

Politics of Competition for Foreign Direct Investment: A Simple Theory*

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Abstract

We study the impact of special interest politics on competition for a multinational between two countries. We show that whether a country will win this competition is determined by both economic factors, which include for which country foreign direct investment will bring more national welfare, and in which country the multinational will make more profits; and to what extent each country's government is influenced by domestic special interest groups. Now a country that benefits less from foreign direct investment, and is not the multinational's preferred location, may win this competition provided that its government is far more influenced by special interest groups, so that the cost it can bear to attract the multinational can be greater than the cost its rival can bear to attract the multinational. This implies that allocative efficiency cannot be always achieved.

Key Words: Foreign direct investment (Multinational), Special interest politics, Subsidy competition

JEL Classification: F23, D72

Very Preliminary and Comments Welcome.

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1 Introduction

The world has witnessed fierce competition among countries for foreign direct investment during the recent years. For instance, Table 1 lists some competitions that occurred in Europe.¹

City, State	Year	Plant	Other locations considered	State investment (million \$)	Company's investment (million \$)	Financial incentive per job (\$)
Setubal, Portugal	1991	Ford, Volkswagen	UK, Spain	483.5	2603	254,451
North-East England	1994/95	Samsung	France, Germany, Portugal, Spain	89	690.3	29,675
Castle Bromwich, Birmingham, Whitley, UK	1995	Jaguar	Detroit, USA	128.72	767	128,720
Hambach, Lorraine, France	1995	Mercedes-Benz, Swatch	Belgium, Germany	111	370	?
Newcastle upon Tyne, UK	1995	Siemens	Austria, Germany, Ireland, Portugal, Singapore	76.92	1428.6	51,820

Table 1: The cost of attracting investment: Examples of incentives given to investors in Europe

Many researchers study this phenomenon. For example, Haufler and Wooton (1999), Barros and Cabral (2000), and Fumagalli (2003) study the competition for indivisible foreign direct investment (a multinational) in the framework of imperfect competition. Navaretti and Venables (2004) discuss the implications of policy competition for a multinational in a simple model.² Haaparanta (1996) considers the case where the exogenously given foreign direct investment is perfectly divisible, and countries compete for their own shares. These researches share the same feature:

¹This table is made on the base of Table III.7 of UNCTAD (1996). Indeed, the competition for foreign direct investment is extensively documented by UNCTAD (1996), and Oman (2000).

²See Chapter 10, section 10.3.1.

they all assume that governments seek to maximize national welfare, and study the strategic interactions between governments.

However, Putnam (1988) points out that

“The politics of many international negotiations can usually be conceived as a two-level game. At the national level, domestic groups pursue their interests by pressuring the government to adopt favorable policies, and politicians seek power by constructing coalitions among those groups. At the international level, national governments seek to maximize their own ability to satisfy domestic pressures, while minimizing the adverse consequences of foreign developments. Neither of the two games can be ignored by central decision-makers, so long as their countries remain interdependent, yet sovereign.” (Putnam (1988), pp. 434.)

Following Putnam, in this paper we regard competition for foreign direct investment as a “two-level game”. Our basic idea is as follows. Foreign direct investment has income redistribution effects in each country. Hence, in each country, the special interest groups who are the gainers of this redistribution have an incentive to lobby the government to attract the foreign direct investment, whilst the special interest groups who are the losers of this redistribution have an incentive to lobby the government not to attract the foreign direct investment. The government’s objective is shaped by this political competition. Then the governments engage in the competition for foreign direct investment. The outcome of this competition, and the national welfare of each country are determined. Notice that when the special interest groups in each country engage in political competition, they know that such competition occurs in other countries. Therefore, the optimal lobby behavior should be based on the anticipations on how the special interest groups in other countries lobby their governments, and should take into account the equilibrium outcome of competition for foreign direct investment, given that lobby behavior is sunk. This idea is illustrated in Figure 1.

How do we put this idea to work? We consider the case where two countries compete for a multinational. There is a monopoly market of a homogenous good in each country. The only factor of production is labor, which is unionized, and the wage rate and employment level are determined in a Leontief model. Therefore, in each country, the trade union welcomes the multinational, because it can sell more labor and achieve more employment gains, whilst the domestic firm does not welcome the multinational because its profits will decrease. Therefore, the redistribution effects of foreign direct investment are characterized, and the gainer and loser of this redistribution are identified in each country. How the trade union and the domestic firm shape a government’s objective via political competition in each country is modelled as a common agency situation based on Bernheim and Whinston (1986), and Grossman and Helpman (1994).³

³Notice that we treat the trade union and the domestic firm in each country as special interest

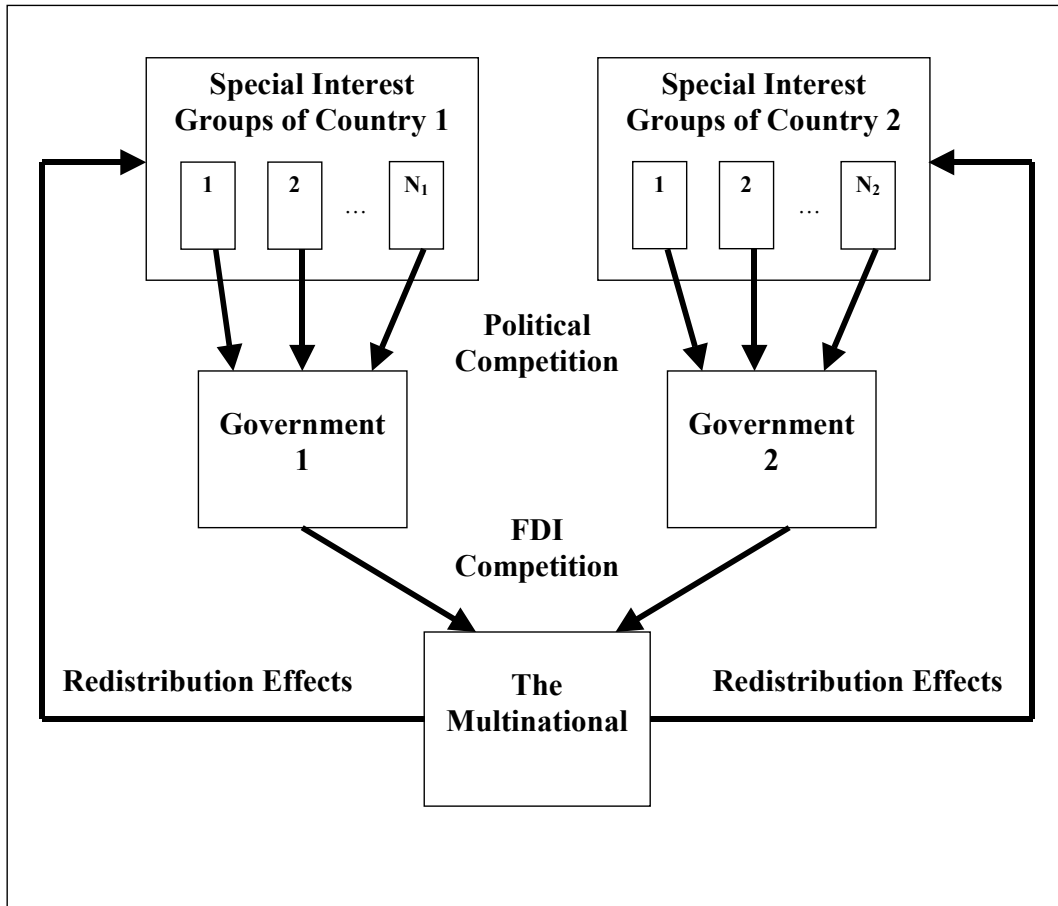


Figure 1: Illustration of the basic idea

This paper explores Putnam’s idea of a “two-level game” in the context of competition for foreign direct investment. This idea is also explored in the context of negotiation for a free-trade agreement by Grossman and Helpman (1995a); trade wars and trade talks by Grossman and Helpman (1996b); and international cooperation in fiscal policy by Persson and Tabellini (2000).

To the best of our knowledge, Biglaiser and Mezzetti (1997) is the only other groups.

Lahiri and Ono (2004) point out that the trade union who wants the government to stipulate that the multinational purchase most their inputs from the local markets, has an incentive to lobby the government, and the purpose is to maximize the income of the workers.

Kayalica and Lahiri (2003) point out that almost all countries have well-organized local producers, e.g., automobile industry, who lobby the government for higher levels of protection against the goods of foreign-owned plants producing in the country.

In this paper, we suppose that consumers are not organized, and do not form a special interest group.

paper to study the bidding war for a firm from a political economy perspective. In their paper, elected officials have re-election concerns, which make their willingness to pay for attracting a firm differ from voters' willingness to pay for that. However, in this model the voters are assumed to be symmetric vis-à-vis the investment project; there are no conflicts of interest among them. Notice that the redistribution effects of foreign direct investment are considered explicitly in this paper.

The structure of this paper is as follows. section 2 sets out the model, which is analyzed in section 3 and section 4. The welfare effects are analyzed in section 5. In section 6, we consider an extension, introducing the policy of a minimum wage rate into the model, and the final section concludes. See Appendix for some proofs.

2 The Model

We set out the model in this section.

Preference:

There are two countries, $i = 1, 2$. The preference of the representative consumer of country i is given by

$$U^i(q_i, I_i) = u^i(q_i) + I_i,$$

where

$$u^i(q_i) = \alpha_i q_i - \frac{1}{2} \beta_i q_i^2.$$

q_i is the consumption of a homogenous good, and I_i is the consumption of a numeraire good. The inverse market demand (market price) is given by

$$p_i = \alpha_i - \beta_i q_i.$$

Production:

Labor is the only input for producing q_i , and the technology is a Ricardian one:

$$q_i = \frac{L_i}{\gamma_i},$$

where γ_i is the inverse of the input-output coefficient, and the marginal product of labor is $\frac{1}{\gamma_i}$. Therefore, if labor market is competitive, the real wage rate is $w_i^c = \frac{1}{\gamma_i}$. We assume that labor is organized and forms a trade union in each country.

