Coordination of tax policies toward inward foreign direct investment

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Abstract: We study competition for foreign direct investment (FDI) between host countries and the implications of tax policy coordination between them. By reducing its tax on multinational production, a host country can attract additional FDI, some of which is diverted from other host countries. The shift in FDI causes host wages to rise while wages elsewhere fall. The host country with the lower natural attractiveness for FDI (absent intervention) adopts a smaller tax on multinational production. Coordination between hosts eliminates the FDI diversion effect and leads them to impose a harmonized FDI tax that is larger than their non-cooperative tax levels.

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JEL Classification: F1, F2, L1
1. Introduction

The rise in the importance of multinational firms in world production and the changes in the global policy environment have heightened interest in the impact of foreign direct investment (FDI) on the host and source countries involved. During the period 1990-2012, the global stock of inward FDI increased over a thousand percent from roughly two trillion US dollars to over twenty (UNCTAD, 2013). At the same time, policies toward FDI became relatively more liberal across the world. Many countries – not just developing countries but developed ones too – go further than mere liberalization of their policies and offer tax holidays and other tax concessions to entice multinational firms to establish or expand local production facilities.

The rapidly increasing global stock of FDI raises the question whether countries need to coordinate their policy decisions with respect to FDI. While member countries of the OECD were unable to reach a multilateral agreement on investment during the 1990s, their failed attempt did raise the issue of whether the agenda of the World Trade Organization (WTO) ought to be expanded to allow for negotiations of international investment policies. A potential concern for some countries is whether such international negotiations will result in limits on their ability to attract FDI. Our goal in this paper is to examine the interaction between the FDI policies of rival host countries in order to evaluate the potential rationale for policy coordination.

We begin with the premise that countries that host FDI face limited supplies of skilled labor (or other factors) required for production by multinational firms. While FDI into such countries is often motivated by lower production costs, FDI inflows elevate local wages,
thereby reducing the incentives for further FDI. An inevitable implication of the limited supply of skilled labor is that the FDI policies of any one host country will affect source countries as well as other host countries. For example, FDI attracted into one country by pro-FDI tax policies may be diverted from other potential host countries. Our model captures this potential conflict between rival host countries and sheds light on how policy coordination can avert it.

In our model, FDI occurs to shift production from a single high-wage source country into two low-wage host countries. We complement the existing literature by studying product market interaction between multinationals and local firms in an environment where wages (and hence costs of production) are determined endogenously. Such interaction is worth studying since multinationals are found, by and large, in oligopolistic industries and because the volume of global FDI in today's world is large enough to have significant labor market effects. Indeed, pro-FDI policies are often implemented by governments with the hope of improving the economic conditions facing local workers that are likely to be employed by multinational firms.

We derive the equilibrium where firms from the source country invest in both host countries. All firms freely export to a world market. In addition to wage differentials, FDI is also influenced by policy differences across countries: all else equal, firms shift more production to the host country with the more favorable tax policy. Thus, when choosing its tax on multinational production, each host country recognizes that FDI is diverted to the alternative host country if its own policy becomes more stringent. We derive optimal FDI policies when host countries set their policies in a Nash fashion, finding that the less attractive host sets a lower tax on FDI.
We also examine how FDI policy adjusts when the host countries cooperate in setting their policies and describe the tension inherent in achieving such agreement. Our analysis sheds light on the following types of questions. Does international coordination between host countries result in harmonization of national FDI policies? When investment policies are set cooperatively, are they more lenient or restrictive compared to when they are set in a noncooperative fashion? We find that, when acting jointly, host countries pick a harmonized (i.e. symmetric) FDI tax and that policy cooperation leads them to implement more stringent tax on FDI. Additionally, we find that coordination places a more binding constraint on the policy of the country that is a relatively less attractive host for FDI. This result provides a potential rationale for the concern that an international agreement on FDI policies is likely to limit the freedom of certain countries to attract FDI to a greater extent than others.

Our paper contributes to the literature on tax competition and FDI. Haaland and Wooton (1999) examine competition between countries to attract FDI, where FDI increases employment opportunities and demand for domestic intermediates. Our model does not have any intermediates, so FDI does not generate the scale effects present in their model. Haufler and Wooton (1999) discuss the case of competition between two countries to attract the investment of a single multinational. There the issue is market access - due to transport costs, the larger market is a more attractive location.

Haaparanta (1996) models governments as choosing their FDI policies to maximize the net wage income generated by a multinational’s investment. We generalize the government’s objective function to include both wage income and profits of host firms: while FDI elevates wages, it also depresses host profits.

Using the idea that firms will relocate production to exploit tax or subsidy differentials,
Janeba (1998) finds that *laissez-faire* is the only equilibrium when governments set their policies in a Nash fashion. By contrast, in our model, wages respond to FDI so that production taxes can be positive in equilibrium. Janeba (2000, 2002) studies commitment problems on the side of firms (leading to low subsidies) or governments (leading to dispersion of production). Motta and Norman (1996) find that economic integration may cause countries to offer investment incentives to encourage FDI. Markusen, Morey, and Olewiser (1995) consider competition using pollution tax rates while Martin and Rogers (1995) study infrastructure as a means of encouraging firms to locate in a country.

