# Double-edged Incentive Competition for Foreign Direct Investment*

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**Abstract**

This paper studies the impact of special interest lobbying on competition between two countries for a multinational in a common agency framework. We address the following questions. On the positive side, is special interest lobbying a determinant of competition for FDI? If so, how does it work? How does it affect the equilibrium price for attracting FDI? On the normative side, what are the welfare effects of FDI competition when special interest lobbying is present? Is allocative efficiency always achieved? We argue that special interest lobbying provides an extra political incentive for a government to attract FDI. We show that compared to the benchmark case when governments maximize national welfare, now (1) an economically disadvantageous country has a chance to win the competition; (2) the equilibrium price for attracting FDI is higher than in the benchmark case; (3) allocative efficiency cannot be always achieved.

*Key Words:* Foreign direct investment (Multinational), Incentive competition, Special interest lobbying, Common agency
*JEL Classification:* D72, F23, H25, H71, H73, H87

## 1 Introduction

The world has witnessed fierce FDI competition between countries during recent years. For instance, Table 1 lists some of the competitions that have occurred in Europe.[1]

Countries have an economic incentive to attract FDI since possible benefits of FDI include job creation, antitrust, technological spillover and import substitution effects. In order to achieve

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[1] This table is based on Table III.7 of UNCTAD (1996). Competition for FDI is extensively documented by UNCTAD (1996) and Oman (2000).

| 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

these potential beneficiary effects, countries tend to give favorable offers to companies. However, in some cases, financial incentives provided were unbelievably high. Consider the case where Portugal, Spain and UK competed for Ford and Volkswagen in 1991. Portugal won the competition but the Portuguese government paid over 250,000 US dollars to companies in order to create one new job. Did Portugal really benefit that much from foreign investments? People have good reason to question whether the Portuguese government behaved efficiently since they can hardly understand why a national-welfare-maximizing government made such a generous offer to foreign investors.[2]

This puzzle stimulates our research. In this paper, we study the impact of special interest lobbying on competition between countries for FDI. We want to address the following questions. On the positive side, is special interest lobbying a determinant of competition for FDI? If so, how does it work? How does it affect the equilibrium price for attracting FDI? On the normative side, what are the welfare effects of FDI competition when special interest lobbying is present? Is allocative efficiency always achieved?

Our basic idea is as follows. FDI 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 FDI, whilst the special interest groups who are the losers of this redistribution have an incentive to lobby the government not to attract the FDI. The government's objective is shaped by this political competition. Governments then engage in competition for FDI. The outcome of this competition determines national welfare of

[2]See Barba Navaretti and Venables *et al.* (2004), Chapter 10, section 10.3.1.

each country. 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 anticipation of how the special interest groups in other countries lobby their governments, and should take into account the equilibrium outcome of competition for FDI, given that lobby behavior is sunk. This idea is illustrated in Figure 1.