Players:

There are three firms: the domestic firm of country 1, the domestic firm of country 2, and a multinational firm; and two trade unions: the trade union of country 1, and the trade union of country 2; and two governments: government 1 and 2.

Timing:

This is a five-stage game.

Stage 1: The trade union and the domestic firm in each country lobby the government simultaneously by giving the government political contributions contingent

on the multinational's locations.⁴ In particular, trade union i 's contribution schedule is given by

$$C_i^T = \begin{cases} C_{ii}^T & \text{if FDI in country } i, \\ C_{ij}^T & \text{if FDI in country } j; \end{cases} \quad (1)$$

where $C_i^T \in [0, \bar{C}_i^T]$. I.e., the trade union i 's political contributions should be bounded, and its greatest lower bound is zero, whilst its least upper bound is \bar{C}_i^T . Domestic firm i 's contribution schedule is given by

$$C_i^F = \begin{cases} C_{ii}^F & \text{if FDI in country } i, \\ C_{ij}^F & \text{if FDI in country } j; \end{cases} \quad (2)$$

where $C_i^F \in [0, \bar{C}_i^F]$. I.e., the firm i 's political contributions should be bounded, and its greatest lower bound is zero, whilst its least upper bound is \bar{C}_i^F . $i = 1, 2, j = 1, 2, i \neq j$.⁵ Notice that any interest group will not make positive political contributions for both locations. Why is that? This interest group may gain or may lose from foreign direct investment, or may be indifferent between two locations. Obviously, it does not have an incentive to make positive contributions when its unfavorable outcome occurs, whilst it may do that when its favorable outcome occurs. If this interest group is indifferent between two outcomes, it surely does not have an incentive to make positive political contributions irrespective of where the multinational locates. In addition, it is quite natural to think that the political contributions, which this interest group make when its favorable outcome occurs, should not be strictly greater than its net gain under that outcome. We will see that whether any interest group welcomes the multinational, and the least upper bound on its political contributions, will be determined endogenously. Also notice that the multinational is not allowed to make political contributions.

Stage 2: Given the contributions schedules, two governments announce simultaneously a lump-sum subsidy b_i to the multinational.⁶

Stage 3: The multinational makes its location choice. We suppose that the multinational wants to establish a subsidiary at country 1 or 2.⁷

Stage 4: The wage rate and employment level are determined in each country. In particular, we assume that a trade union has full control over the wage rate, whilst

⁴Notice that in Bernheim and Whinston (1986), (and Grossman and Helpman (1994)), the contract (contribution schedule) offered to the agent (the national government) by a principal (a special interest group) is contingent on the agent's action (trade policy). Our approach is different from theirs. Also see later discussions.

⁵Here we assume that any interest group's political contributions cannot exceed some number. By doing this, we assume implicitly that we do not allow players to choose weakly dominated strategies in the first stage of the game. Also see Grossman and Helpman (1995a).

⁶If b_i is negative, it is a lump-sum tax.

⁷We do not consider direct export as one of the multinational's possible options in this paper.

a firm (or firms) decides (decide) employment level. We use a Leontief model to characterize the strategic interactions in this stage.

Stage 5: Firms engage in product market competition as Cournot competitors. We assume that if the multinational locates in country i , it will adopt the same technology as firm i 's technology. Moreover, the firms will incur unit marketing cost when selling their products. In particular, firm i 's marketing cost at country i is given by m_i^i , whilst its marketing cost at country j is given by m_j^i . The multinational's marketing cost at country i is given by m_i , whilst its marketing cost at country j is given by m_j .

Then the game is over.

Payoffs

A domestic firm maximizes the difference between its profits and its political contributions. A trade union maximizes the difference between its employment gains and its political contributions.

Government i maximizes

$$G^i = \begin{cases} (C_{ii}^F + C_{ii}^T) + a^i (W_i^i - b_i) & \text{if FDI in country } i, \\ (C_{ij}^F + C_{ij}^T) + a^i W_j^i & \text{if FDI in country } j. \end{cases}, \quad a^i \geq 0. \quad (3)$$

W_i^i is the national welfare when country i wins the competition for the multinational, whilst W_j^i is the national welfare when country i loses the competition for the multinational. National welfare is defined by the sum of (1) consumers' surplus,⁸ (2) domestic firm's profits, and (3) employment gains. When country i wins the competition for the multinational, it pays a lump-sum subsidy b_i to the multinational, which is collected from consumers by lump-sum taxation. a^i is a parameter that represents the marginal rate of substitution between national welfare and political contributions. The larger a^i is, the more weight is placed on the national welfare relative to political contributions.⁹ Hence, the larger a^i is, the less government i will be influenced by trade union i and firm i . When $a^i \rightarrow \infty$, government i maximizes national welfare, and cannot be influenced by political contributions.

The multinational maximizes the sum of its profits and the subsidy it receives.

Next, we analyze the simplest case, i.e., we assume that if the multinational locates in country i , we have $m_i = m_i^i$, and $m_j^i = m_j$. In addition, the marketing cost at country j is so high that it is not profitable for firm i , and the multinational to sell products in country j , $i = 1, 2$, $j = 1, 2$, $i \neq j$. This motivates the supposition that the multinational wants to invest in one of two countries rather than both countries when the option of direct export is not feasible. This also implies that there is no trade between two countries.¹⁰

⁸We assume that the workers do not consumer the good produced by themselves.

⁹See Grossman and Helpman (1994), and Helpman (1997).

¹⁰We should mention two points here. First, to introduce a fixed investment cost into the model is another way to motivate the supposition that the multinational invests in one of two countries. Second, we can consider the case where there is trade between countries. However, we wonder

We solve the model in section 3 and 4, and the solution concept is a Subgame Perfect Nash Equilibrium.

3 Equilibrium Analysis I: The Later Three Stages

Let us consider country i . When the multinational locates in this country, in the last stage of the game, the domestic firm maximizes its profits:

$$\pi_i^i = (\alpha_i - \beta_i (q_{ii} + q_i^M)) q_{ii} - \gamma_i w_{ii} q_{ii} - m_i^i q_{ii},$$

whilst the multinational maximizes its profits:

$$\pi_i^M = (\alpha_i - \beta_i (q_{ii} + q_i^M)) q_i^M - \gamma_i w_{ii} q_i^M - m_i^i q_i^M.$$

q_{ii} is the domestic firm's sales in country i , q_i^M is the multinational's sales in country i , and w_{ii} is the wage rate when the multinational locates in country i . The domestic firm's first-order condition for profit maximization and the multinational's first-order condition for profit maximization determine simultaneously the Nash equilibrium:

$$(q_{ii}, q_i^M) = \left(\frac{\alpha_i - \gamma_i w_{ii} - m_i^i}{3\beta_i}, \frac{\alpha_i - \gamma_i w_{ii} - m_i^i}{3\beta_i} \right).$$

Hence, the optimal employment levels are given by

$$(L_i^i, L_i^M) = \left(\gamma_i \left(\frac{\alpha_i - \gamma_i w_{ii} - m_i^i}{3\beta_i} \right), \gamma_i \left(\frac{\alpha_i - \gamma_i w_{ii} - m_i^i}{3\beta_i} \right) \right),$$

where L_i^i are firm i 's employment levels, and L_i^M are the multinational's employment levels.

In the penultimate stage, trade union i maximizes its employment gains:

$$\omega_i^i = (w_{ii} - w_i^c) (L_i^i + L_i^M).$$

The first order condition for maximization is given by

$$(L_i^i + L_i^M) + (w_{ii} - w_i^c) \frac{d(L_i^i + L_i^M)}{dw_{ii}} = 0,$$

which can be rewritten as

$$\frac{w_{ii} - w_i^c}{w_{ii}} = \frac{\alpha_i - \gamma_i w_{ii} - m_i^i}{\gamma_i w_{ii}}. \quad (4)$$

whether the basic results derived from the simplest case could be changed when considering more complicated cases.

Notice that the RHS is the inverse of the wage rate elasticity of labor demand. From equation 4, we can solve the optimal wage rate:

$$w_{ii} = \frac{\alpha_i - m_i^i + 1}{2\gamma_i}. \quad (5)$$

Using expression 5, we can show

$$\begin{aligned} q_{ii} &= q_i^M = \frac{\alpha_i - m_i^i - 1}{6\beta_i}, \\ L_i^i &= L_i^M = \gamma_i \left(\frac{\alpha_i - m_i^i - 1}{6\beta_i} \right), \\ \pi_i^i &= \pi_i^M = \frac{(\alpha_i - m_i^i - 1)^2}{36\beta_i}, \\ \omega_i^i &= \frac{(\alpha_i - m_i^i - 1)^2}{6\beta_i}, \\ cs_i^i &= \frac{(\alpha_i - m_i^i - 1)^2}{18\beta_i}, \\ W_i^i &= cs_i^i + \omega_i^i + \pi_i^i = \frac{(\alpha_i - m_i^i - 1)^2}{4\beta_i}. \end{aligned}$$

Notice that cs_i^i is the consumers' surplus when the multinational locates in country i .¹¹

When the multinational locates in country j , in the last stage of the game, the domestic firm maximizes its profits:

$$\pi_j^i = (\alpha_i - \beta_i q_{ij}) q_{ij} - \gamma_i w_{ij} q_{ij} - m_i^i q_{ij}.$$

q_{ij} is domestic firm's sales when the multinational locates in country j , w_{ij} is the wage rate when the multinational locates in country j . From the first order condition for profit maximization, we can solve

$$q_{ij} = \frac{\alpha_i - \gamma_i w_{ij} - m_i^i}{2\beta_i}.$$

¹¹It should be noted that q_{ii} , and q_i^M are not functions of γ_i respectively. Why is that? Recall that the production function is $q_i = \frac{L_i}{\gamma_i}$. Therefore, to produce one unit of output requires γ_i units of labor, and the unit production cost is the product of γ_i and the wage rate, which prevails. Here, we consider competitive wage rate, which is equal to $w_i^c = \frac{1}{\gamma_i}$. Hence, the unit production cost is 1. Therefore, γ_i does not appear in the expressions for q_{ii} , and q_i^M respectively. This indicates that in this model, the unit production cost is one of the fundamental parameters. It happens to be 1 in the case that we consider. However, consider the case where country i adopts the policy of minimum wage rate, and the minimum wage rate is \underline{w}_i , which is strictly greater than the competitive wage rate. Now the unit production cost is $\gamma_i \underline{w}_i$. (Also see section 6.)

