

Coordinating FDI Policies Among Host Countries

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Abstract

We study competition for foreign direct investment (FDI) between host countries versus policy coordination. 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 smaller labor supply per firm, and hence the lower natural attractiveness for FDI absent intervention, adopts a smaller tax on multinational production. The host countries can implement larger taxes by coordinating their policies to eliminate the FDI diversion effect.

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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. On average, policies toward FDI have been liberalized across the world. Many countries have gone further than mere liberalization

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of their policies and now offer tax holidays and other tax concessions to entice multinational firms to establish or expand local production facilities.

The increasing importance of FDI has raised the question of whether countries need to coordinate their policy decisions with respect to FDI. While the OECD failed to reach a multilateral agreement on investment, the attempt did raise the issue of whether the WTO's agenda ought to be expanded to allow for negotiations of international investment policies. However, developing countries remain concerned that 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 wages in the host country, thereby reducing the incentives for further FDI. An inevitable implication of the limited supply of 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 may be *diverted* from other potential host countries. Our model captures this potential conflict between rival host countries and how policy coordination can avert it.

In our model, FDI occurs to shift production from a high-cost source country into two low-cost host countries. We complement the existing liter-

ature by shedding light on the 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.

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 policy. Thus, when choosing its tax on multinational production, each host country recognizes that FDI will be diverted to the alternative host country as its policy becomes more stringent. We derive optimal FDI policies when the countries set their policies in a Nash fashion, finding that the more attractive host sets a larger tax on FDI.

We also examine how FDI policy adjusts when the host countries cooperate in setting their policies and describe the tensions between host countries inherent in achieving such agreement. Our analysis sheds light on the following types of questions. Does coordination reduce differences in FDI policies? We find that host countries will jointly pick symmetric FDI policies? When investment policies are set cooperatively, are they more lenient or restrictive compared to when they are set in a noncooperative fashion? Comparing the two outcomes indicates that policy cooperation would lead to more restrictive FDI policies being adopted by host countries. Additionally, we find that, under coordination, countries that are

less attractive to FDI face more severe restrictions on their policies than other countries.

Our paper contributes to the literature on tax competition and FDI. For example, 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. Hauffer 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. 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. Martin and Rogers (1995) study infrastructure as a means of encouraging firms to locate in a country.

Finally, in terms of data, Coughlin *et al.* (1991) find that low taxes, extensive transportation infrastructure, and low wages attract FDI. Wheeler and Mody (1992) find little empirical evidence that short-run incentives influenced the location decisions of U.S. multinationals in the 1980s. Head *et al.* (1995) also observe that little investment is induced if locations are otherwise unattractive for Japanese firms. 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. Hines (1996) distinguishes between source countries that grant foreign tax credits and those who do not. Devereux and Griffith (1998) distinguish between choosing locations within a region and those that are further removed. Kumar (1998) distinguishes between producing for the home versus third country markets. These three studies all find qualified support. Recent work by Desai *et al.* (2002) finds that higher tax rates lead to less FDI, controlling for observable traits of firms and countries. Overall, the empirical evidence appears favorable for the notion that tax policy and wage differences can affect location decisions.

2. Model with Two Host Countries

We construct a model where firms from one source country invest in two host countries. The three countries are indexed by i , $i = 0, 1, 2$. The first country $i = 0$ is a source country, whose firms undertake FDI in two host countries $i = 1, 2$. Each country has n symmetric oligopolistic industries. The number of industries plays an insignificant role so 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 labor, the sole factor of production. By shifting some production abroad, source firms can take advantage of cheaper labor in the host country. Let α_i denote the extent of FDI in host country i by firms from the source country. Figure 1 illustrates the FDI flows considered in this scenario. Since FDI seeks low cost locations and thus occurs in only one direction (out of the source country into the host countries). The amount of FDI that occurs into each host country is endogenously determined.

