_2 > -F/\omega \). This is the intermediate case where, in period 2, country B’s size is such that the MNE optimally chooses to remain wherever it produced in period 1. Here, \( BB \) dominates \( AA \) iff \( \mu_1 + \delta \mu_2 > 0 \), which defines the downward-sloping boundary between \( AA \) and \( BB \) in Figure 1.

3.2. Commentary on Figure 1

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\( \footnote{\text{For reference, the P.D.V. of the MNE’s profits in } AA \text{ is } \pi_L + m_1\pi_F - F + \delta(\pi_L + m_2\pi_F) - 2c.} \)
The pattern in Figure 1 makes intuitive sense. If country $B$ is at a size disadvantage in both periods (the SW quadrant), then the MNE chooses $AA$. Conversely, if country $B$ is larger than $A$ in both periods (the NE quadrant), then the MNE chooses $BB$. A rise in $B$’s size advantage over $A$ in period $t$ makes $B$ more likely to be chosen as the location of production in period $t$, $t \in \{1,2\}$.

If $B$’s size is constant over time (so that $\mu_1 = \mu_2$ on the 45° line), then the MNE remains in its initial location for both periods, choosing whichever country is larger. Thus, relocation, which occurs in the location profiles $AB$ and $BA$, requires some change in the market-size of country $B$ over time.

Finally, we note two extensions of our analysis, which are both straightforward within the context of Figure 1. First, if the geographical change between periods 1 and 2 is unanticipated, then the two relocation regions, $AB$ and $BA$, both expand sideways. In this case, the MNE assumes that $\mu_2 = \mu_1$ when deciding its period-1 location, choosing $B$ initially iff $\mu_1 > 0$. (Thus, the $AB/BB$, $AA/BB$ and $AA/BA$ inter-regional boundaries all become the vertical line $\mu_1 = 0$.) Therefore, relocation by the MNE between periods 1 and 2 is more likely if the geographical change is unanticipated. This makes intuitive sense because some adjustment can occur before an anticipated geographical shock (i.e. in the MNE’s period-1 location decision), whereas all the adjustment must occur after an unanticipated shock, making relocation after the shock more likely.

We can also observe that the effect on Figure 1 of assuming unanticipated geographical change is identical to that of assuming complete myopia (i.e. $\delta = 0$).

Second, if the plant cost $F$ is fixed rather than sunk (so that it must be paid in both periods even if production remains in the same location), then the MNE optimally chooses $B$ in period $t$ iff $\mu_t > 0$. The absence of a sunk cost implies “separability” between the periods: the MNE’s location in a given period depends only on country $B$’s size advantage during that period. (In this case, each of the four regions in Figure 1 would coincide exactly with one of the quadrants. One can see this by setting $F = 0$.) Of course, one can think of this fixed-cost case as representing complete capital depreciation between periods.

4. Fiscal Competition (FC)

The MNE’s equilibrium locations under FC are depicted in Figure 2 below. In this case, the host compete in fiscal offers in both periods to win/retain the MNE’s production.

If the intra-regional trade cost falls, which reduces $\omega$, then relocation over time becomes less likely: both $AB$ and $BA$ shrink.

The following observations hold good in the fiscal competition (FC) case, which we consider in the next section.

However, the vertical positions of the flat $AB/AA$ and $BA/BB$ inter-regional boundaries do not change because when period 2 arrives, the new geography is revealed and the MNE’s period-2 decision problem is then identical to that under anticipated geographical change.
4.1. Derivation of MNE’s equilibrium locations under FC

We begin with the fiscal competition in period 2. If country $A$ won the MNE’s plant in period 1, then $B$ wins the period-2 competition iff

$$(V + \omega)\mu_2 - F > 0$$

or $\mu_2 > F/(V + \omega)$. In the inequality above, $V\mu_2$ is $B$’s valuation premium over $A$ in period 2, $\omega\mu_2$ is $B$’s geographic advantage in period 2 (as defined in section 2 above), and the $-F$ term reflects the fact that production in $B$ in period 2 requires new investment whereas continuing to produce in $A$ does not.\(^{10}\)

In this case, $B$’s winning tax offer in period 2 is given by

$$\tau^{CAP}_B = \omega\mu_2 - F - V$$

\(^{10}\) Another way of interpreting the inequality is that it ensures higher post-tax profits in $B$ if both countries offer their maximum bids (i.e. subsidies equal to their valuations): $m_2V + m_2\pi_L + \pi_F - F > V + \pi_L + m_2\pi_F$. 