Overall, empirical evidence appears favorable for the notion that tax policy and wage differences can affect location decisions. For example, Coughlin *et al.* (1991) find that low taxes, extensive transportation infrastructure, and low wages attract FDI – see also Hines (1996), Devereux and Griffith (1998), and Kumar (1998). While Head *et al.* (1995) observe that little investment is induced if locations are otherwise unattractive for Japanese firms, in a follow up paper, Head *et al.* (1999) find that lower taxes and job creation subsidies do influence location decisions, but that state promotional policies tend to offset each other.

2. **Model with Two Host Countries**

Building on Glass and Saggi (1999), we construct a model where firms from a single source country invest in two host countries. In Glass and Saggi (1999) our objective was to analyze how the Dixit and Grossman (1986) critique of strategic trade policy in the presence of multiple oligopolistic industries is affected by the possibility of FDI. A key feature of the common framework underlying the present model and the work on which we build is that several oligopolistic industries require a factor of production that is available in fixed supply.
in each country. Differences in the supply of this factor as well as in market structure across countries create incentives for FDI by giving rise to wage differentials across countries.

The three countries are indexed by \( i, i = 0, 1, 2 \). The first country \( i = 0 \) is the source country, whose firms undertake FDI in two countries 1 and 2. Each country has \( n \) symmetric oligopolistic industries. Since the number of industries plays a minor role in terms of the questions motivating our model we set \( n = 1 \) without loss of generality. The number of firms is equal to \( m_i \) in country \( i \) (with \( M \equiv \sum_{i=0}^{2} m_i \) the total number of firms in the world).

Firms decide whether to produce each unit at home or abroad. To produce a unit of output, a firm needs one unit of skilled labor, the sole factor of production. By shifting some production abroad, source firms can take advantage of cheaper skilled labor in the host country. Suppose that source firms must pay a tax \( \tau_i \) for each unit of output produced in host country \( i \). We allow for the case of subsidies by permitting \( \tau_i < 0 \). The tax or subsidy should be viewed as relative to each host country’s treatment of its local firms: a tax means that multinational production is taxed by more than production of local firms. In this model, a common tax faced by all firms producing in a country translates directly into a lower wage in that country, so only differential taxes matter for FDI and welfare.

A source firm can produce at home at marginal cost \( z_0 \) or in either of the host countries at marginal cost \( z_i + \tau_i \). From the perspective of a source firm, an increase in the tax rate of a host country is equivalent to an increase in the local wage rate. Each firm views the wage in each country as given, and wages are measured in terms of efficiency units of skilled labor. A source firm may split its production across countries in any way it chooses to minimize its costs of production per unit.

Let \( \alpha_i \) denote the extent of FDI in host country \( i \) by firms from the source country. Since
FDI seeks low cost locations, it occurs in only one direction in our model (out of the source country into the host countries). The amount of FDI that occurs into each host country is endogenously determined.

Our formulation of FDI is special in several respects. First, since firms are symmetric in our model, all source firms undertake FDI to the same degree. Second, FDI does not entail any fixed costs in our model. An alternative, and perhaps a more realistic, formulation would be one where FDI requires a fixed cost investment and firms are heterogeneous with respect to productivity (as in Antràs and Helpman, 2004) or some other dimension that determines incentives for FDI. However, the objective of our model is to explore the implications of aggregate product shifting via FDI for welfare and optimal policy and not on firm level characteristics that determine FDI behavior. As a result, we have opted for a tractable formulation of FDI in which firms are symmetric with respect to their FDI decisions. Our approach proves useful for understanding aggregate production shifting across countries and overall FDI responds to changes in national policies. Admittedly, since the model does not include any firm level determinants of FDI, it cannot address the firm-level impact of FDI policies.

We should also note that our model cannot speak to the question of internalization since it does not consider the possibility of source firms licensing their production technologies to independent agents in host countries. An early and influential contribution to the theory of the multinational firm was made by Ethier (1986) who showed that when internalization is explicitly modeled in a general equilibrium framework using an incomplete contracts approach, two-way FDI is more likely to occur when countries have relatively similar factor endowments. Similarly, Ethier and Markusen (1996) provide a novel treatment of internal-
ization in an environment where local agents acquire the knowledge necessary for production and can defect and produce the good themselves thereby generating competition for the parent firm (or the licensor). Building on this insight, Ethier and Markusen (1996) show when and why each of the three modes of serving foreign markets – exporting, licensing, or FDI – arise as equilibrium outcomes.

Since our model abstracts from internalization, we refer to any production undertaken abroad as FDI. An equilibrium where firms undertake FDI in both host countries \(0 < \alpha_i < 1, i = 1, 2\) requires the marginal cost of production to be equalized across countries.

\[
z_0 = z_1 + \tau_1 = z_2 + \tau_2
\]

This condition implies that the host country with the larger tax on multinational production must have the lower wage.

\[
\Delta z \equiv z_1 - z_2 = -(\tau_1 - \tau_2) \equiv -\Delta \tau
\]

Thus, wages differ across host countries according to how much their FDI policies differ.