We consider the role taxes or subsidies imposed by host countries on multinational production play in altering the incentives for FDI. Profit taxes would act in a similar manner to our results for production taxes. Suppose that source firms must pay a tax τ_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 the host country's treatment of their own local firms: a tax means that multinational production is taxed by more than production by local firms. In this model, any common tax faced by all firms producing in a country translates directly into a lower wage, so only differential taxes matter for FDI and a country's 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, the output tax is equivalent to an increase in the wage in that host country. Each firm views the wage in each country as given, and wages are measured in terms of efficiency units of labor (wage paid for the amount of labor needed to produce one unit of output). A source firm may split its production across countries in any way it chooses to minimize its costs of production per unit. An equilibrium with FDI into both host countries ($0 < \alpha_i < 1$, $i = 1, 2$) requires the marginal cost of production to be equalized across countries.

$$z_0 = z_1 + \tau_1 = z_2 + \tau_2 \quad (1)$$

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

$$\Delta z \equiv z_1 - z_2 = -(\tau_1 - \tau_2) \equiv -\Delta\tau \quad (2)$$

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

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

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 industry output is fixed by the world labor supply, so ψ can be viewed as a fixed parameter (provided the world 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 will have the larger output by its host firms.

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

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

Denote the labor supply (per industry) in country i by k_i , with $K \equiv \sum_{i=0}^2 k_i$ as the world labor supply. In each country, one unit of output

is produced using one unit of labor. Since a fixed supply of workers are available in each country, wages must adjust to clear the labor markets. The demand for 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:

$$(1 - \alpha_1 - \alpha_2) m_0 y_0 = k_0 \quad (5)$$

Similarly, labor market equilibrium for the two host countries requires labor demand in each host country to equal the fixed labor supply:

$$\alpha_i m_0 y_0 + m_0 y_i = k_i, \forall i = 1, 2 \quad (6)$$

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

As we will show below, the source country must be the country with the *smallest 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 labor supply per firm.

$$\frac{k_0}{m_0} < \frac{k_1}{m_1} \leq \frac{k_2}{m_2} \quad (7)$$

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 labor supply per firm in that country.

$$y_i^a = \frac{k_i}{m_i}, \forall i = 0, 1, 2 \quad (8)$$

As a result, the wage in each country is

$$z_i^a = p - \psi \frac{k_i}{m_i}, \forall i = 0, 1, 2 \quad (9)$$

Since the source country must have the smallest labor supply per firm by assumption (7), it has the smallest output per firm and the highest wage

in the absence of FDI.

$$y_0^a < y_1^a \leq y_2^a, z_2^a < z_1^a \leq z_0^a \quad (10)$$

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. Proofs of propositions appear in the Appendix.

Proposition 1 *In the absence of FDI, the second host country (which has the largest labor supply per firm) has the largest output per firm and the lowest wage; the source country (which has the smallest 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 $\{y_i^n, z_i^n, \alpha_i^n\}$ denote the optimal 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 imposing that the taxes are zero $\tau_1 = \tau_2 = 0$. As previously mentioned, no intervention can also be viewed as national treatment, treating multinationals the same as host firms.

In the absence of government intervention, the equilibrium extent of

FDI from the source country into a host country is

$$\alpha_i^n = \frac{M}{m_0} \frac{k_i}{K} - \frac{m_i}{m_0}, \forall i = 1, 2. \quad (11)$$

FDI arises due to 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 labor supply per firm above the world average.

$$\alpha_i^n > 0 \iff \frac{k_i}{m_i} > \frac{K}{M}, \forall i = 1, 2 \quad (12)$$

Assume that the 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 labor supply per firm (7).

$$\alpha_1^n \leq \alpha_2^n \iff \frac{k_1}{m_1} \leq \frac{k_2}{m_2} \quad (13)$$

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 larger the larger the labor supply in the host country relative to the world. FDI arises due to labor scarcity being more severe in the source relative to the host country. When a host country's 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 labor supply elsewhere is the same in magnitude, as well as sign, regardless of whether the labor supply expands in the source or rival host country (as either reduces the host's labor supply relative to the world).

The equilibrium extent of FDI into a host country is larger the smaller the number of firms in the host country. A smaller number of firms in a host country generates a smaller demand for labor. As a result, the host wage falls relative to the source wage, and a greater extent of FDI emerges. The equilibrium extent of FDI into a host country is larger the larger the number of firms in the source or rival host country. Again (as with 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 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 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 labor supply of host country i relative to the source country. Figure 2 illustrates the FDI patterns in (δ_1, δ_2) space. From

the expression for the extent of FDI (11), the line **D1** depicts the boundary for FDI to occur into the first host country $\alpha_1^n > 0$

$$\delta_2 < -1 + \left(\frac{M}{m_1} - 1 \right) \delta_1 \quad (14)$$

and the line **D2** depicts the boundary for FDI to occur into the second host country $\alpha_2^n > 0$ ¹

$$\delta_2 > \frac{1}{\frac{M}{m_2} - 1} (1 + \delta_1) \quad (15)$$

In the area above **D2** and below **D1**, firms from both source countries invest in the host country ($\alpha_1^n > 0$ and $\alpha_2^n > 0$). Focus attention on this region, in which the labor supply in each host country is large relative to the source country.