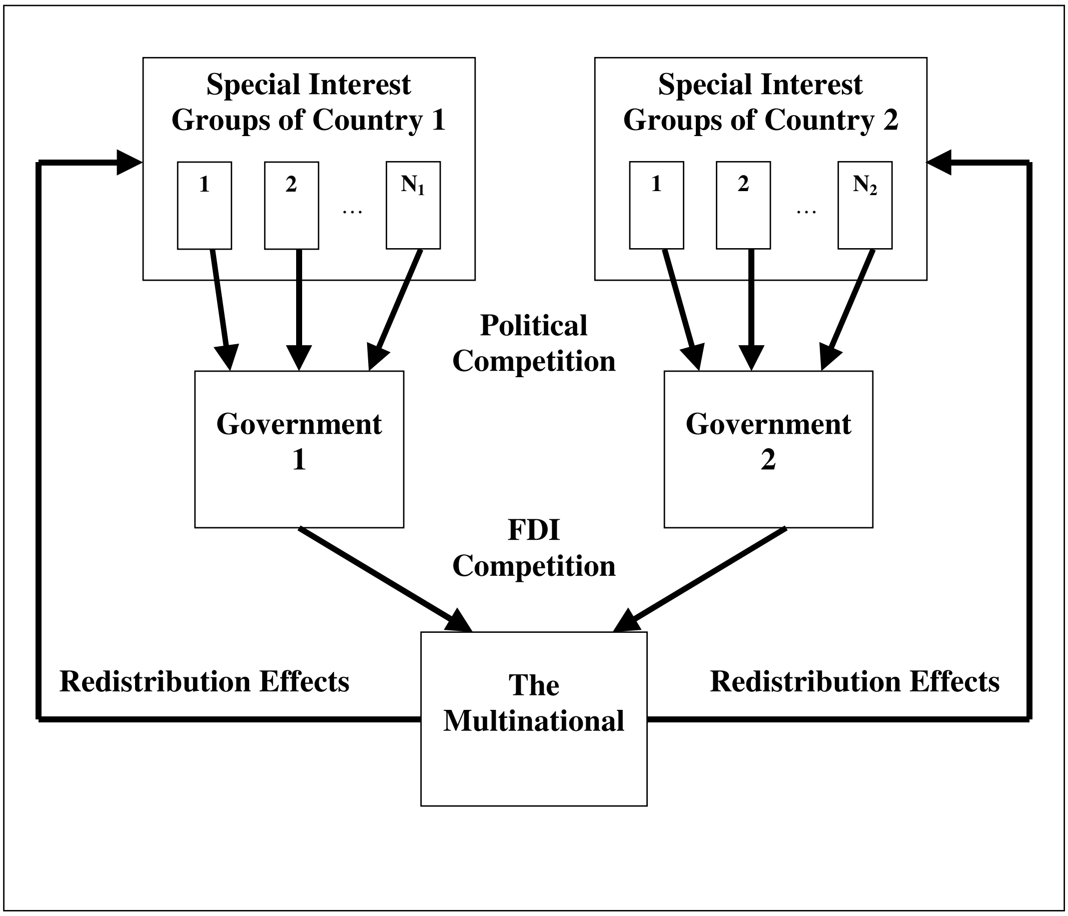


Figure 1: Illustration of the basic idea

How do we put this idea to work? We consider the case where two countries compete for a multinational. There is a monopoly market for 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 economic rents, whilst the domestic firm does not welcome the multinational because its profits will decrease. The shaping of a government's objective by the trade union and the domestic firm 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]

[3]In our model, we treat the trade union and the domestic firm in each country as special interest groups. Lahiri and Ono (2004) point out that the trade union who wants the government to stipulate that multinationals purchase most their inputs from the local markets, has an incentive to lobby the government, and the purpose is to maximize the income of workers. Kayalica and Lahiri (2003) point out that almost all countries have well-

Common agency is initiated by Bernheim and Whinston (1986), and is successfully used to study political economy of trade policy by Grossman and Helpman (1994). Grossman and Helpman (1994) develop a political contributions approach in which at the first place special interest groups acting as principals simultaneously make political contributions, which are functions of trade policies, then after observing political contributions the government acting as the agent chooses trade policies to maximize a weighted sum of political contributions and national welfare with more weight putting on political contributions. Grossman and Helpman (1994) capture the idea that when special interest groups are present, the mechanism of trade policy making would fail to internalize all benefits and costs as the consequence of trade policies. Applying this framework to studying competition for FDI shows the possibility that the cost of subsidizing FDI is not fully internalized and a government's willingness to pay for FDI may be higher than its country's economic incentive to attract FDI.[4]

But a common agency framework *per se* is not sufficient to determine the equilibrium price for attracting FDI since we consider competition between two countries for FDI. As our basic idea shows, we study a situation in which two common agencies compete with each other. This relates to Putnam's idea of a two-level game.[5] Several papers explore this idea in different settings. Grossman and Helpman (1995a) study the impact of special interest politics on negotiation of a free-trade agreement between two countries. Grossman and Helpman (1995b) introduce special-interest politics to the analysis of international trade relations, considering both noncooperative tariff setting and negotiated tariffs. Aidt and Hwang (2006) study whether international lobbying can be a substitute for failed international agreements in the context of a two-country economy where national governments use labour standards to regulate working conditions in their country. Persson and Tabellini (1992) study the effects of election under majority rule on competition for mobile capital between countries in order to shed light on the repercussions of European integration on fiscal policies in different countries.[6] Our paper gives a new application of the idea of a two-level game showing that how it can be used to study competition for FDI when governments are influenced by special interest groups.[7]