Firms behave as Cournot oligopolists. The demand function facing the world industry is given by \(P = p(Q)\) where \(p'(Q) < 0\) and \(p''(Q) \leq 0\). Let \(y_i\) denote the output of a firm from country \(i\). Total world output \(Q\) is the sum of the outputs of firms from each country \(Q \equiv \sum_{i=0}^{2} m_i y_i\). Profit of a firm in country \(i\) is \(\pi_i = (p - c_i) y_i\), where \(c_0 = (1 - \alpha_1 - \alpha_2) z_0 + \sum_{i=1}^{2} \alpha_i (z_i + \tau_i)\) for source firms and \(c_i = z_i\) for host firms \(i = 1, 2\) (where \(\alpha_1 + \alpha_2 < 1\) so some production occurs in source country). Profit maximization requires the
first order conditions

\[ p - y_i \psi = c_i, \forall i = 0, 1, 2 \]  (3)

where \( p = p(Q^*) > 0 \) is the price and \( \psi \equiv -p'(Q^*) > 0 \) is the negative of the slope of the demand function at the equilibrium industry output. We argue below that since industry output is fixed by the world skilled labor supply, \( \psi \) can be viewed as a fixed parameter (provided the world skilled labor supply is held constant). Applying the FDI equilibrium conditions to simplify the first order conditions yields

\[ p - y_i \psi = z_i \] as \( c_i = z_i \) for any \( i = 0, 1, 2 \).

The host country with the larger tax on multinational production ends up having the larger output by its host firms.

\[ \Delta y \equiv y_1 - y_2 = \frac{\tau_1 - \tau_2}{\psi} \equiv \frac{\Delta \tau}{\psi} \]  (4)

Thus, in our model, output per firm differs across host countries according to how much their FDI policies differ.

Denote the skilled labor supply (per industry) in country \( i \) by \( k_i \), with \( K \equiv \sum_{i=0}^{2} k_i \) as the world skilled labor supply. In each country, one unit of output is produced using one unit of skilled labor. Since the supply of skilled workers in each country is fixed, wages must adjust to clear labor markets. The demand for skilled labor in the source country is the share of multinational production that remains in the source country. Labor market equilibrium for the source country requires:

\[ (1 - \alpha_1 - \alpha_2) m_0 y_0 = k_0 \]  (5)
Similarly, labor market equilibrium for the two host countries requires skilled labor demand in each host country to equal the fixed skilled labor supply:

\[ \alpha_i m_0 y_0 + m_0 y_i = k_i, \forall i = 1, 2 \]  

(6)

Defining \( Q = \sum_{i=0}^{2} m_i y_i \) as total world output and adding all the skilled labor constraints together yields \( Q = K \). Total world output is determined by the world supply of skilled labor.

As we will show below, the source country must be the country with the smallest skilled labor supply per firm so that FDI does indeed originate from the source country. Label the host countries so that the second host country has the largest skilled labor supply per firm.

\[ \frac{k_0}{m_0} < \frac{k_1}{m_1} \leq \frac{k_2}{m_2} \]  

(7)

We fix the identities of countries as source or hosts based on the role they play in the absence of any policy intervention.

3. FDI Equilibrium

We first establish the properties of the autarky equilibrium (where FDI is not allowed) and the no intervention equilibrium (where taxes are fixed at zero). These properties allow us to characterize countries based on wages in the absence of FDI and extents of FDI in the absence of policy intervention.
3.1. No FDI

If FDI is infeasible, $\alpha_1^a = 0, \alpha_2^a = 0$. An autarky equilibrium then specifies the output of firms from the source country and each host country $\{y_0, y_1, y_2\}$ and the wage in each country $\{z_0, z_1, z_2\}$. Let $\{y_i^a, z_i^a\}$ denote the optimal solution to the three first order conditions (3) and the three labor constraints (5, 6) in the absence of FDI.

The equilibrium without FDI has a simple form. Each firm in each country produces output reflecting the skilled labor supply per firm in that country.

$$y_i^a = \frac{k_i}{m_i}, \forall i = 0, 1, 2$$

As a result, the wage in each country is

$$z_i^a = p - \psi \frac{k_i}{m_i}, \forall i = 0, 1, 2$$

Since the source country must have the smallest skilled labor supply per firm by assumption (7), it has the smallest output per firm and the highest wage in the absence of FDI.

$$y_0^a < y_1^a \leq y_2^a, \ z_2^a < z_1^a \leq z_0^a$$

Because the source country has the highest wage, firms there will want to shift some of their production to the host countries if FDI is permitted. We can now state our first main result:

**Proposition 1** In the absence of FDI, the second host country (which has the largest skilled labor supply per firm) has the largest output per firm and the lowest wage; the source country
(which has the smallest skilled labor supply per firm) has the smallest output per firm and the highest wage; the first host country holds the intermediate values.

3.2. No Intervention

An equilibrium with FDI specifies the output of firms from each country \( \{y_0, y_1, y_2\} \), the wage in each country \( \{z_0, z_1, z_2\} \), and the extent of FDI into each host country \( \{\alpha_1, \alpha_2\} \). Let \( \{y^n_i, z^n_i, \alpha^n_i\} \) denote the solution to the three first order conditions (3), the three labor constraints (5, 6) and the two FDI equilibrium conditions (1). The case without intervention is examined by setting \( \tau_1 = \tau_2 = 0 \). As previously mentioned, since taxes on local firms are set to zero, the no intervention regime can also be viewed as a regime of *national treatment* since it affords multinationals the same treatment as domestic firms.