In the absence of government intervention, wages in all countries equal

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

FDI achieves wage equalization across countries. The wage in any country increases with an increase in the number of firms in any country. A greater number of firms generates greater labor demand, which elevates the wage.

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

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

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 *The extent of FDI into a host country increases in the labor supply of the host country relative to the world and decreases in the number of firms in the host country relative to the world. The wage in any country decreases and the output of a firm in any country increases with a larger world labor supply per firm.*

3.3. Intervention

We now permit government intervention by allowing the host taxes on multinational production τ_1 and τ_2 to differ from zero. The equilibrium extents of FDI into the two host countries are

$$\alpha_i^* = \frac{\psi(Mk_i - m_iK) - (m_0 + m_j)m_i\tau_i + m_1m_2\tau_j}{m_0(\psi K - m_1\tau_1 - m_2\tau_2)} \quad (18)$$

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 decreases the extent of FDI into the first host country and *increases* the extent of FDI into the second host country. The level of FDI that would choke off FDI into a host country depends on the taxes of other host countries. The extent of FDI into a host country depends on not just its own tax, but also on the taxes of other host countries.

Define total FDI as the sum $\alpha_H^* \equiv \alpha_1^* + \alpha_2^*$. While the tax contracts total FDI, part of the decreased FDI into the first host country is diverted into the second host country rather than production being shifted back to

the source country. The extent that total FDI α_H^* falls is the *FDI reduction effect* ($|\partial\alpha_H^*/\partial\tau_i|$). The extent that the composition of FDI shifts toward α_j^* is the *FDI diversion effect* ($|\partial\alpha_j^*/\partial\tau_i|$). The effect of increasing the tax on the extent of FDI into the host country ($\partial\alpha_i^*/\partial\tau_i$) is the sum of the FDI reduction and diversion effects.

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

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

An increase in the tax on multinational production in the first host country lowers wages there and raises wages in the source country and the rival host country.

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 ($\forall i, j = 1, 2, i \neq j$)

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

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 one host country deters FDI to that country and diverts some FDI to other host countries (FDI diversion effect), with a decline in total FDI (FDI reduction effect). Wages fall in the host country and rise elsewhere. Output and profits of local firms in the host country rises while output and profits of other firms falls.*

4. FDI Policy

Having found how the FDI equilibrium depends on taxes on multinational production, now we are ready to address how host countries set their policy toward FDI. What determines whether host countries encourage or discourage multinational production? And how does the policy chosen by one host country affect that chosen by another? 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 labor earnings

$$W_0 = \beta \left(\sum_{i=1}^2 m_i \pi_i \right) + m_0 \pi_0 + z_0 k_0 \quad (23)$$

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 labor earnings plus any revenue from taxing multinational production

$$W_i = (1 - \beta) m_i \pi_i + z_i k_i + T_i \quad (24)$$

where tax revenues are $T_i = \tau_i \alpha_i m_0 y_0$. The weights on host profit can also be given a political economy interpretation (instead of or in addition to cross-ownership). Host governments may care more about host 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. *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 τ_i in terms of the other host country's tax τ_j ($\forall i, j = 1, 2, i \neq j$) yields:

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

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.

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

Figure 3 graphs the policy reaction functions (25) for the two host countries.

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

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

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

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

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

$$\alpha_i^* \equiv \left(\frac{2}{1 + 4\beta} \right) \left[\frac{2\beta k_i (5 + 4\beta)}{k_0 + 4\beta K} - 1 \right] \quad (29)$$

More favorable host countries, those with larger labor supplies, do host more FDI even when difference in tax rates are taken into account:

$$\Delta\alpha^* \equiv \alpha_1^* - \alpha_2^* = - \left(\frac{4\beta}{1+4\beta} \right) \left(\frac{5+4\beta}{k_0+4\beta K} \right) (k_2 - k_1) < 0 \quad (30)$$

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

$$\tau_i^* > 0 \iff \beta < \bar{\beta}_i^* = \frac{1}{4} \left(\frac{1 + \delta_j + 4\delta_i}{1 + \delta_1 + 4\delta_2} \right) \quad (31)$$