Hence, the optimal employment levels are given by

$$L_j^i = \gamma_i \left(\frac{\alpha_i - \gamma_i w_{ij} - m_i^i}{2\beta_i} \right),$$

where L_j^i denotes the employment levels when the multinational locates in country j .

In the penultimate stage, trade union i maximizes its employment gains:

$$\omega_j^i = (w_{ij} - w_i^c) L_j^i.$$

The first order condition for maximization is given by

$$L_j^i + (w_{ij} - w_i^c) \frac{dL_j^i}{dw_{ij}} = 0,$$

which can be rewritten as

$$\frac{w_{ij} - w_i^c}{w_{ij}} = \frac{\alpha_i - \gamma_i w_{ij} - m_i^i}{\gamma_i w_{ij}}. \quad (6)$$

Notice that the RHS is the inverse of the wage rate elasticity of labor demand. From equation 6, we can solve the optimal wage rate:

$$w_{ij} = \frac{\alpha_i - m_i^i + 1}{2\gamma_i}. \quad (7)$$

Notice that the wage rate is the same as that when the multinational locates in country i . How do we explain this? Notice that equation 4, and equation 6 share the same functional forms, therefore we must have $w_{ii} = w_{ij}$.¹²

Using expression 7, we can show

$$\begin{aligned} q_{ij} &= \frac{\alpha_i - m_i^i - 1}{4\beta_i}, \\ L_j^i &= \gamma_i \left(\frac{\alpha_i - m_i^i - 1}{4\beta_i} \right), \\ \pi_j^i &= \frac{(\alpha_i - m_i^i - 1)^2}{16\beta_i}, \\ \omega_j^i &= \frac{(\alpha_i - m_i^i - 1)^2}{8\beta_i}, \\ cs_j^i &= \frac{(\alpha_i - m_i^i - 1)^2}{32\beta_i}, \\ W_j^i &= cs_j^i + \omega_j^i + \pi_j^i = \frac{7(\alpha_i - m_i^i - 1)^2}{32\beta_i}. \end{aligned}$$

¹²Indeed, we can show that the wage rate elasticity of labor demand is not dependent on the number of firms. Therefore, the equilibrium wage rate is not affected by the number of firms.

Notice that cs_j^i is the consumers' surplus when the multinational locates in country j .

We summarize the results in Table 2.

Term	FDI	NO	WELFARE CHANGE
consumers' surplus	$\frac{(\alpha_i - m_i^i - 1)^2}{18\beta_i}$	$\frac{(\alpha_i - m_i^i - 1)^2}{32\beta_i}$	$\frac{7(\alpha_i - m_i^i - 1)^2}{288\beta_i}$
employment gains	$\frac{(\alpha_i - m_i^i - 1)^2}{6\beta_i}$	$\frac{(\alpha_i - m_i^i - 1)^2}{8\beta_i}$	$\frac{(\alpha_i - m_i^i - 1)^2}{24\beta_i}$
domestic profits	$\frac{(\alpha_i - m_i^i - 1)^2}{36\beta_i}$	$\frac{(\alpha_i - m_i^i - 1)^2}{16\beta_i}$	$-\frac{5(\alpha_i - m_i^i - 1)^2}{144\beta_i}$
national welfare	$\frac{(\alpha_i - m_i^i - 1)^2}{4\beta_i}$	$\frac{7(\alpha_i - m_i^i - 1)^2}{32\beta_i}$	$\frac{(\alpha_i - m_i^i - 1)^2}{32\beta_i}$

Table 2: The redistribution effects of FDI in the basic model

We shall use the following Definition.

Definition 1

$$\Delta_i \equiv \frac{(\alpha_i - m_i^i - 1)^2}{\beta_i}.$$

It is straightforward to show that

$$\frac{\partial \Delta_i}{\partial \alpha_i} > 0, \quad \frac{\partial \Delta_i}{\partial m_i^i} < 0, \quad \frac{\partial \Delta_i}{\partial \beta_i} < 0. \quad (8)$$

See Table 2. Recall the discussion on the form of a special interest group's contribution schedules. Now in country i , trade union i gains, whilst firm i loses from foreign direct investment. Trade union i 's net gain is $\frac{1}{24}\Delta_i$ if the multinational locates in country i . Hence we must have

$$C_{ii}^T \in \left[0, \overline{C}_i^T\right], \quad C_{ij}^T = 0, \quad \overline{C}_i^T = \frac{1}{24}\Delta_i. \quad (9)$$

If the multinational locates in country j , firm i 's net gain is $\frac{5}{144}\Delta_i$. Hence we must have

$$C_{ii}^F = 0, \quad C_{ij}^F \in \left[0, \overline{C}_i^F\right], \quad \overline{C}_i^F = \frac{5}{144}\Delta_i. \quad (10)$$

Country j 's case is very much similar to country i 's. Replacing superscript i with j , subscript i with j , and subscript ij with ji , we have the results that hold for country j .

Without loss of generality, in the following analysis we make the following Assumption.

Assumption 1

$$\Delta_i > \Delta_j.$$

See Table 2. Country i 's net gain under foreign direct investment is $\frac{1}{32}\Delta_i$, whilst country j 's net gain under foreign direct investment is $\frac{1}{32}\Delta_j$. Now according to Assumption 1, $\frac{1}{32}\Delta_i - \frac{1}{32}\Delta_j > 0$. Hence, Assumption 1 says that country i benefits more from foreign direct investment. In addition, notice that $\pi_i^i = \pi_i^M = \frac{1}{36}\Delta_i$, whilst $\pi_j^j = \pi_j^M = \frac{1}{36}\Delta_j$. According to Assumption 1, $\frac{1}{36}\Delta_i - \frac{1}{36}\Delta_j > 0$. Hence, the multinational's preferred location is country i . Let

$$\Delta\pi^M \equiv \pi_i^M - \pi_j^M = \frac{1}{36}(\Delta_i - \Delta_j). \quad (11)$$

In the third stage, the multinational makes its location choice. Given country i 's lump-sum subsidy, b_i , and country j 's lump-sum subsidy, b_j , the multinational locates in country i , if and only if

$$\pi_i^M + b_i \geq \pi_j^M + b_j,$$

i.e.,

$$b_i + \Delta\pi^M \geq b_j.$$

Otherwise, it locates in country j .¹³ Notice that if $b_i = b_j$, it will locate in country i .

4 Equilibrium Analysis II: The First Two Stages

4.1 The second stage

In the second stage, given the contribution schedules, government i 's objective is given by

$$G^i = \begin{cases} C_{ii}^T + a^i(W_i^i - b_i) & \text{if FDI in country } i, \\ C_{ij}^F + a^iW_j^i & \text{if FDI in country } j. \end{cases} \quad (12)$$

(Substituting expression 9, expression 10 into expression 3, we get expression 12.)
Setting

$$C_{ii}^T + a^i(W_i^i - b_i) = C_{ij}^F + a^iW_j^i,$$

we can solve country i 's best offer, (country i 's maximum subsidy or minimum tax,) S_i .¹⁴

$$\begin{aligned} S_i &= \frac{1}{a^i}(C_{ii}^T - C_{ij}^F) + (W_i^i - W_j^i) \\ &= \frac{1}{a^i}(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i. \end{aligned} \quad (13)$$

¹³We prescribe that the multinational locates in country i if $b_i + \Delta\pi^M = b_j$.

¹⁴Notice that the gross value of foreign direct investment to government i is $(C_{ii}^T + a^iW_i^i) - (C_{ij}^F + a^iW_j^i)$. However, government i will pay b_i to the multinational when the multinational locates in country i . Since b_i is collected from consumers, from government i 's viewpoint, to attract the multinational costs a^ib_i . Therefore, the net value of foreign direct investment to government i is $(C_{ii}^T + a^iW_i^i) - (C_{ij}^F + a^iW_j^i) - a^ib_i = [C_{ii}^T + a^i(W_i^i - b_i)] - (C_{ij}^F + a^iW_j^i)$. Let this expression equal zero, we can solve government i 's best offer.

Similarly, country j 's best offer is given by

$$\begin{aligned} S_j &= \frac{1}{a^j} (C_{jj}^T - C_{ji}^F) + (W_j^j - W_i^j) \\ &= \frac{1}{a^i} (C_{jj}^T - C_{ji}^F) + \frac{1}{32} \Delta_j. \end{aligned} \quad (14)$$

Notice that S_i (S_j) increases with C_{ii}^T (C_{jj}^T), decreases with C_{ij}^F (C_{ji}^F).

Therefore, given the contribution schedules, and given the governments' anticipations on how the game evolves from the second stage, the equilibrium in this stage is characterized as follows:¹⁵ if

$$S_i + \Delta\pi^M \geq S_j, \quad (15)$$

then country i wins the competition, and pays the amount $b_i = S_j - \Delta\pi^M$, to the multinational; if

$$S_i + \Delta\pi^M < S_j, \quad (16)$$

then country j wins the competition, and pays the multinational $b_j = S_i + \Delta\pi^M$.¹⁶

On the other hand, if country i wins the competition for the multinational in equilibrium, then we must have $S_i + \Delta\pi^M \geq S_j$. Why is that? Suppose that country i wins the competition in equilibrium, however, $S_i + \Delta\pi^M < S_j$. By the above analysis, if this is true, then country j will win the competition in equilibrium. A contradiction. Using similar arguments, we can establish that if country j wins the competition for the multinational in equilibrium, then we must have $S_i + \Delta\pi^M < S_j$.¹⁷

4.2 The first stage

Given the analysis of the later four stages of the game, what is (are) the equilibrium (equilibria) in the first stage?