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where the superscript \( \textit{CAP} \) stands for “capture”: i.e. this is B’s equilibrium tax that captures the MNE (away from A) in period 2. Essentially, B can extract its geographic advantage from the MNE in tax, but against this must be offset the investment cost of relocating to B (\( F \)) and A’s subsidy offer (V).

On the other hand, if country B won the MNE’s plant in period 1, then B also wins the period-2 competition iff

\[
(V + \omega)\mu_2 + F > 0
\]

or \( \mu_2 > -F/(V + \omega) \). In the inequality above, the \(+F\) term reflects the fact that continuing to produce in B in period 2 requires no new investment whereas relocating to A does. In this case, B’s winning tax offer in period 2 is given by

\[
\tau_B^{\textit{RET}} = \omega\mu_2 + F - V
\]

where the superscript \( \textit{RET} \) stands for “retain”: i.e. this is B’s equilibrium tax that retains the MNE in period 2. Note that \( \tau_B^{\textit{RET}} \) is increasing in \( F \): the fact that country B contains a pre-existing plant (whereas A does not) gives country B leverage in the period-2 fiscal competition.

Note that \( \tau_B^{\textit{RET}} - \tau_B^{\textit{CAP}} = 2F > 0 \). In equilibrium, country B imposes a higher tax in period 2 to retain the MNE than to capture it. This is due to the existence of a sunk investment in a plant from period 1. Indeed, if \( F = 0 \) so there is no sunk cost associated with starting production in a given location, then \( \tau_B^{\textit{RET}} = \tau_B^{\textit{CAP}} \); that is, the outcome of the period-2 fiscal competition is independent of the location of production in period 1.

Note also that there is an important between the period-2 analyses under LF and FC. In both cases, the MNE is “more likely” to produce in B in period 2 if it previously produced in B in period 1. Again, this follows from the sunk nature of plant investment.

We turn now to the fiscal competition in period 1. As in the LF case, there are three cases to consider:

- **Case 1:** \( \mu_2 > F/(V + \omega) \). Here, country B always wins the period-2 competition (i.e. regardless of which country won in period 1), and thus the MNE’s overall location profile is either \( AB \) or \( BB \).

Country B wins the period-1 competition iff

\[
(V + \omega)\mu_1 + \delta(\tau_B^{\textit{RET}} - \tau_B^{\textit{CAP}}) - \delta(\tau_B^{\textit{RET}} - \tau_B^{\textit{CAP}} - F) > 0
\]

(Clearly, the terms in \( \tau_B^{\textit{RET}} - \tau_B^{\textit{CAP}} \) cancel [more on that in a moment], but I have included them above for the sake of intuition-building.)

In the inequality above, the first term, \( (V + \omega)\mu_1 \), reflects B’s valuation premium over A and its geographic advantage, as in the period-2 analysis above. The second term, \( \delta(\tau_B^{\textit{RET}} - \tau_B^{\textit{CAP}}) \), is an \textit{additional} component of country B’s period-1 valuation of the MNE. It reflects the fact that government B knows that its period-2 tax revenue will be higher if it wins the MNE in period 1. Finally, the third term above reflects the
fact that the MNE knows that locating in $B$ (rather than $A$) in period 1 has implications for its period-2 tax and sunk-cost outlays. Specifically, if it chooses $B$ over $A$ in period 1, the MNE will face a higher tax in period 2 but it will also avoid an additional sunk-cost investment in period 2 (i.e. the cost of relocating from $A$ to $B$).