In Figure 4, using the expression for the equilibrium taxes (27), the line **D3** depicts the boundary for the first host country to tax multinational production $\tau_1^* > 0$

$$\delta_2 < -\frac{1}{4\beta} \left[1 + \left(\frac{8\beta(2\beta-1)+5}{4\beta-1} \right) \delta_1 \right] \quad (32)$$

and the line **D4** depicts the boundary for the second host country to tax multinational production $\tau_2^* > 0$

$$\delta_2 > - \left(\frac{4\beta-1}{16\beta^2-8\beta-5} \right) [1 + 4\beta + 4\beta\delta_1] \quad (33)$$

In the area below **D3** and above **D4**, both host countries tax multinational production ($\tau_1^* > 0$ and $\tau_2^* > 0$). In this region labor supplies in both host countries are sufficiently small. Aligning Figure 4 on top of Figure 2 indicates that for the parameters used to construct these figures, both host countries tax FDI over the full range for which they are indeed host countries. Also, the equilibrium tax (27) increases in a host country's share of the world labor supply.

Proposition 4 *The first host country, which has the smaller labor supply per firm, the higher wage in the absence of FDI and hence the smaller extent of FDI in the absence of intervention, adopts a smaller tax on multinational production than the second host country. A host country's chosen tax increases in the host country's labor supply relative to the world.*

4.3. Cooperation

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

$$\tau_i(\tau_j) = \frac{\psi\left((1-\beta)K - \frac{3}{2}k_0\right) + \tau_j(4\beta - 1)}{1 + 5\beta} \quad (34)$$

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:

$$\frac{\partial\tau_i}{\partial\tau_j} = \frac{4\beta - 1}{1 + 5\beta} > 0 \iff \beta > \frac{1}{4} \quad (35)$$

Finally, the chosen FDI taxes are given by:

$$\tau^t = \frac{1}{2} \left(\frac{k_0\psi}{2 + \beta} \right) [1 + 2(1 - \beta)(\delta_1 + \delta_2 - 1)] > 0 \quad (36)$$

The coordinated FDI policy is always a tax, regardless of the source ownership share of host firms β . Unequal taxes would lead to unequal wages

across host countries, and raising the tax where the wage was higher and lowering the tax where the wage was lower would raise total host welfare.

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

$$\alpha_i^t \equiv \frac{(1 + \beta) k_i - k_0/2 - k_j}{k_0 + \beta K} \quad (37)$$

Cooperative taxes are nonprohibitive if source ownership of host firms is sufficiently large

$$\alpha_i^t > 0 \iff \beta > \underline{\beta} \equiv \frac{1 + 2(\delta_j - \delta_i)}{2\delta_i} \quad (38)$$

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

$$\Delta\alpha^t \equiv \alpha_1^t - \alpha_2^t = - \left(\frac{2 + \beta}{k_0 + \beta K} \right) (k_2 - k_1) < 0 \quad (39)$$

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

Comparing the cooperative (36) to the noncooperative (27) policies shows that both host countries tax multinational production *more severely* when cooperating than when they set policy non-cooperatively. This higher taxation arises because a host country does not suffer as large a decrease 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 coordinated elevation of taxes removes the FDI diversion effect where some FDI is shifted to alternative host countries.

While generally viewed as a means of promoting unfettered investment, an implication of our model is that multilateral investment agreements involve inherent pressures toward *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.

Proposition 5 *When both host countries collectively set their FDI policies to maximize total host welfare (the sum of welfare across host countries), they set equal taxes on multinational production. FDI taxes become more severe relative to the noncooperative levels.*

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 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 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 into the region 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. However, we highlight an inherent instability in these negotiated agreements, as both host countries have an incentive to cheat on the agreement by offering hidden perks to attract multinational production.

The two host countries can be interpreted as representing two groups

of host countries. The coordinated scenario could represent a multilateral investment agreement including all major host countries (such as through the WTO). The agreement would shift investment policies toward taxes by eliminating the FDI diversion effect of taxing FDI. While we do not claim to have fully captured all the features of such an agreement, we do feel that recognizing the presence of pressure pushing toward restricting international investment is vital to ever achieving negotiation success.