In this stage, trade union i 's payoffs are as follows: it gets $\frac{1}{8}\Delta_i + (\frac{1}{24}\Delta_i - C_{ii}^T)$ if the multinational locates in country i ; it gets $\frac{1}{8}\Delta_i$ if the multinational locates in country j .

Firm i 's payoffs are as follows: it gets $\frac{1}{36}\Delta_i$ if the multinational locates in country i ; it gets $\frac{1}{36}\Delta_i + (\frac{5}{144}\Delta_i - C_{ij}^F)$ if the multinational locates in country j .

Trade union j 's payoffs are as follows: it gets $\frac{1}{8}\Delta_j$ if the multinational locates in country i ; it gets $\frac{1}{8}\Delta_j + (\frac{1}{24}\Delta_j - C_{jj}^T)$ if the multinational locates in country j .

¹⁵Here we assume implicitly that government i (j) does not play (weakly) dominated strategies, i.e., it does not choose a b_i (b_j), which is strictly greater than S_i (S_j).

¹⁶Notice that government j should choose a $b_j = S_i + \Delta\pi^M + \varepsilon$, $\varepsilon > 0$, to beat government i . However, if this is the case, the equilibrium does not exist since ε can be an arbitrarily small number that is strictly greater than 0. Here, we treat the payment in the limit case where $\varepsilon \rightarrow 0$, as equilibrium payment. We deal with such kind of problem in this way in this paper. (Also see Tirole (1988).)

¹⁷How do we explain this? Notice that the second stage can be reinterpreted as a first price auction under complete information. It is well known that a player wins the auction in equilibrium if and only if this player has the highest valuation for the object.

Firm j 's payoffs are as follows: it gets $\frac{1}{36}\Delta_j + (\frac{5}{144}\Delta_j - C_{ji}^F)$ if the multinational locates in country i ; it gets $\frac{1}{36}\Delta_j$ if the multinational locates in country j .

4.2.1 Equilibrium characterization

Now we characterize the equilibrium (equilibria) in the first stage of the game. First we derive the best response for each interest group.

Lemma 1 (*Best Response.*) *Given the other players' strategies, trade union i 's best response is given by*

$$C_i^T = \begin{cases} \begin{cases} C_{ii}^T = \max \{0, z_i^T\} \\ C_{ij}^T = 0 \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i}) (\frac{1}{24}\Delta_i - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ \geq (\frac{1}{a^j}) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j \end{cases} \\ \begin{cases} C_{ii}^T \in [0, \frac{1}{24}\Delta_i] \\ C_{ij}^T = 0 \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i}) (\frac{1}{24}\Delta_i - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ < (\frac{1}{a^j}) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j \end{cases} \end{cases},$$

where z_i^T is determined by

$$\left(\frac{1}{a^i}\right) (z_i^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j. \quad (17)$$

Given the other players' strategies, firm i 's best response is given by

$$C_i^F = \begin{cases} \begin{cases} C_{ii}^F = 0 \\ C_{ij}^F \in [0, \frac{5}{144}\Delta_i] \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i}) (C_{ii}^T - \frac{5}{144}\Delta_i) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ \geq (\frac{1}{a^j}) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j \end{cases} \\ \begin{cases} C_{ii}^F = 0 \\ C_{ij}^F = \max \{0, z_i^F\} \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i}) (C_{ii}^T - \frac{5}{144}\Delta_i) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ < (\frac{1}{a^j}) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j \end{cases} \end{cases},$$

where z_i^F is determined by

$$\left(\frac{1}{a^i}\right) (C_{ii}^T - z_i^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j. \quad (18)$$

Given the other players' strategies, trade union j 's best response is given by

$$C_j^T = \begin{cases} \begin{cases} C_{ji}^T = 0 \\ C_{jj}^T \in [0, \frac{1}{24}\Delta_j] \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i})(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ \geq (\frac{1}{a^j})(\frac{1}{24}\Delta_j - C_{ji}^F) + \frac{1}{32}\Delta_j \end{cases} \\ \begin{cases} C_{ji}^T = 0 \\ C_{jj}^T = \max\{0, z_j^T\} \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i})(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ < (\frac{1}{a^j})(\frac{1}{24}\Delta_j - C_{ji}^F) + \frac{1}{32}\Delta_j \end{cases} \end{cases},$$

where z_j^T is determined by

$$\left(\frac{1}{a^i}\right)(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right)(z_j^T - C_{ji}^F) + \frac{1}{32}\Delta_j. \quad (19)$$

Given the other players' strategies, firm j 's best response is given by

$$C_j^F = \begin{cases} \begin{cases} C_{ji}^F = \max\{0, z_j^F\} \\ C_{jj}^F = 0 \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i})(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ \geq (\frac{1}{a^j})(C_{jj}^T - \frac{5}{144}\Delta_j) + \frac{1}{32}\Delta_j \end{cases} \\ \begin{cases} C_{ji}^F \in [0, \frac{5}{144}\Delta_j] \\ C_{jj}^F = 0 \end{cases} & \text{if } \begin{cases} (\frac{1}{a^i})(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \\ < (\frac{1}{a^j})(C_{jj}^T - \frac{5}{144}\Delta_j) + \frac{1}{32}\Delta_j \end{cases} \end{cases},$$

where z_j^F is determined by

$$\left(\frac{1}{a^i}\right)(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right)\left(C_{jj}^T - \frac{5}{144}\Delta_j\right) + \frac{1}{32}\Delta_j. \quad (20)$$

Proof. First, let us establish trade union i 's best response. Given trade union j 's political contributions, and firm j 's political contributions, country j 's best offer to the multinational is determined. Given that and given firm i 's political contributions, can trade union i make country i win the competition? If

$$\left(\frac{1}{a^i}\right)\left(\frac{1}{24}\Delta_i - C_{ij}^F\right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq \left(\frac{1}{a^j}\right)(C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j,$$

this is true. Clearly trade union i will choose the lowest possible political contributions. Hence, trade union i will choose a number, which makes the above inequality hold with equality. Define z_i^T such that

$$\left(\frac{1}{a^i}\right)(z_i^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right)(C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j.$$

If $z_i^T \geq 0$, trade union i chooses $C_{ii}^T = z_i^T$. However, if $z_i^T < 0$, it chooses $C_{ii}^T = 0$, since it is not allowed to make negative political contributions.

On the other hand, if

$$\left(\frac{1}{a^i}\right) \left(\frac{1}{24}\Delta_i - C_{ij}^F\right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) < \left(\frac{1}{a^j}\right) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j,$$

then trade union i cannot make country i win the competition. It can choose arbitrarily its political contributions.

Using the same type of arguments, we can establish the best responses for firm i , trade union j , and firm j respectively. ■

Let us find the equilibrium (equilibria), in which country i wins the competition for the multinational. Indeed, we have two forms of equilibria. The first is given by the following Proposition.

Proposition 1 $C_i^T = 0$; $C_j^F = 0$; plus the following contribution schedules

$$C_i^F = \begin{cases} 0 & \text{if FDI in country } i, \\ C_{ij}^F & \text{if FDI in country } j, \end{cases}$$

where $C_{ij}^F \in [0, \frac{5}{144}\Delta_i]$;

$$C_j^T = \begin{cases} 0 & \text{if FDI in country } i, \\ C_{jj}^T & \text{if FDI in country } j, \end{cases}$$

where $C_{jj}^T \in [0, \frac{1}{24}\Delta_j]$; constitute an equilibrium in the first stage of the game, in which country i wins the competition for the multinational, if and only if

$$\left(\frac{1}{32} + \frac{1}{36}\right) (\Delta_i - \Delta_j) \geq \frac{5}{144} \left(\frac{1}{a^i}\right) \Delta_i + \frac{1}{24} \left(\frac{1}{a^j}\right) \Delta_j. \quad (21)$$

Proof. See Appendix. ■

Hence we have a continuum of equilibria here. Given any equilibrium country i wins the competition for the multinational, and pays the amount

$$b_{i1} = \left(\frac{1}{a^j}\right) C_{jj}^T + \frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j), \quad (22)$$

where $C_{jj}^T \in [0, \frac{1}{24}\Delta_j]$, to the multinational. It is straightforward to show

$$\frac{\partial b_{i1}}{\partial a^j} < 0, \quad \frac{\partial b_{i1}}{\partial C_{jj}^T} > 0, \quad \frac{\partial b_{i1}}{\partial \Delta_j} > 0, \quad \frac{\partial b_{i1}}{\partial \Delta_i} < 0.$$

And b_{i1} takes the minimum value at $C_{jj}^T = 0$, i.e., the minimum payment to the multinational is given by

$$b_{i1}^{\min} = \frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j). \quad (23)$$

(Of course, Δ_i (Δ_j) is a function of the fundamental parameters, i.e., market scale, the slope of the inverse market demand, marketing cost, and unit production cost, of the model. See expression 8.)

The second form of equilibria is given by the following Proposition.

Proposition 2 *The following contribution schedules*

$$C_i^T = \begin{cases} C_{ii}^T & \text{if FDI in country } i, \\ 0 & \text{if FDI in country } j; \end{cases}$$

$$C_i^F = \begin{cases} 0 & \text{if FDI in country } i, \\ \frac{5}{144}\Delta_i & \text{if FDI in country } j; \end{cases}$$

$$C_j^T = \begin{cases} 0 & \text{if FDI in country } i, \\ \frac{1}{24}\Delta_j & \text{if FDI in country } j; \end{cases}$$

$$C_j^F = \begin{cases} C_{ji}^F & \text{if FDI in country } i, \\ 0 & \text{if FDI in country } j; \end{cases}$$

where C_{ii}^T , and C_{ji}^F satisfy

$$\left(\frac{1}{a^i}\right) \left(C_{ii}^T - \frac{5}{144}\Delta_i\right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right) \left(\frac{1}{24}\Delta_j - C_{ji}^F\right) + \frac{1}{32}\Delta_j,$$

constitute an equilibrium in the first stage of the game, in which country i wins the competition for the multinational, if and only if

$$\begin{aligned} \frac{1}{24} \left(\frac{1}{a^i}\right) \Delta_i + \frac{5}{144} \left(\frac{1}{a^j}\right) \Delta_j + \left(\frac{1}{32} + \frac{1}{36}\right) (\Delta_i - \Delta_j) &\geq \\ \frac{5}{144} \left(\frac{1}{a^i}\right) \Delta_i + \frac{1}{24} \left(\frac{1}{a^j}\right) \Delta_j &> \left(\frac{1}{32} + \frac{1}{36}\right) (\Delta_i - \Delta_j). \end{aligned} \tag{24}$$

This form of equilibria is unique.