In the absence of government intervention, the equilibrium extent of FDI from the source country into a host country is

\[
\alpha^n_i = \frac{M}{m_0} \frac{k_i}{K} - \frac{m_i}{m_0} \quad \forall i = 1, 2. \tag{11}
\]

FDI arises due to skilled labor abundance in the host country relative to the rest of the world. The expression for the extent of FDI indicates that each host country must have a skilled labor supply per firm above the world average.

\[
\alpha^n_i > 0 \iff \frac{k_i}{m_i} > \frac{K}{M}, \forall i = 1, 2 \tag{12}
\]

Assume that the skilled labor supply per firm of both host countries is large enough that
FDI does indeed occur into both host countries in the absence of any FDI policy. The first host country has a smaller extent of FDI than the second due to having a smaller skilled labor supply per firm (7).

\[
\alpha_1^n \leq \alpha_2^n \iff \frac{k_1}{m_1} \leq \frac{k_2}{m_2}
\]  

(13)

Thus, we focus on scenarios such that FDI occurs into both hosts, with more going into the second than the first: \(0 < \alpha_1^n \leq \alpha_2^n\).

The extent of FDI into a host country is increasing in its stock of skilled labor supply relative to the world. FDI arises due to skilled labor scarcity being more severe in the source relative to the host country. When a host country’s skilled labor supply rises relative to the world, its wage falls, and a larger extent of inward FDI becomes attractive. The effect of an increase in skilled labor supply elsewhere is the same in magnitude, as well as sign, regardless of whether the skilled labor supply expands in the source or rival host country (as either reduces the host’s skilled labor supply relative to the world).

The equilibrium extent of FDI into a host country decreases with the number of local firms. A larger number of local firms in a host country generates more demand for skilled labor. As a result, the host wage increases relative to the source wage, and the extent of FDI declines. For analogous reasons, the equilibrium extent of FDI into a host country increases with the number of firms in the source or rival host country. Again (as with skilled labor supply), the magnitude of response is the same regardless of whether the number of firms rises in the source or the rival host country.

An interesting aspect of the analysis of FDI with multiple host countries is that bilateral autarky wage predictions do not necessarily predict FDI patterns. The autarky wage in the
first host country is lower than in the source country $z_1^a < z_0^a$ because the first host country must have a larger skilled labor supply per firm than the host country $k_1/m_1 > k_0/m_0$ by (9). However, FDI occurs from the source country into the first host country $\alpha_1^n > 0$ if and only if the first host country has a larger skilled labor supply per firm than the world $k_1/m_1 > K/M$ by (11), which is a stricter condition. FDI into the second host country can eliminate the potential cost savings for the first host country, erasing the potential for FDI inflows. Wages between the first host country and the source need to be compared allowing for FDI from the source into the second host country to predict whether FDI would indeed occur from the source into the first host country.

Define $\delta_i \equiv k_i/k_0$ as the skilled labor supply of host country $i$ relative to the source country. The expression for the extent of FDI (11) provides the boundary for FDI to occur into the first host country $\alpha_1^n > 0$

$$\delta_2 < -1 + \left( \frac{M}{m_1} - 1 \right) \delta_1$$

(14)

and the boundary condition for FDI to occur into the second host country $\alpha_2^n > 0$

$$\delta_2 > \frac{1}{\frac{M}{m_2} - 1} (1 + \delta_1)$$

(15)

For $m_0 = m_1 = m_2 = 1$ in the area $\delta_2 < -1 + 2\delta_1$ and $\delta_2 > \frac{1}{2}(1 + \delta_1)$ firms from the source country invest in both host countries ($\alpha_1^n > 0$ and $\alpha_2^n > 0$). Focus attention on this region, in which the skilled labor supply in each host country is large relative to the source country.

In the absence of government intervention (the case of national treatment), wages in all
countries are equalized due to FDI:

$$z_i^n = z^n = p - \psi \frac{K}{M}, \forall i = 0, 1, 2$$  \hspace{1cm} (16)$$

The wage in any country increases with an increase in the number of firms in any country. A greater number of firms generates greater skilled labor demand, which elevates the wage.

The output of each firm reflects the average skilled labor supply per firm in the world

$$y_i^n = y^n = \frac{K}{M}, \forall i = 0, 1, 2$$  \hspace{1cm} (17)$$

The output of any firm decreases with an increase in the number of firms in any country, as the constant total output must be split across a larger number of firms.

**Proposition 2** Under national treatment (no intervention by governments), the extent of FDI into country i ($\alpha_i^n$) increases in its skilled labor supply relative to the world ($k_i/K$) whereas it decreases in the number of local firms relative to the world ($m_i/M$). The wage in any country decreases while the output of each firm increases with an increase in the total skilled labor supply per firm ($K/M$) in the world.