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 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 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 country's 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 ($\forall i, j = 1, 2, i \neq j$).

$$\begin{aligned} \frac{\partial \alpha_i}{\partial \tau_i} &= -\frac{m_i M [\psi(k_0 + k_j) - m_j \tau_j]}{m_0 (\psi K - m_1 \tau_1 - m_2 \tau_2)^2} < 0 \\ \frac{\partial \alpha_j}{\partial \tau_i} &= \frac{m_i M [\psi k_j - m_j \tau_j]}{m_0 (\psi K - m_1 \tau_1 - m_2 \tau_2)^2} > 0 \\ \frac{\partial \alpha_H}{\partial \tau_i} &= -\frac{m_i M \psi k_0}{m_0 (\psi K - m_1 \tau_1 - m_2 \tau_2)^2} < 0 \end{aligned}$$

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 country rise while profits of other firms fall.

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

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

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

A4. Proof of Proposition 4

Equation (28) follows directly from equation (27) for $i = 1, 2$. An increase in the first host country's 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.

$$\tau_1^t - \tau_1^* = \frac{2(5 + 4\beta)(k_2 - k_1) + 4N_1 + 5N_2}{(2 + \beta)(5 + 4\beta)(1 + 4\beta)} > 0$$

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 τ_2^t into W_1 and show that $\partial W_1 / \partial \tau_1|_{\tau_2^*} = 0$ implies that the first host country wants a smaller tax than τ_1^t given that the second host country has chosen τ_2^t

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

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Figure 1: FDI with Two Host Countries