Simplifying and rearranging the inequality above, country $B$ wins the period-1 competition iff $\mu_1 > -\delta F/(V + \omega)$.

In particular, note that the fact that the tax terms, which are transfers, cancel out implies that $B$ wins in period 1 iff locating in $B$ generates greater world welfare. (The expression $(V + \omega)\mu_1 + \delta F > 0$ requires that moving from $A$ to $B$ in period 1 increases the P.D.V. of world welfare, given that period-2 production will be in $B$.)

- **Case 2:** $\mu_2 < -F/(V + \omega)$. This is analogous to case 1 above, but here country $A$ always wins the production in period 2. Reworking the analysis of case 1, one can show that country $B$ wins the period-1 competition iff $\mu_1 > \delta F/(V + \omega)$.\footnote{The analogue to the inequality condition in Case 1 is $[\textbf{I think!}] (V + \omega)\mu_1 - \delta(t^\text{RET}_A - t^\text{CAP}_A) + \delta(t^\text{RET}_A - t^\text{CAP}_A - F) > 0$.}

- **Case 3:** $F/(V + \omega) > \mu_2 > -F/(V + \omega)$. This is the intermediate case where, in period 2, country $B$’s size is such that the period-1 winner (whether $A$ or $B$) retains the MNE. Thus, the MNE’s overall location profile is either $AA$ or $BB$.

Country $B$’s valuation in period 1 is $m_1V + \delta(m_2V + \tau^\text{RET}_B)$. Country $B$ appreciates that it will either win the MNE in both periods or not at all. This increases its willingness to bid in period 1 by $\delta(m_2V + \tau^\text{RET}_B)$, which reflects discounted social benefits and tax revenue from period 2. Therefore, the P.D.V. of the MNE’s post-tax profits if locates in $B$ in period 1 and receives $B$’s maximum subsidy is

$$m_1V + \delta(m_2V + \tau^\text{RET}_B) + m_1\pi_L + \pi_F - F + \delta(m_2\pi_L + \pi_F - \tau_B^\text{RET})$$

An analogous expression holds for the P.D.V. of post-tax profits in $A$.\footnote{The analogous expression for the MNE’s P.D.V. of post-tax profits in $A$ is

$$m_1V + \delta(m_2V + \tau^\text{RET}_A) + m_1\pi_L + \pi_F - F + \delta(m_2\pi_L + \pi_F - \tau_A^\text{RET})$$}

Comparing these two expressions, we can show that country $B$ wins the period-1 competition iff $\mu_1 + \delta\mu_2 > 0$, as in Case 3 of LF above.

### 4.2. Commentary on Figure 2

The most striking feature of Figure 2 is that it is qualitatively identical to Figure 1, the LF case. Indeed, the dashed lines in Figure 2 are the inter-regional boundaries from Figure 1. Therefore, the observations in section 3.2 above carry over to the FC case.\footnote{Note that if the geographical change is unanticipated, then relocation remains “more likely” under FC than under LF but, in that case, this arises because the conditions on $\mu_F$ for relocation to occur are weaker under FC. (In contrast, with unanticipated geographical change, the vertical $\mu_i$ inter-regional boundaries in Figures 1 and 2 coincide.)}
If the plant cost $F$ were a per-period fixed cost rather than a sunk cost, then our model would follow Haufler and Wooton (1999) in finding that, in any period, the larger country within a region always hosts the FDI, under both LF and FC. In contrast, with repeated periods and a sunk plant investment that persists over time, we show that the smaller country might host production for a period, under both LF and FC.

Compared to LF (Figure 1), the areas where relocation occurs between periods 1 and 2, $AB$ and $BA$, are bigger under FC in Figure 2. Thus, relocation by the MNE between the two periods is “more likely” under FC. This is our central result, which we discuss further in the next section.

We have shown that the equilibrium location profile over time under FC is efficient, in the sense that it coincides with the choices that would be made by a social planner who decides the MNE’s period-1 and period-2 locations to maximise the P.D.V. of world welfare. [Do we need more justification/discussion of this point?] This extends to the two-period case the efficiency result that is well known to hold in the one-shot FC game.