### 3.3. Intervention

We now permit government intervention by allowing the host taxes on multinational production $\tau_1$ and $\tau_2$ to differ from zero. The equilibrium extents of FDI into the two host countries are

$$\alpha_i^* = \frac{\psi (Mk_i - m_iK) - (m_0 + m_j) m_i\tau_i + m_1m_2\tau_j}{m_0 (\psi K - m_1\tau_1 - m_2\tau_2)}$$  \hspace{1cm} (18)$$
We state our effects for the first host country – the effects for the second host country are analogous. Increasing the tax (or decreasing the subsidy) on multinational production in the first host country reduces inward FDI into its market while it simultaneously increases FDI into the second host country.

Define global FDI as the sum $\alpha_H^* = \alpha_1^* + \alpha_2^*$. An increase in host country $i$’s tax rate not only reduces global FDI, it also diverts FDI to the rival host country. The extent to which global FDI $\alpha_H^*$ falls is the \textit{FDI reduction effect} ($|\partial \alpha_H^* / \partial \tau_i|$) while the extent to which the composition of FDI shifts toward $\alpha_j^*$ is the \textit{FDI diversion effect} ($|\partial \alpha_j^* / \partial \tau_i|$).

Equilibrium wages in the source country equal

$$z_0 = p - \frac{\psi K}{M} + \frac{m_1 \tau_1 + m_2 \tau_2}{M} \quad (19)$$

and in the host countries ($\forall i, j = 1, 2, i \neq j$) equal

$$z_i^* = p - \frac{\psi K}{M} + \frac{m_j \tau_j - (m_0 + m_j) \tau_i}{M} \quad (20)$$

Observe that an increase in the tax on multinational production in the first host country lowers wages there and raises wages in the other two countries.

Lastly, equilibrium output of a source firm is

$$y_0^* = \frac{K}{M} - \frac{m_1 \tau_1 + m_2 \tau_2}{M \psi} \quad (21)$$
and of a host firm from host country $i$ is ($\forall i, j = 1, 2, i \neq j$)

$$y_i^* = \frac{K}{M} - \frac{m_j \tau_j - (m_0 + m_j) \tau_i}{M \psi}.$$  \hspace{1cm} (22)

An increase in the tax on multinational production in the first host country raises the output of local firms in the first host country but reduces the output of multinationals from the source country and of local firms in the rival host country. Output of local firms in the rival host country contracts because FDI is diverted there from the first host country, thus absorbing scarce resources that would otherwise be available for production.

**Proposition 3** An increase in the tax on multinational production in a host country has the following effects. It (i) deters FDI into that country; (ii) diverts some FDI to the other host country (FDI diversion effect); (iii) lowers total FDI in the world economy (FDI reduction effect); (iv) lowers local wages while it increases them elsewhere; and (v) increases profits of local firms at the expense of foreign firms.

4. FDI Policies

Having studied how the FDI equilibrium depends on taxes on multinational production, we are now ready to address how host countries set their policies toward FDI. What determines whether host countries encourage or discourage multinational production? And how does the policy chosen by one host depend on that of the other host? The interaction between host policies is an important issue since at present there exists no multilateral agreement within the auspices of the WTO that directly constrains the investment policies of individual countries.
4.1. Welfare

Define source welfare as the sum of profit and skilled labor earnings

\[ W_0 = \beta \left( \sum_{i=1}^{2} m_i \pi_i \right) + m_0 \pi_0 + z_0 k_0 \]  \hspace{1cm} (23)

where \( 0 \leq \beta \leq 1 \) is source country ownership share of host firms. We assume that source firms are fully owned within the source country for simplicity.

Also, define host welfare as the sum of profit and skilled labor earnings plus any revenue from taxing multinational production

\[ W_i = (1 - \beta) m_i \pi_i + z_i k_i + T_i \]  \hspace{1cm} (24)

where tax revenues are \( T_i = \tau_i \alpha_i m_0 y_0 \). The weights on host profits can also be given a political economy interpretation (instead of or in addition to cross-ownership). Host governments may care more about host skilled labor earnings if workers are better organized into lobbying groups, or if workers are poor enough (relative to owners of host firms) that their marginal utility of income is distinctly higher. To keep expressions simple, we now set the number of firms per industry in each country to one: \( m_0 = m_1 = m_2 = 1 \).

4.2. Policy competition

First, plug the equilibrium values of FDI (18), wages (19, 20), and output (21, 22) into host welfare (24) to determine welfare as a function of the policy variables and other exogenous parameters. Solving \( \partial W_i / \partial \tau_i = 0 \) for the reaction functions stating one host
country’s tax $\tau_i$ in terms of the other host country’s tax $\tau_j$ ($\forall i, j = 1, 2, i \neq j$) yields:

$$\tau_i(\tau_j) = -\frac{1}{4} \left[ \psi \left( K (4\beta - 1) - 3k_i \right) - \tau_j (4\beta - 1) \right] \frac{1}{1 + 2\beta}$$  \hspace{1cm} (25)$$

Provided that the source ownership of host firms is sufficiently large $\beta > 1/4$, each host country’s tax increases with the tax of the other host country: the policy reaction functions are upward sloping (the tax policies of the two hosts are strategic complements in our model).

$$\frac{\partial \tau_i}{\partial \tau_j} = \frac{1}{4} \left( \frac{4\beta - 1}{1 + 2\beta} \right) > 0 \iff \beta > \frac{1}{4}$$  \hspace{1cm} (26)$$