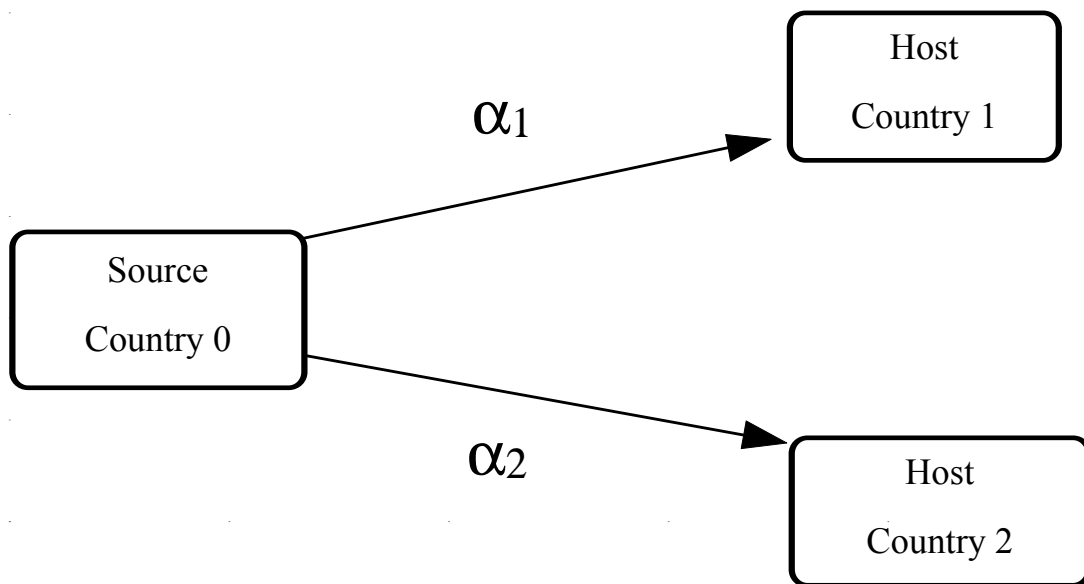


Figure 2: Equilibrium FDI Patterns

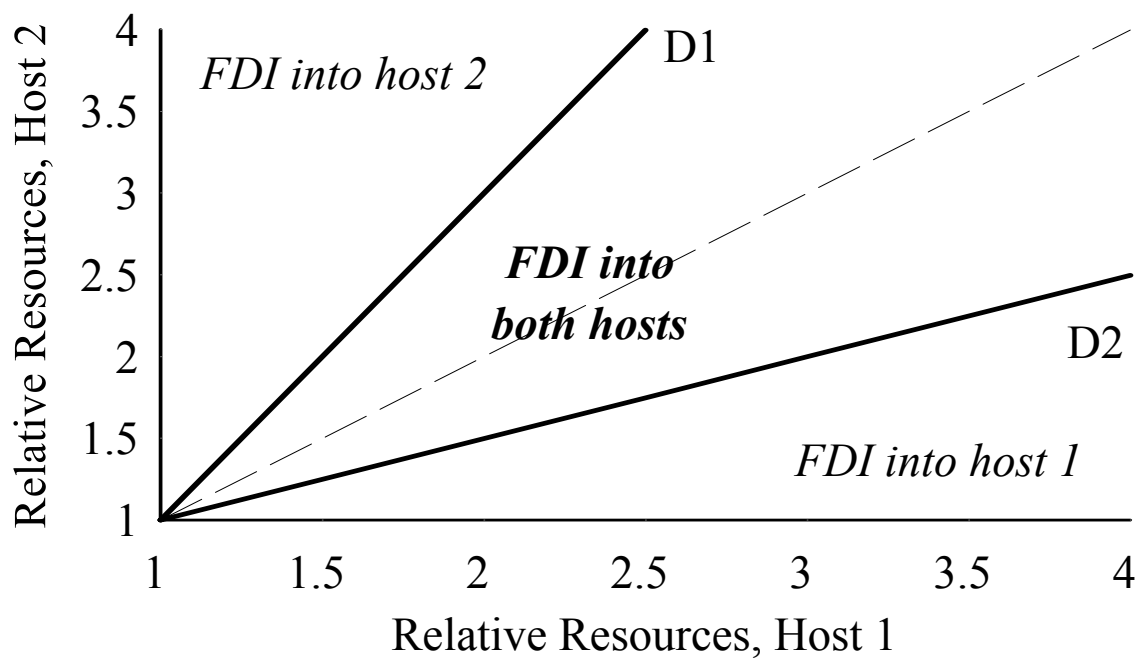


Figure 3: Policy Reaction Functions

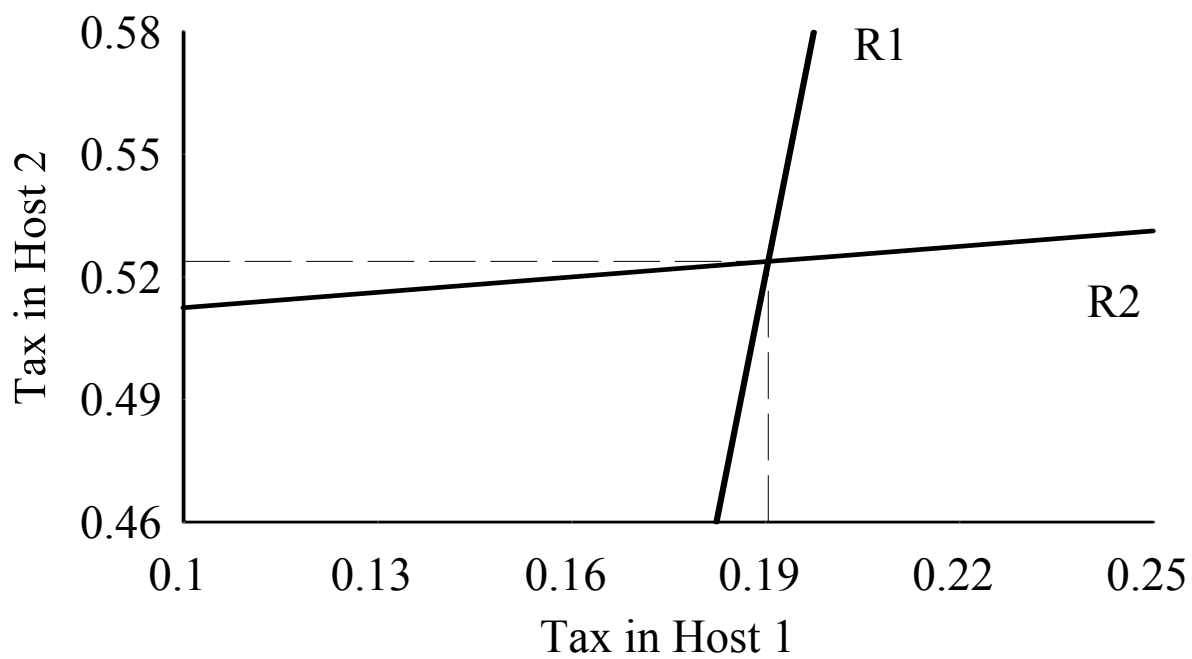


Figure 4: Equilibrium FDI Policy