Proof. See Appendix. ■

Indeed, the nature of the equilibria is a public good one. See Figure 2.

The bold line represents the linear equation

$$\left(\frac{1}{a^i}\right) \left(C_{ii}^T - \frac{5}{144}\Delta_i\right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right) \left(\frac{1}{24}\Delta_j - C_{ji}^F\right) + \frac{1}{32}\Delta_j.$$

The line segment AB denotes the equilibrium combination of C_{ii}^T , and C_{ji}^F .

From Figure 2, it is easy to see that this form of equilibria is unique. Suppose that either firm i contributes $C_{ij}^F < \frac{5}{144}\Delta_i$, or trade union j contributes $C_{jj}^T < \frac{1}{24}\Delta_j$. Then

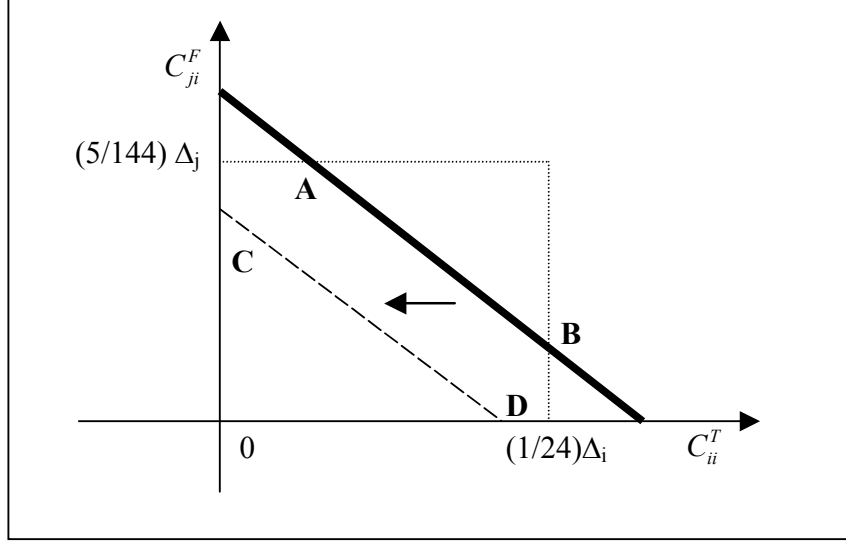


Figure 2: The public-good nature of the equilibria

the bold line moves downward. Now it is represented by the dotted line, and the line segment CD denotes the “equilibrium combination” of C_{ii}^T , and C_{ji}^F . However, consider that either firm i contributes $C_{ij}^F + \varepsilon < \frac{5}{144}\Delta_i$, or trade union j contributes $C_{jj}^T + \varepsilon < \frac{1}{24}\Delta_j$, $\varepsilon > 0$, $\varepsilon \rightarrow 0$. Then country i will lose the competition for the multinational. I.e., either firm i or trade union j gains from its deviation. Hence, this is not an equilibrium.

Given this form of equilibria, country i wins the competition for the multinational, and pays the amount

$$b_{i2} = \left(\frac{1}{a^j}\right) \left(\frac{1}{24}\Delta_j - C_{ji}^F\right) + \frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j), \quad (25)$$

to the multinational. It is straightforward to show

$$\frac{\partial b_{i2}}{\partial a^j} < 0, \quad \frac{\partial b_{i2}}{\partial C_{ji}^F} < 0, \quad \frac{\partial b_{i1}}{\partial \Delta_j} > 0, \quad \frac{\partial b_{i1}}{\partial \Delta_i} < 0.$$

And b_{i2} takes the minimum value at $C_{ji}^F = \frac{5}{144}\Delta_j$, i.e., the minimum payment to the multinational is given by

$$b_{i2}^{\min} = \frac{1}{144} \left(\frac{1}{a^j}\right) \Delta_j + \frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j). \quad (26)$$

Let us turn to find the equilibrium (equilibria), in which country j wins the competition for the multinational. We have the following Proposition.

Proposition 3 *The following contribution schedules*

$$\begin{aligned}
C_i^T &= \begin{cases} \frac{1}{24}\Delta_i & \text{if FDI in country } i, \\ 0 & \text{if FDI in country } j; \end{cases} \\
C_i^F &= \begin{cases} 0 & \text{if FDI in country } i, \\ C_{ij}^F & \text{if FDI in country } j; \end{cases} \\
C_j^T &= \begin{cases} 0 & \text{if FDI in country } i, \\ C_{jj}^T & \text{if FDI in country } j; \end{cases} \\
C_j^F &= \begin{cases} \frac{5}{144}\Delta_j & \text{if FDI in country } i, \\ 0 & \text{if FDI in country } j; \end{cases}
\end{aligned}$$

where C_{ij}^F , and C_{jj}^T satisfy

$$\left(\frac{1}{a^i}\right) \left(\frac{1}{24}\Delta_i - C_{ij}^F\right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right) \left(C_{jj}^T - \frac{5}{144}\Delta_j\right) + \frac{1}{32}\Delta_j,$$

constitute an equilibrium in the first stage of the game, in which country j wins the competition for the multinational, if and only if

$$\frac{1}{24} \left(\frac{1}{a^i}\right) \Delta_i + \frac{5}{144} \left(\frac{1}{a^j}\right) \Delta_j + \left(\frac{1}{32} + \frac{1}{36}\right) (\Delta_i - \Delta_j) < \frac{5}{144} \left(\frac{1}{a^i}\right) \Delta_i + \frac{1}{24} \left(\frac{1}{a^j}\right) \Delta_j. \quad (27)$$

This form of equilibria is unique.

Proof. Using the same type of argument in the Proof of Proposition 2, we can establish this result. ■

Again, the nature of the equilibria is a public good one.

Given this form of equilibria, country j wins the competition for the multinational, and pays the amount

$$b_j = \left(\frac{1}{a^i}\right) \left(\frac{1}{24}\Delta_i - C_{ij}^F\right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j), \quad (28)$$

to the multinational. It is straightforward to show

$$\frac{\partial b_j}{\partial a^i} < 0, \quad \frac{\partial b_j}{\partial C_{ij}^F} < 0, \quad \frac{\partial b_j}{\partial \Delta_i} > 0, \quad \frac{\partial b_j}{\partial \Delta_j} < 0.$$

And b_j takes the minimum value at $C_{ij}^F = \frac{5}{144}\Delta_i$, i.e., the minimum payment to the multinational is given by

$$b_j^{\min} = \frac{1}{144} \left(\frac{1}{a^i}\right) \Delta_i + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j). \quad (29)$$

4.2.2 Further discussions

The above analysis have important implications.

Definition 2 (*A Country's Truthful Offer to the Multinational.*) Country i 's truthful offer to the multinational, \tilde{S}_i , is the value that S_i takes at $C_{ii}^T = \bar{C}_i^T$, $C_{ij}^F = \bar{C}_i^F$:

$$\tilde{S}_i \equiv \frac{1}{a^i} \left(\bar{C}_i^T - \bar{C}_i^F \right) + \frac{1}{32} \Delta_i = \frac{1}{144} \left(\frac{1}{a^i} \right) \Delta_i + \frac{1}{32} \Delta_i. \quad (30)$$

Country j 's truthful offer to the multinational, \tilde{S}_j , is the value that S_j takes at $C_{jj}^T = \bar{C}_j^T$, $C_{ji}^F = \bar{C}_j^F$:

$$\tilde{S}_j \equiv \frac{1}{a^j} \left(\bar{C}_j^T - \bar{C}_j^F \right) + \frac{1}{32} \Delta_j = \frac{1}{144} \left(\frac{1}{a^j} \right) \Delta_j + \frac{1}{32} \Delta_j. \quad (31)$$

\tilde{S}_i (\tilde{S}_j) is country i 's (j 's) best offer to the multinational when each interest group chooses its political contributions that are equal to its net gain under its favorable outcome. This is the reason why we call \tilde{S}_i (\tilde{S}_j) a truthful offer.

Proposition 4 (*Winner Selection.*) Country i wins the competition for the multinational in equilibrium, if and only if $\tilde{S}_i + \Delta\pi^M \geq \tilde{S}_j$. Country j wins the competition for the multinational in equilibrium, if and only if $\tilde{S}_i + \Delta\pi^M < \tilde{S}_j$.

Proof. See Appendix. ■

What is the intuition of Proposition 4? From the discussions on the second stage, S_i (S_j) increases with C_{ii}^T (C_{jj}^T), and decreases with C_{ij}^F (C_{ji}^F). Hence, any interest group has the very incentive to increase its political contributions in order to achieve its favorable outcome. However, the best any interest group can do is to contribute its net gain under its favorable outcome. Thus we get \tilde{S}_i , and \tilde{S}_j . The discussions on the second stage also tell us that country i wins the competition for the multinational in equilibrium if and only if condition 15 holds; country j wins the competition for the multinational in equilibrium if and only if condition 16 holds. Now replacing S_i with \tilde{S}_i , S_j with \tilde{S}_j in condition 15, and condition 16, we have Proposition 4.