The intersection of the two policy reaction functions gives the equilibrium taxes on multinational production (or subsidies if $\tau_i^* < 0$):

$$\tau_i^* = \left[ \frac{1 + 5\delta_i - 4\beta \left[ (4\beta - \delta_i) + (\delta_1 + \delta_2) (1 - 4\beta) \right]}{16\beta^2 + 24\beta + 5} \right] k_0 \psi$$  \hspace{1cm} (27)$$

where $i = 1, 2$. The first host country adopts the smaller tax on multinational production as it has the smaller skilled labor supply per firm and hence the smaller extent of FDI in the absence of intervention.

$$\Delta \tau^* \equiv \tau_1^* - \tau_2^* = - (\delta_2 - \delta_1) \left( \frac{k_0 \psi}{1 + 4\beta} \right) < 0$$  \hspace{1cm} (28)$$

The smaller host country has the higher wage in the absence of intervention. Hence it offers a smaller tax (or larger subsidy) than the larger host country in order to adjust for its lesser attractiveness to source firms.
Inserting the taxes (27) into the extents of FDI (18) yields

\[ \alpha_i^* = \left( \frac{2}{1 + 4\beta} \right) \left[ \frac{2\beta k_i (5 + 4\beta)}{k_0 + 4\beta K} - 1 \right] \]  

(29)

More favorable host countries, those with larger skilled labor supplies, do host more FDI even after the difference in tax rates has been taken into account:

\[ \Delta \alpha^* \equiv \alpha_1^* - \alpha_2^* = - \left( \frac{4\beta}{1 + 4\beta} \right) \left( \frac{5 + 4\beta}{k_0 + 4\beta K} \right) (k_2 - k_1) < 0 \]  

(30)

Each country taxes multinational production if the source ownership share of host firms is sufficiently small.

\[ \tau_i^* > 0 \iff \beta < \bar{\beta}_i^* = \frac{1}{4} \left( 1 + \delta_j + 4\delta_i \right) \left( \frac{1 + \delta_1 + 4\delta_i}{1 + \delta_1 + 4\delta_2} \right) \]  

(31)

The expression for the equilibrium taxes (27) provides the boundary for the first host country to tax multinational production \( \tau_1^* > 0 \)

\[ \delta_2 < - \frac{1}{4\beta} \left[ 1 + \left( \frac{8\beta (2\beta - 1) + 5}{4\beta - 1} \right) \delta_1 \right] \]  

(32)

and the boundary for the second host country to tax multinational production \( \tau_2^* > 0 \)

\[ \delta_2 > - \left( \frac{4\beta - 1}{16\beta^2 - 8\beta - 5} \right) \left[ 1 + 4\beta + 4\beta \delta_1 \right] \]  

(33)

In this region where the skilled labor supplies in both host countries are sufficiently small, both host countries tax multinational production (\( \tau_1^* > 0 \) and \( \tau_2^* > 0 \)). The equilibrium tax
(27) increases in a host country’s share of the world skilled labor supply.

**Proposition 4** In equilibrium, the first host country (which has the smaller supply of skilled labor per firm and is thus the less attractive host) imposes a relatively lower tax on multinational production.

4.3. Cooperation

Now we consider policy when the two hosts cooperate while setting their FDI policies. Define \( W_H = W_1 + W_2 \) as the sum of welfare across the two host countries. Then, solving \( dW_H/d\tau_i = 0 \) (\( \forall i, j = 1, 2, i \neq j \)) yields:

\[
\tau_i(\tau_j) = \frac{\psi((1 - \beta)K - \frac{3}{2}k_0) + \tau_j(4\beta - 1)}{1 + 5\beta} \tag{34}
\]

Again, the two policies are complementary provided that source ownership of host firms is large enough. Even under cooperation, an increase in the tax rate in one country leads to an increase in the tax rate in the other country:

\[
\frac{\partial \tau_i}{\partial \tau_j} = \frac{4\beta - 1}{1 + 5\beta} > 0 \iff \beta > \frac{1}{4} \tag{35}
\]

Finally, using the first order conditions in (34) it is straightforward to show that policy coordination induces the host countries to implement a harmonized (i.e. common) tax policy with respect to FDI:

\[
\tau^t = \frac{1}{2} \left( \frac{k_0\psi}{2 + \beta} \right) \left[ 1 + 2(1 - \beta)(\delta_1 + \delta_2 - 1) \right] > 0 \tag{36}
\]
The coordinated FDI policy is always a tax, regardless of the source ownership share of host firms $\beta$. Unequal taxes across the two hosts would lead to unequal wages across host countries and raising the tax in the high wage location while lowering it in the other location would raise the joint welfare of the two host countries. As a result, harmonization of tax policies emerges endogenously in our model despite the fact that the two host countries are asymmetric in terms of market structure and supplies of skilled labor.