We can use our analysis to investigate the time profile of equilibrium taxes/subsidies paid. Let $\mu_1 = \mu_2$, so the time profile of equilibrium fiscal offers is not “contaminated” by market-size changes. Furthermore, let us assume that $B$ possesses the market-size advantage in both periods, so the equilibrium under FC is $BB$ (see Figure 2). $B$’s equilibrium tax in period 1 is $\tau_B^{\text{RET}} = \omega \mu_2 - F - V$, as shown above. $B$’s equilibrium tax in period 1 is $\tau_B^{\text{RET}} = \omega \mu_2 - F - V$. Comparing expressions, we can see, first, that $B$’s equilibrium tax in period $t$ is increasing in $\mu_t$, as expected; and second, that with $\mu_1 = \mu_2$, $B$’s equilibrium tax rises over time (presumably because, in period 2, country $B$ is able to take advantage of the fact that the MNE has already sunk investment in a local plant).

[We could also briefly consider the equilibrium time path of taxes in other location configurations. For example, if the equilibrium is $AB$, then $\tau_A^{\text{RET}} = -\omega \mu_1 - \delta F - m_1 V$, whereas $B$’s period-2 tax is $\tau_B^{\text{CAP}} = \omega \mu_2 - F - V$. An issue with this comparison is that we cannot assume $\mu_1 = \mu_2$ because $AB$ doesn’t arise in that case; see Figure 2. To neutralise market-size effects, we could perhaps assume that $\mu_2 = -\mu_1$, which would be consistent with an equilibrium of $AB$.]

Finally, we briefly consider what would happen if we assumed binding commitments in both tax/subsidy-setting and location choice. [Do we want to consider other forms of “commitment”? E.g. initial commitment by the countries to P1 and P2 taxes but not by the MNE to a particular location. In this case, the winning country in P1 will have to make some payment to the MNE in P2; otherwise, it will be “stolen”. How would time-path of taxes compare to that in SPNE?]
Essentially, the assumption of “binding commitments” returns our two-period analysis of fiscal competition to a simpler, one-shot case. The valuations of countries $A$ and $B$ are $(1 + \delta) V$ and $(m_1 + \delta m_2) V$ respectively. The P.D.V. of the MNE’s pre-tax profits is $(1 + \delta)p + (m_1 + \delta m_2)p_F$ in $A$ and $(m_1 + \delta m_2)p + (1 + \delta)p_F$ in $B$.

It follows that $B$ wins the MNE for both periods iff $(V + \omega)(\mu_1 + \delta \mu_2) > 0$. Therefore, with binding commitments, the boundary between $A$’s winning region and $B$’s is given by the downward-sloping inter-regional boundary between $AA$ and $BB$ in Figures 1 and 2.

5. Comparison between LF and FC

Our central result is that, compared to LF, there is greater observed plant mobility between periods 1 and 2 under FC. This is, perhaps, counter-intuitive. To explore this result intuitively, we focus (for ease) on the case where $\mu_2$ is “large”, so the MNE’s period-2 location is always $B$. We now present two intuitive approaches to understanding our central result.

Our first approach begins with the observation that, in period 1, the MNE is able to anticipate period-2 taxes and, specifically, how its period-1 location choice affects its tax burden in period 2. The MNE knows its period-2 location is going to be $B$. Therefore, for given period-1 fiscal offers, the change in its discounted profits if it chooses $A$ rather than $B$ in period 1 is

$$\delta(\tau^\text{RET}_B - \tau^\text{CAP}_B) - \omega \mu_1 - \delta F$$

where $\tau^\text{RET}_B - \tau^\text{CAP}_B = 2F > 0$, so the MNE knows that choosing $A$ in period 1 reduces the period-2 tax that it will pay to $B$ (i.e. it is able to “manipulate” its period-2 tax). In essence, with endogenously determined fiscal inducements, the government of $B$ absorbs some of the MNE’s relocation cost in its tax/subsidy offers. By definition, this “tax advantage” to relocation is not available under LF; hence, the MNE is more willing to relocate under FC.