Notice that

$$\begin{aligned} & \tilde{S}_i + \Delta\pi^M \left\{ \begin{array}{l} \geq \\ < \end{array} \right\} \tilde{S}_j \\ & \Leftrightarrow \\ & \frac{1}{144} \left(\frac{1}{a^i} \right) \Delta_i + \frac{1}{32} \Delta_i + \frac{1}{36} (\Delta_i - \Delta_j) \left\{ \begin{array}{l} \geq \\ < \end{array} \right\} \frac{1}{144} \left(\frac{1}{a^j} \right) \Delta_j + \frac{1}{32} \Delta_j. \end{aligned}$$

The rank between $\tilde{S}_i + \Delta\pi^M$, and \tilde{S}_j are determined jointly by Δ_i , Δ_j , a^i , and a^j . Δ_i , and Δ_j represents economic factors that have impact on the competition for the

multinational. These factors include where the multinational's preferred location is, and for which location the multinational will bring more national welfare. a^i and a^j represents to what extent government i , and government j are influenced by special interest politics respectively. Hence, Proposition 4 implies that whether a country will win the competition for the multinational in equilibrium is determined by the interactions of economic and political factors.

We can derive two testable implications from Proposition 4.

Corollary 1 *If country j wins the competition for the multinational in equilibrium, then $a^i > a^j$.*

Proof. Suppose not. According to Proposition 4, if country j wins the competition for the multinational in equilibrium, we must have $\tilde{S}_i + \Delta\pi^M < \tilde{S}_j$. And $\tilde{S}_i + \Delta\pi^M < \tilde{S}_j$ if and only if $(\frac{1}{32} + \frac{1}{36})(\Delta_i - \Delta_j) < \frac{1}{144}(\frac{1}{a^j})\Delta_j - \frac{1}{144}(\frac{1}{a^i})\Delta_i$. Since by Assumption 1, $\Delta_i > \Delta_j$, $(\frac{1}{32} + \frac{1}{36})(\Delta_i - \Delta_j) > 0$. Now if $a^i \leq a^j$, then $\frac{1}{144}(\frac{1}{a^j})\Delta_j - \frac{1}{144}(\frac{1}{a^i})\Delta_i < 0$. A contradiction. ■

According to Assumption 1, country i benefits more from foreign direct investment, and the multinational's preferred location is country i . Hence, country j cannot win the competition if economic factors matter only. However, whether a country will win the competition is determined by both economic and political factors. Now if country j wins the competition in equilibrium, its government must be more influenced by special interest groups.

Corollary 2 *When $\Delta_i = \Delta_j = \Delta$, country i wins the competition for the multinational in equilibrium, if and only if $a^i \leq a^j$.*

Proof. According to Proposition 4, country i wins the competition for the multinational in equilibrium, if and only if

$$\begin{aligned} \tilde{S}_i + \Delta\pi^M &\geq \tilde{S}_j \\ &\Leftrightarrow \\ \frac{1}{144}\left(\frac{1}{a^i}\right)\Delta + \frac{1}{32}\Delta &\geq \frac{1}{144}\left(\frac{1}{a^j}\right)\Delta + \frac{1}{32}\Delta, \text{ since } \Delta_i = \Delta_j = \Delta \\ &\Leftrightarrow \\ \frac{1}{a^i} &\geq \frac{1}{a^j} \\ &\Leftrightarrow \\ a^i &\leq a^j. \end{aligned}$$

■

When two countries benefit equally from foreign direct investment, and the multinational is indifferent between two locations, political factors alone determine which country wins the competition. If a country's government is more influenced by special interest groups, then it wins the competition, and *vice versa*.

5 Welfare Analysis

We consider welfare effects in this section. Our benchmark is the case where $a^i \rightarrow \infty$, and $a^j \rightarrow \infty$, i.e., the two governments are benevolent. Notice that $\tilde{S}_i + \Delta\pi^M = \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j)$, $\tilde{S}_j = \frac{1}{32}\Delta_j$ in this case. Obviously,

$$\frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) > \frac{1}{32}\Delta_j, \quad (32)$$

by Assumption 1. Country i wins the competition for the multinational, and pays $b_i = \frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j)$, to the multinational in equilibrium. Country i 's national welfare is given by $W_i^i = \frac{1}{4}\Delta_i - [\frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j)]$, whilst country j 's national welfare is given by $W_i^j = \frac{7}{32}\Delta_j$.

Condition 32 implies that country i 's net gain from foreign direct investment, $\frac{1}{32}\Delta_i$, plus the profits that the multinational makes in country i , $\frac{1}{36}\Delta_i$, is strictly greater than country j 's net gain from foreign direct investment, $\frac{1}{32}\Delta_j$, plus the profits that the multinational makes in country j , $\frac{1}{36}\Delta_j$. I.e., allocative efficiency is achieved.¹⁸

Now consider the case where

$$\left(\frac{1}{32} + \frac{1}{36}\right)(\Delta_i - \Delta_j) \geq \frac{5}{144}\left(\frac{1}{a^i}\right)\Delta_i + \frac{1}{24}\left(\frac{1}{a^j}\right)\Delta_j.$$

Proposition 5 *Country i 's national welfare is equal to that in the benchmark case when it pays b_{i1}^{\min} to the multinational, otherwise its national welfare is strictly smaller than that in the benchmark case. Country j 's national welfare is the same as that in the benchmark case. And allocative efficiency is achieved.*

Proof. According to Proposition 1, country i wins the competition in equilibrium in this case. Country i pays the multinational b_{i1} , which is given by expression 22. Country i 's national welfare, $\frac{1}{4}\Delta_i - b_{i1}$, decreases strictly with b_{i1} . It takes its maximum value at b_{i1}^{\min} , which is given by expression 23. And $\frac{1}{4}\Delta_i - b_{i1}^{\min} = \frac{1}{4}\Delta_i - [\frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j)]$, which is equal to country i 's national welfare in the benchmark case. Otherwise, $\frac{1}{4}\Delta_i - b_{i1} < \frac{1}{4}\Delta_i - [\frac{1}{32}\Delta_j - \frac{1}{36}(\Delta_i - \Delta_j)]$. Since country j loses the competition for the multinational, it gets $\frac{7}{32}\Delta_j$, which is equal to its national welfare in the benchmark case.

Notice that b_{i1} is a transfer payment. And it is straightforward to show that allocative efficiency is achieved. ■

Since country i 's payment to the multinational is generally higher than its payment to the multinational in the benchmark case, its national welfare is generally lower than that in the benchmark case.

¹⁸Allocative efficiency requires that the multinational locates in a country such that the profits the multinational makes in that country and that country's benefits from foreign direct investment are jointly maximized.

Consider the case where

$$\begin{aligned} \frac{1}{24} \left(\frac{1}{a^i} \right) \Delta_i + \frac{5}{144} \left(\frac{1}{a^j} \right) \Delta_j + \left(\frac{1}{32} + \frac{1}{36} \right) (\Delta_i - \Delta_j) &\geq \\ \frac{5}{144} \left(\frac{1}{a^i} \right) \Delta_i + \frac{1}{24} \left(\frac{1}{a^j} \right) \Delta_j &> \left(\frac{1}{32} + \frac{1}{36} \right) (\Delta_i - \Delta_j). \end{aligned}$$

Proposition 6 *Country i 's national welfare is strictly smaller than that in the benchmark case. Country j 's national welfare is the same as that in the benchmark case. And allocative efficiency is achieved.*

Proof. According to Proposition 2, country i wins the competition in equilibrium in this case. Country i pays the multinational b_{i2} , which is given by expression 25. Country i 's national welfare, $\frac{1}{4}\Delta_i - b_{i2}$, decreases strictly with b_{i2} , which is given by expression 25. It takes its maximum value at b_{i2}^{\min} , which is given by expression 26. And $\frac{1}{4}\Delta_i - b_{i2}^{\min} = \frac{1}{4}\Delta_i - \left[\frac{1}{144} \left(\frac{1}{a^j} \right) \Delta_j + \frac{1}{32} \Delta_j - \frac{1}{36} (\Delta_i - \Delta_j) \right]$, which is strictly smaller than its national welfare in the benchmark case: $\frac{1}{4}\Delta_i - \left[\frac{1}{32} \Delta_j - \frac{1}{36} (\Delta_i - \Delta_j) \right]$. Since country j loses the competition for the multinational, it gets $\frac{7}{32}\Delta_j$, which is equal to its national welfare in the benchmark case.

Notice that b_{i2} is a transfer payment. And it is straightforward to show that allocative efficiency is achieved. ■

Since country i 's payment to the multinational is strictly higher than its payment to the multinational in the benchmark case, its national welfare is strictly lower than that in the benchmark case.

In Propositions 5 and 6, allocative efficiency is achieved. This is simply because that the interactions between economic and political factors determine country i as the winner of the competition.

Consider the case where

$$\frac{1}{24} \left(\frac{1}{a^i} \right) \Delta_i + \frac{5}{144} \left(\frac{1}{a^j} \right) \Delta_j + \left(\frac{1}{32} + \frac{1}{36} \right) (\Delta_i - \Delta_j) < \frac{5}{144} \left(\frac{1}{a^i} \right) \Delta_i + \frac{1}{24} \left(\frac{1}{a^j} \right) \Delta_j.$$

Proposition 7 *Country i 's national welfare is strictly smaller than that in the benchmark case. Country j 's national welfare is strictly smaller than that in the benchmark case. And allocative efficiency is not achieved.*

Proof. According to Proposition 3, country j wins the competition in equilibrium in this case. Country j pays the multinational b_j , which is given by expression 28. Country i 's national welfare is $\frac{7}{32}\Delta_i$. It is straightforward to show that this is strictly smaller than its national welfare in the benchmark case: $\frac{1}{4}\Delta_i - \left[\frac{1}{32} \Delta_j - \frac{1}{36} (\Delta_i - \Delta_j) \right]$. Country j 's national welfare, $\frac{1}{4}\Delta_j - b_j$, decreases strictly with b_j , which is given by expression 28. It takes its maximum value at b_j^{\min} , which is given by expression 29. And $\frac{1}{4}\Delta_j - b_j^{\min} = \frac{1}{4}\Delta_j - \left[\frac{1}{144} \left(\frac{1}{a^i} \right) \Delta_i + \frac{1}{32} \Delta_i + \frac{1}{36} (\Delta_i - \Delta_j) \right]$. It is straightforward

to show that this is strictly smaller than $\frac{7}{32}\Delta_j$, its national welfare in the benchmark case.