Inserting the taxes in (36) into the extents of FDI in (18) yields

$$\alpha'_i \equiv \frac{(1 + \beta) k_i - k_0/2 - k_j}{k_0 + \beta K}$$  \hspace{1cm} (37)

Cooperative taxes are non-prohibitive if source ownership of host firms is sufficiently large

$$\alpha'_i > 0 \iff \beta > \beta_i \equiv \frac{1 + 2(\delta_j - \delta_i)}{2\delta_i}$$  \hspace{1cm} (38)

If cooperative taxes are non-prohibitive, then the noncooperative taxes will be non-prohibitive as well (because cooperative taxes are larger). As under non-cooperation, the larger host country still attracts more FDI

$$\Delta \alpha' \equiv \alpha'_1 - \alpha'_2 = -\left(\frac{2 + \beta}{k_0 + \beta K}\right)(k_2 - k_1) < 0$$  \hspace{1cm} (39)

Since tax policies are set equal across host countries, the country that is naturally the better host is revealed as such when policies are set cooperatively.

Comparing the cooperative tax policy in (36) to noncooperative ones in (27) shows that both host countries tax multinational production more severely when cooperating relative
when they act non-cooperatively. This higher taxation arises because a host country does not suffer as large a reduction in its tax base of multinational production when raising its tax if the other host country follows suit by raising its tax as well. The \textit{coordinated elevation of taxes removes the FDI diversion effect} that arises under non-cooperatively chosen tax policies.

While generally viewed as a means of promoting unfettered investment, an implication of our model is that multilateral investment agreements involve inherent pressures toward \textit{larger} investment taxes in host countries. Consequently, it may be necessary to require participating host countries to reduce their degree of discriminatory treatment (relative to local firms) in order to protect the interests of potential source countries by ensuring that investment policies become less restrictive. However, such conditions make agreements harder to reach. Also, under cooperative taxes, either host country will have an incentive to offer hidden incentives, which must be punished for the negotiated FDI policy to survive.

\textbf{Proposition 5} \textit{When host countries coordinate their tax policies to maximize joint welfare, they set a harmonized tax on multinational production. Furthermore, the harmonized tax is higher than their non-cooperatively chosen taxes.}

\section{5. Conclusion}

This paper constructs a three country model to gain insight into cross-country repercussions of FDI policies chosen by individual host countries. In a scenario of two host countries and one source country, we demonstrate that the host country that offers the smaller tax on multinational production is the one with the smaller skilled labor supply per firm. This host
country has a higher wage in the absence of FDI and hence a smaller extent of FDI when FDI is permitted (but intervention is not). A host country imposes a smaller tax on multinational production the smaller its skilled labor supply relative to the world or the larger its number of firms as a share of the world. In this sense, differences in taxes on multinational production make up for less natural attractiveness for FDI: countries offer lower taxes (or even subsidies) to restore the balance when greater cost savings are available by producing elsewhere.

While we state our results mostly in terms of taxes on multinational production, they apply as well to subsidies. Suppose China subsidizes multinational production as a strategy for encouraging multinational firms to locate production facilities there. As a consequence, FDI would indeed be attracted to China. Some of the FDI into China would be diverted from alternative host countries such as, say, Malaysia. But the overall level of FDI in the world would rise. Furthermore, Chinese wages would rise at the expense of wages elsewhere.

We also consider the possible implications of attempts to negotiate a common policy toward FDI across host countries. We show that a negotiated agreement enables host countries to commit to larger FDI taxes by eliminating the FDI diversion effect. Furthermore, in our model, coordination among hosts induces them to implement a harmonized tax rate on FDI. However, we highlight an inherent enforcement problem in these negotiated agreements, as both host countries have an incentive to cheat on the agreement by offering hidden perks to attract multinational production.

If the two host countries are viewed as representing two groups of host countries, the coordination scenario could represent a multilateral investment agreement including all major host countries. The agreement would shift investment policies toward higher taxes (or
lower subsidies) by internalizing the FDI diversion effect of non-cooperative national policies toward FDI. While we do not claim to have fully captured all the features of such an agreement, our model does show that there may be need for a mechanism that restrains favorable national tax policies toward FDI that emerge in an non-cooperative environment.

A Appendix

A1. Proof of Proposition 1

The ordering of outputs and wages (10) follows immediately from the expressions for outputs (8) and wages (9), using the ordering of skilled labor supplies per firm (7).

A2. Proof of Proposition 2

Define \( k_0 \equiv (1 - \eta) (1 - \kappa) K, k_1 = \kappa K, \) and \( k_2 = \eta (1 - \kappa) K, \) where \( \kappa \equiv k_1/K \) denotes the first host country’s share of the world skilled labor supply. Also define \( m_0 \equiv (1 - \nu) (1 - \mu) M, m_1 = \mu M, \) and \( m_2 = \nu (1 - \mu) M, \) where \( \mu \equiv m_1/M \) denotes the first host country’s share of the firms in the world. An increase in the first host county’s skilled labor supply relative to the world increases the extent of FDI into the first host country and decreases the extent of FDI into the second host country:

\[
\frac{\partial \alpha_1}{\partial \kappa} = \frac{1}{(1 - \nu) (1 - \mu)} > 0, \quad \frac{\partial \alpha_2}{\partial \kappa} = -\frac{\eta}{(1 - \nu) (1 - \mu)} < 0.
\]

An increase in the first host country’s number of firms relative to the world decreases the extent of FDI into the first host country and increases the extent of FDI into the second
host country:

\[ \frac{\partial \alpha_1}{\partial \mu} = -\frac{1 - \kappa}{(1 - \nu)(1 - \mu)^2} < 0, \quad \frac{\partial \alpha_2}{\partial \mu} = \frac{\eta (1 - \kappa)}{(1 - \nu)(1 - \mu)^2} > 0 \]

The results involving wages and outputs are obvious from the stated equilibrium expressions.