Our second approach to intuition-building compares the private and social incentives to choose a period-1 location that avoids subsequent relocation. Assume again that the MNE’s period-2 location is going to be $B$. Under LF, choosing $B$ over $A$ in period 1 is privately profitable iff

$$\omega \mu_1 + \delta F > 0$$

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18 Note that because the no-commitment equilibrium under FC is efficient, there will be scope for welfare-enhancing renegotiations whenever the binding-commitment and no-commitment equilibria diverge (i.e. whenever the latter involves relocation between periods).

19 [When we began this research, we felt that plant mobility over time (as anticipated geographical changes unfold) was likely to be lower under FC. This is because, under FC, countries can build future geographical developments (e.g. foreseen market-size growth) into their initial fiscal offers, suggesting only muted reactions over time as geography unfolds. However, this intuition was shown by our modelling to be wrong: the interesting question is, Why?]

20 By moving from $B$ to $A$ in period 1, the MNE foregoes $B$’s period-1 geographic advantage (hence $-\omega \mu_1$), and it will also have to build a second plant (in $B$) in period 2 (hence $-\delta F$).
(By choosing $B$ over $A$ in period 1, the MNE gains $B$’s period-1 geographic advantage [hence $\omega \mu_1$], and it also avoids having to build a second plant [in $B$] in period 2 [hence $\delta F$].)

On the other hand, choosing $B$ over $A$ in period 1 is socially beneficial iff

$$(V + \omega)\mu_1 + \delta F > 0$$

(In contrast to the previous inequality, this one takes account of international differences in the “social benefits” from inward FDI: the $V\mu_1$ term.)

Thus, choosing $B$ over $A$ in period 1 is privately profitable iff $\mu_1 > -\delta F/\omega$ and socially beneficial iff $\mu_1 > -\delta F/(V + \omega)$. (Note that these conditions define vertical inter-regional boundaries in Figures 1 and 2.)

The key point to note is that the latter (“social”) condition is clearly the more demanding. Thus, if avoiding relocation (by choosing $B$ in period 1) is socially beneficial, then it will also be privately profitable in LF. However, it might be privately profitable to avoid relocation when doing so is socially harmful. That is, there will be “too little” relocation from a social-welfare/efficiency point of view under LF. To complete this exercise, we note that, under FC, the location pattern over time maximises social welfare – i.e., effectively, it responds to social (rather than private) incentives. Thus, there is less relocation under LF than under FC.

6. Conclusion

[Incomplete]

Our central result is that plant relocation over time is more likely under period-by-period fiscal competition than under laissez-faire (perhaps contrary to intuition). However, this does not imply that there is “too much” plant mobility under fiscal competition: we have shown that location choices under fiscal competition are efficient. Rather, from an efficiency viewpoint, there is “too little” plant mobility under laissez-faire.

Moreover, within the context of our model, we have confirmed our initial intuition that changes in geography ($\mu_1 \neq \mu_2$) are necessary to explain plant relocation.

References [includes related literature to cite]

Besley and Seabright 1999 Economic Policy on “state aid” (vol. 28, pp. 13-42)

Black and Hoyt (AER, 1989)

Haaland and Wooton (Easy Come, Easy Go)²²

Haufler and Wooton 1999 JPubE

²¹ Note, however, that the private and social preferences between $AA$ and $BB$, neither of which involve relocation over time, coincide: The $AA/BB$ boundary is the same in Figures 1 and 2.

²² Discusses exit costs of firms at end of lifespan of FDI—somewhat related to the fixed cost of relocation, F.
King and Welling (*Economica*, 1992)

King, McAfee and Welling (*CJE*, 1993)

Konrad and Kovenock (*JIE*, 2009)$^{23}$

Padilla, 1995, *JET*

$^{23}$ KK have infinite horizon and no geographical change. Competition for firms that arrive in a flow and live for two periods. No relocation. If no discrimination between firms in tax-setting, a country faces a trade-off: high tax on existing (immobile) firm versus low tax to attract new firm.