Notice that b_j is a transfer payment. And it is straightforward to show that the allocative efficiency is not achieved. ■

If country j 's government is far more influenced by special interest groups, so the cost it can bear to attract the multinational can be greater than country i 's government, then country j wins the competition in equilibrium. Now country i 's potential gain from foreign direct investment is not realized, at the same time country j makes payment to the multinational. Hence, both country i 's and country j 's national welfare are strictly smaller than their national welfare in the benchmark case. And allocative efficiency is not achieved.

In summary, each country's national welfare is smaller or equal to its national welfare in the benchmark case, and at least one country's national welfare is smaller than its national welfare in the benchmark case. And allocative efficiency cannot be always achieved.

6 An Extension: Minimum Wage Rate

In the previous analysis, we suppose that the wage rate in each country is equal to the competitive wage rate. In many countries, however, minimum wage rate policies are used. In this section, we introduce this policy into our model and consider its effects.

Let the minimum wage rate in country i be \underline{w}_i , which is assumed to be strictly greater than w_i^c . When the multinational locates in country i , we can show

$$\begin{aligned}
 q_{ii} &= q_i^M = \frac{\alpha_i - m_i^i - \gamma_i \underline{w}_i}{6\beta_i}, \\
 L_i^i &= L_i^M = \gamma_i \left(\frac{\alpha_i - m_i^i - \gamma_i \underline{w}_i}{6\beta_i} \right), \\
 \pi_i^i &= \pi_i^M = \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{36\beta_i}, \\
 \omega_i^i &= \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{6\beta_i}, \\
 cs_i^i &= \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{18\beta_i}, \\
 W_i^i &= cs_i^i + \omega_i^i + \pi_i^i = \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{4\beta_i}.
 \end{aligned}$$

When the multinational locates in country j , we can show

$$\begin{aligned}
q_{ij} &= \frac{\alpha_i - m_i^i - \gamma_i \underline{w}_i}{4\beta_i}, \\
L_j^i &= \gamma_i \left(\frac{\alpha_i - m_i^i - \gamma_i \underline{w}_i}{4\beta_i} \right), \\
\pi_j^i &= \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{16\beta_i}, \\
\omega_j^i &= \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{8\beta_i}, \\
cs_j^i &= \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{32\beta_i}, \\
W_j^i &= cs_j^i + \omega_j^i + \pi_j^i = \frac{7(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{32\beta_i}.
\end{aligned}$$

We summarize the results in Table 3.

Term	FDI	NO	WELFARE CHANGE
consumers' surplus	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{18\beta_i}$	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{32\beta_i}$	$\frac{7(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{288\beta_i}$
employment gains	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{6\beta_i}$	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{8\beta_i}$	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{24\beta_i}$
domestic profits	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{36\beta_i}$	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{16\beta_i}$	$-\frac{5(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{144\beta_i}$
national welfare	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{4\beta_i}$	$\frac{7(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{32\beta_i}$	$\frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{32\beta_i}$

Table 3: The redistribution effects of FDI under the policy of minimum wage rate

The similar results hold for country j . We define

$$\Delta'_i \equiv \frac{(\alpha_i - m_i^i - \gamma_i \underline{w}_i)^2}{\beta_i}, \quad \Delta'_j \equiv \frac{(\alpha_j - m_j^j - \gamma_j \underline{w}_j)^2}{\beta_j}.$$

Notice that

$$\Delta'_i < \Delta_i, \quad \Delta'_j < \Delta_j,$$

since $\underline{w}_i > w_i^c = \frac{1}{\gamma_i}$, and $\underline{w}_j > w_j^c = \frac{1}{\gamma_j}$. Without loss of generality, we make the following Assumption.

Assumption 2

$$\Delta'_i > \Delta'_j.$$

Therefore, the analysis in this case is similar to that in the basic model. In particular, we have the following Proposition.

Proposition 8 *If $a^i = a^j$, $\alpha_i = \alpha_j$, $\beta_i = \beta_j$, $m_i^i = m_j^j$, and $\gamma_i = \gamma_j$, then country i wins the competition for the multinational in equilibrium if and only if $\underline{w}_i \leq \underline{w}_j$.*

Proof. Given $a^i = a^j$, $\alpha_i = \alpha_j$, $\beta_i = \beta_j$, $m_i^i = m_j^j$, and $\gamma_i = \gamma_j$. According to Proposition 4, country i wins the competition for the multinational in equilibrium, if and only if

$$\begin{aligned} \left(\frac{1}{32} + \frac{1}{36}\right) (\Delta'_i - \Delta'_j) &\geq \frac{1}{144} \left(\frac{1}{a^j}\right) \Delta'_j - \frac{1}{144} \left(\frac{1}{a^i}\right) \Delta'_i \\ &\Leftrightarrow \\ \left(\frac{1}{32} + \frac{1}{36}\right) (\Delta'_i - \Delta'_j) + \frac{1}{144} \left(\frac{1}{a}\right) (\Delta'_i - \Delta'_j) &\geq 0, \text{ since } a^i = a^j \\ &\Leftrightarrow \\ \Delta'_i - \Delta'_j &\geq 0 \\ &\Leftrightarrow \\ \underline{w}_i &\leq \underline{w}_j. \end{aligned}$$

■

Since $a^i = a^j$, government i and government j are influenced equally by special interest groups. Now economic factors alone determine which country wins the multinational. Given $\alpha_i = \alpha_j$, $\beta_i = \beta_j$, $m_i^i = m_j^j$, and $\gamma_i = \gamma_j$, country i benefits more from foreign direct investment, and the multinational's preferred location is country i , if country i 's minimum wage rate is lower than country j 's minimum wage rate, and *vice versa*.

7 Conclusion

We have used a political economy approach to study competition for a multinational between two countries. We show that whether a country wins this competition is determined by both economic factors and the extent to which each country's government is influenced by domestic special interest groups.

Two testable hypotheses are derived. First, if a less attractive country in an economic sense (e.g., having small domestic market and high labor cost,) wins the competition, then the extent to which this country's government is influenced by special interest groups must be greater than the extent to which the other country's government is influenced. Second, if the economic attractiveness of the two countries is the same, then the country that is more influenced by special interest groups wins the competition.

We then do welfare analysis. Allocative efficiency cannot be always achieved. It requires that the multinational locates in a particular country. However, if the other country's government is far more influenced by special interest groups, then the cost

it can bear to attract the multinational may be greater than the cost its rival can bear to attract the multinational. In this case, the other country wins the competition.

We also introduce minimum wage policy into the model, and find that other things being equal, in particular, the two governments are equally influenced by special interest groups, then a country wins the competition if and only if it sets a lower minimum wage rate.

It should be noted that in Haufler and Wooton (1999), Barros and Cabral (2000), and Fumagalli (2003), which study competition for a multinational between countries having welfare-maximizing governments, allocative efficiency is always achieved. However, we show that this can be changed if political distortions exist. Biglaiser and Mezzetti (1997) derive a similar result as ours: the allocation of foreign direct investment may be inefficient. However, this research and theirs are complements rather than substitutes. The driving force of our model is special interest politics, whilst the driving force of their model is politicians' re-election concerns.

Besides the contributions to the existing literatures of competition for foreign direct investment, this research has significant policy implications. Recently, José Manuel Barroso, the new president of the European Commission, assailed French and German efforts to end tax competition among European Union countries.

“Some member countries would like to use tax harmonization to raise taxes in other countries to the high-tax levels in their own countries,” Mr. Barroso said in an interview during the World Economic Forum’s annual meeting in this Swiss ski resort. “We do not accept that. And member states will not accept it.”¹⁹

His view has been supported by some economists. For example, Milton Friedman said that

Competition, not identity, among countries in government taxation and spending is highly desirable. How can competition be good in the provision of private goods and services but bad in the provision of governmental goods and services? A governmental tax and spending cartel is as objectionable as a private cartel.²⁰

However, this paper gives a caveat to this optimistic view. We point out that this competition might end up with allocative inefficiency when special interest politics are present.

One may argue that in this paper we just consider the simplest case where there is no trade between countries. However, we wonder whether the basic results derived from this case could be changed when considering more complicated cases. The key point is that since foreign direct investment has income redistribution effects,

¹⁹ *Wall Street Journal Europe*, 31 January 2005.

²⁰ See Barros and Cabral (2000).

different special interest groups have incentives to lobby the government to attract, or not to attract the multinational. Considering more complicated cases is equivalent to considering different redistributions due to foreign direct investment. The key point is unlikely to change.

Things would become more interesting if we consider the case where direct export is one of the multinational's options. Now, a trade union may lobby a high tariff, and a high subsidy; whilst a firm may lobby a low tariff, and a low subsidy. To think how this new game would be played is in our agenda.

In this paper, we use Subgame Perfect Nash Equilibrium rather than Truthful Equilibrium as a solution concept because special interest groups' contribution schedules are contingent on the outcome of competition for the multinational rather than governments' actions, which is the case considered by Bernheim and Whinston (1986) where Truthful Equilibrium is used as a solution concept. How do we develop a "truthful equilibrium", which is the counterpart of Truthful Equilibrium in Bernheim and Whinston (1986), in our case? This is an interesting research question as well.

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Appendix Proofs

Proof of Proposition 1

Suppose that $C_i^T = 0$, C_i^F , C_j^T , and $C_j^F = 0$, constitute an equilibrium, in which country i wins the competition for the multinational. According to Lemma 1, we must have $(\frac{1}{a^i})(0 - \frac{5}{144}\Delta_i) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq (\frac{1}{a^j})(C_{jj}^T - 0) + \frac{1}{32}\Delta_j$. Hence, firm i cannot make unilateral profitable deviation. We also must have $(\frac{1}{a^i})(0 - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq (\frac{1}{a^j})(\frac{1}{24}\Delta_j - 0) + \frac{1}{32}\Delta_j$. Hence trade union j cannot make

unilateral profitable deviation. In summary, if the proposed strategy profile is an equilibrium, in which country i wins this competition, then $(\frac{1}{32} + \frac{1}{36})(\Delta_i - \Delta_j) \geq \max\{\frac{5}{144}(\frac{1}{a^i})\Delta_i + (\frac{1}{a^j})C_{jj}^T, (\frac{1}{a^i})C_{ij}^F + \frac{1}{24}(\frac{1}{a^j})\Delta_j\}$. Notice that we choose arbitrarily C_{ij}^F , and C_{jj}^T , this implies that condition 21 must holds.