A3. Proof of Proposition 3

A tax on multinational production in one host country deters FDI to that country and diverts FDI to the rival host country (\( \forall i, j = 1, 2, i \neq j \)).

\[ \frac{\partial \alpha_i}{\partial \tau_i} = -\frac{m_i M [\psi (k_0 + k_j) - m_j \tau_j]}{m_0 (\psi K - m_1 \tau_1 - m_2 \tau_2)^2} < 0 \]

\[ \frac{\partial \alpha_j}{\partial \tau_i} = \frac{m_i M [\psi k_j - m_j \tau_j]}{m_0 (\psi K - m_1 \tau_1 - m_2 \tau_2)^2} > 0 \]

\[ \frac{\partial \alpha_H}{\partial \tau_i} = -\frac{m_i M \psi k_0}{m_0 (\psi K - m_1 \tau_1 - m_2 \tau_2)^2} < 0 \]

By the definition of total FDI, the effect on the extent of FDI in the host country is the sum of the FDI destruction effect and the FDI diversion effect.

\[ \frac{\partial \alpha_i}{\partial \tau_i} = \frac{\partial \alpha_H}{\partial \tau_i} - \frac{\partial \alpha_j}{\partial \tau_i} = \left| \frac{\partial \alpha_H}{\partial \tau_i} \right| + \left| \frac{\partial \alpha_j}{\partial \tau_i} \right| \]

Wages fall in the host country and rise elsewhere.

\[ \frac{\partial z_i}{\partial \tau_i} = -\frac{m_0 + m_j}{M} < 0, \quad \frac{\partial z_0}{\partial \tau_i} = \frac{\partial z_j}{\partial \tau_i} = \frac{m_i}{M} > 0 \]
Output of local firms in the host country rises while output of other firms falls.

\[
\frac{\partial y_i}{\partial \tau_i} = \frac{m_0 + m_j}{M\psi} > 0, \quad \frac{\partial y_0}{\partial \tau_i} = \frac{\partial y_j}{\partial \tau_i} = -\frac{m_i}{M\psi} < 0
\]

Profits of local firms in the host county rise while profits of other firms fall.

\[
\frac{\partial \pi_i}{\partial \tau_i} = 2 \left( \frac{m_0 + m_j}{M^2\psi} \right) \left[ K\psi - t_jm_j + t_i (m_0 + m_j) \right] > 0
\]

\[
\frac{\partial \pi_j}{\partial \tau_i} = -2 \left( \frac{m_i}{M^2\psi} \right) \left[ K\psi - t_i m_i + t_j (m_0 + m_j) \right] < 0
\]

\[
\frac{\partial \pi_0}{\partial \tau_i} = -2 \left( \frac{m_i}{M^2\psi} \right) \left[ K\psi - t_i m_i - t_j m_j \right] < 0
\]

A4. Proof of Proposition 4

Equation (28) follows directly from equation (27) for \( i = 1, 2 \). An increase in the first host county’s skilled labor supply relative to the world increases the first host country’s and decreases the second host country’s tax on multinational production.

\[
\frac{\partial \tau_1}{\partial \kappa} = \frac{4 (1 + \beta) + 4\beta (1 - \eta) + \eta}{(4\beta + 5) (1 + 4\beta)} > 0
\]

\[
\frac{\partial \tau_2}{\partial \kappa} = -\frac{1 + 4\eta (1 + 2\beta) - 4\beta}{(4\beta + 5) (1 + 4\beta)} < 0
\]

This last inequality is assured as \( m_i = 1 \ \forall i \) and \( k_2 > k_0 \) from (7) imply \( \eta > 1/2 \), and \( \beta \leq 1 \).
A5. Proof of Proposition 5

See the expression for the cooperative policy (36) and calculate the difference between the cooperative and noncooperative taxes.

\[
\tau^*_t - \tau^*_1 = \frac{2(5 + 4\beta)(k_2 - k_1) + 4N_1 + 5N_2}{(2 + \beta)(5 + 4\beta)(1 + 4\beta)} > 0
\]

where \( N_i = -k_0 - 4\beta(k_0 + k_j - k_i) + 2\beta k_i (1 + 4\beta) > 0 \) by \( \alpha_i > 0 \). Insert \( \tau^*_2 \) into \( W_1 \) and show that \( \partial W_1 / \partial \tau_1 \mid_{\tau_2^*} = 0 \) implies that the first host country wants a smaller tax than \( \tau^*_1 \) given that the second host country has chosen \( \tau^*_2 \)

\[
\tau^*_t - \tau_1 = \frac{3}{8} \left[ \frac{2(k_2 - k_1)(1 + 2\beta) + 2\beta k_1 + 3k_0}{(2 + \beta)(1 + 2\beta)} \right] > 0
\]
References