Given that condition 21 holds. According to Lemma 1, it is straightforward to show that zero contribution schedule is a dominant strategy for trade union i , and zero contribution schedule is a dominant strategy for firm j ; and either firm i , or trade union j cannot make unilateral profitable deviation, i.e., make country j win the competition for the multinational. ■

Proof of Proposition 2

Suppose that the strategy profile $(C_i^T, C_i^F, C_j^T, C_j^F)$ constitutes an equilibrium, in which country i wins the competition for the multinational. What properties does this strategy profile must have?

Given C_i^F , C_j^T , and C_j^F , we must have $(\frac{1}{a^i})(\frac{1}{24}\Delta_i - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq (\frac{1}{a^j})(C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j$, otherwise, country i cannot win the competition, a contradiction. According to Lemma 1, $C_{ii}^T = \max\{0, z_i^T\}$, where z_i^T is determined by

$$\left(\frac{1}{a^i}\right)(z_i^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right)(C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j, \quad (\text{A1})$$

$z_i^T \leq \frac{1}{24}\Delta_i$. Given C_i^T , C_j^T , and C_j^F , we must have $(\frac{1}{a^i})(C_{ii}^T - \frac{5}{144}\Delta_i) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq (\frac{1}{a^j})(C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j$, otherwise, country i cannot win the competition, a contradiction. According to Lemma 1, $C_{ij}^F = [0, \frac{5}{144}\Delta_i]$. Given C_i^T , C_i^F , and C_j^F , we must have $(\frac{1}{a^i})(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq (\frac{1}{a^j})(\frac{1}{24}\Delta_j - C_{ji}^F) + \frac{1}{32}\Delta_j$, otherwise, country i cannot win the competition, a contradiction. According to Lemma 1, $C_{jj}^T = [0, \frac{1}{24}\Delta_j]$. Given C_i^T , C_i^F , and C_j^T , we must have $(\frac{1}{a^i})(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq (\frac{1}{a^j})(C_{jj}^T - \frac{5}{144}\Delta_j) + \frac{1}{32}\Delta_j$, otherwise, country i cannot win the competition, a contradiction. According to Lemma 1, $C_{jj}^F = \max\{0, z_j^F\}$, where z_j^F is determined by

$$\left(\frac{1}{a^i}\right)(C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right)(C_{jj}^T - z_j^F) + \frac{1}{32}\Delta_j, \quad (\text{A2})$$

$$z_j^F \leq \frac{5}{144}\Delta_j.$$

Now we claim $z_i^T \geq 0$. Suppose $z_i^T < 0$. Then $C_{ii}^T = \max\{0, z_i^T\} = 0$. Now we have

$$\left(\frac{1}{a^i}\right)(0 - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) > \left(\frac{1}{a^j}\right)(C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j.$$

However, if this is true, firm j can choose $C_{ji}^F - \varepsilon$, $\varepsilon > 0$, such that

$$\left(\frac{1}{a^i}\right)(0 - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) > \left(\frac{1}{a^j}\right)[C_{jj}^T - (C_{ji}^F - \varepsilon)] + \frac{1}{32}\Delta_j.$$

This is contradicted to the hypothesis that the strategy profile $(C_i^T, C_i^F, C_j^T, C_j^F)$ constitutes an equilibrium.

We also claim $z_j^F \geq 0$. Suppose $z_j^F < 0$. Then $C_{ji}^F = \max\{0, z_j^F\} = 0$. Now we have

$$\left(\frac{1}{a^i}\right) (C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) > \left(\frac{1}{a^j}\right) (C_{jj}^T - 0) + \frac{1}{32}\Delta_j.$$

However, if this is true, trade union i can choose $C_{ii}^T - \varepsilon$, $\varepsilon > 0$, such that

$$\left(\frac{1}{a^i}\right) [(C_{ii}^T - \varepsilon) - C_{ij}^F] + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) > \left(\frac{1}{a^j}\right) (C_{jj}^T - 0) + \frac{1}{32}\Delta_j.$$

This is contradicted to the hypothesis that the strategy profile $(C_i^T, C_i^F, C_j^T, C_j^F)$ constitutes an equilibrium.

Since we must have $C_{ii}^T = \max\{0, z_i^T\} = z_i^T \geq 0$, and $C_{jj}^F = \max\{0, z_j^F\} = z_j^F \geq 0$, equation (A1) and equation (A2) coincide. Hence, in equilibrium

$$\left(\frac{1}{a^i}\right) (C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j. \quad (\text{A3})$$

Since $z_i^T \leq \frac{1}{24}\Delta_i$, we have $0 \leq C_{ii}^T \leq \frac{1}{24}\Delta_i$, i.e., C_{ii}^T in equation (A3) is well defined. Since $z_j^F \leq \frac{5}{144}\Delta_j$, we have $0 \leq C_{ji}^F \leq \frac{5}{144}\Delta_j$, i.e., C_{ji}^F in equation (A3) is well defined.

We claim in equation (A3) $C_{ij}^F = \frac{5}{144}\Delta_i$. Suppose $0 \leq C_{ij}^F < \frac{5}{144}\Delta_i$. If this is true, firm i can choose $\frac{5}{144}\Delta_i - \varepsilon > C_{ij}^F$, $\varepsilon > 0$, such that

$$\left(\frac{1}{a^i}\right) \left[C_{ii}^T - \left(\frac{5}{144}\Delta_i - \varepsilon \right) \right] + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) < \left(\frac{1}{a^j}\right) (C_{jj}^T - C_{ji}^F) + \frac{1}{32}\Delta_j.$$

This is contradicted to the hypothesis that the strategy profile $(C_i^T, C_i^F, C_j^T, C_j^F)$ constitutes an equilibrium. We also claim in equation (A3) $C_{jj}^T = \frac{1}{24}\Delta_j$. Suppose $0 \leq C_{jj}^T < \frac{1}{24}\Delta_j$. If this is true, trade union j can choose $\frac{1}{24}\Delta_j - \varepsilon > C_{jj}^T$, $\varepsilon > 0$, such that

$$\left(\frac{1}{a^i}\right) (C_{ii}^T - C_{ij}^F) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) < \left(\frac{1}{a^j}\right) \left[\left(\frac{1}{24}\Delta_j - \varepsilon \right) - C_{ji}^F \right] + \frac{1}{32}\Delta_j.$$

This is contradicted to the hypothesis that the strategy profile $(C_i^T, C_i^F, C_j^T, C_j^F)$ constitutes an equilibrium.

So far, we have shown that in equilibrium

$$\left(\frac{1}{a^i}\right) \left(C_{ii}^T - \frac{5}{144}\Delta_i \right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) = \left(\frac{1}{a^j}\right) \left(\frac{1}{24}\Delta_j - C_{ji}^F \right) + \frac{1}{32}\Delta_j. \quad (\text{A4})$$

I.e., trade union i chooses $C_i^T = (C_{ii}^T, 0)'$, firm i chooses $C_i^F = (0, \frac{5}{144}\Delta_i)'$, trade union j chooses $C_j^T = (0, \frac{1}{24}\Delta_j)'$, and firm j chooses $C_j^F = (C_{ji}^F, 0)'$, where C_{ii}^T ,

and C_{ji}^F satisfy equation (A4). Notice that The LHS of (A4) increases with C_{ii}^T , and the RHS of (A4) decreases with C_{ji}^F . This implies that $\left(\frac{1}{a^i}\right) \left(\frac{1}{24}\Delta_i - \frac{5}{144}\Delta_i\right) + \frac{1}{32}\Delta_i + \frac{1}{36}(\Delta_i - \Delta_j) \geq \left(\frac{1}{a^j}\right) \left(\frac{1}{24}\Delta_j - \frac{5}{144}\Delta_j\right) + \frac{1}{32}\Delta_j$. This plus Proposition 1 implies condition 24.

Given that condition 24 holds. It is straightforward to show that any player's proposed strategy is a best response to other players' proposed strategies. Hence, a continuum of equilibria is established. And it is easy to see that this form of equilibria is unique since in any equilibrium, we must have $C_{ij}^F = \frac{5}{144}\Delta_i$, and $C_{jj}^T = \frac{1}{24}\Delta_j$. ■

Proof of Proposition 4

$$\tilde{S}_i + \Delta\pi^M \left\{ \begin{array}{l} \geq \\ < \end{array} \right\} \tilde{S}_j$$

$$\Leftrightarrow$$

$$\frac{1}{24} \left(\frac{1}{a^i}\right) \Delta_i + \frac{5}{144} \left(\frac{1}{a^j}\right) \Delta_j + \left(\frac{1}{32} + \frac{1}{36}\right) (\Delta_i - \Delta_j) \left\{ \begin{array}{l} \geq \\ < \end{array} \right\}$$

$$\frac{5}{144} \left(\frac{1}{a^i}\right) \Delta_i + \frac{1}{24} \left(\frac{1}{a^j}\right) \Delta_j.$$

Now, if $\tilde{S}_i + \Delta\pi^M \geq \tilde{S}_j$, then we have two forms of equilibria. One is given by Proposition 1, and the other Proposition 2. Country i wins the competition irrespective of the forms of equilibria. If country i wins the competition in equilibrium, then this equilibrium is characterized by either Proposition 1 or Proposition 2. If it is characterized by Proposition 1, then $\left(\frac{1}{32} + \frac{1}{36}\right) (\Delta_i - \Delta_j) \geq \frac{5}{144} \left(\frac{1}{a^i}\right) \Delta_i + \frac{1}{24} \left(\frac{1}{a^j}\right) \Delta_j$ implies $\tilde{S}_i + \Delta\pi^M \geq \tilde{S}_j$. If it is characterized by Proposition 2, then we also have $\tilde{S}_i + \Delta\pi^M \geq \tilde{S}_j$.

The second part of this Proposition is implied by Proposition 3. ■