Notice that in the benchmark case when governments maximize national welfare, an economically advantageous country wins competition for FDI for sure. The equilibrium price for attracting FDI is equal to the other country's economic incentive to attract FDI minus the multinational's investment premium in the winning country (or plus the multinational's investment

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

[4]Notice that we follow this political contributions framework, but political contributions are not contingent on governments' actions (lump-sum subsidies or taxes) but the outcome of FDI competition in our model.

[5]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." See Putnam (1988), pp. 434.

People may argue that in his original work, Putnam (1988) does not suggest whether the idea of a two-level game should be modelled as a sequential game or a simultaneous game. However, in economic analysis, this idea is related to the idea of strategic delegation and is modelled as a sequential game. See Grossman and Helpman (1995b), and Persson and Tabellini (1995).

[6]Persson and Tabellini (2000) present a slightly different version of this model. See Chapter 12, section 12.4.4.

[7]Notice that in Persson and Tabellini (1992), voters do not vote directly on policy but elect a policy maker who makes policy decision. In Grossman and Helpman (1995a), (1995b), Aidt and Hwang (2006) and our paper, special interest groups lobby directly for policies.

premium in the other country). Allocative efficiency is always achieved.

But when special interest lobbying is present, all these results can be changed.

First of all, special interest groups provide a government an extra political incentive to attract FDI via the domestic political competition. If in the economically disadvantageous country, the political incentive provided is great enough to dominate both the other country's economic advantage and the other government's political incentive to attract FDI, then the economically disadvantageous country wins competition for FDI. Otherwise, the economically advantageous country wins the competition.

Two testable hypotheses are derived. First, if the economically disadvantageous country wins FDI competition, then the extent to which its government is influenced by special interest groups must be greater than the extent to which the other government is influenced. Second, if no country has an economic advantage over the other country in FDI competition, then the country whose government is more influenced by special interest groups, wins the competition.

The equilibrium price for attracting FDI is higher than in the case when governments maximize national welfare. The competition for the multinational can be viewed as a Bertrand game. When special interest lobbying is present, each government is provided an extra political inventive to attract FDI besides an economic incentive. So, irrespective of who wins the competition, the payments to the multinational must be higher than before.

We then do welfare analysis. Allocative efficiency cannot be always achieved. This happens when the economically disadvantageous country wins the competition.

As an application of the model, we provide a possible explanation of the competition between Portugal, Spain and UK in 1991. Our conjecture is that UK had an economic advantage over Portugal in the competition. But Portugal won the competition, at a 'price' of 250,000 US dollars per job. We think that special interest lobbying mattered there. The Portuguese government was far more influenced by special interest groups than Spanish and UK governments. The trade union won the political competition in Portugal and provided a sufficiently great political incentive for the Portuguese government to dominate its rivals in international arena. Since Spanish and UK governments were also politically-motivated, as a result, the Portuguese government paid a high price for attracting the two companies.

This is the first paper studying the effects of special interest politics on competition for FDI and is related to several strands of literatures.

Many papers study competition for FDI from a purely economic angle. For example, Haufler and Wooton (1999), Barros and Cabral (2000), and Fumagalli (2003) study competition for a multinational in the framework of imperfect competition. Barba Navaretti and Venables *et al.* (2004) discuss the implications of policy competition for a multinational in a simple model.[8] Haaparanta (1996) considers the case where the exogenously given FDI is perfectly divisible, and countries compete for their own shares. They all assume that governments seek to maximize national welfare, and study the strategic interactions between governments. We have shown that the results obtained under this assumption do not hold when special interest lobbying plays a role in competition for FDI.

To the best of our knowledge, Biglaiser and Mezzetti (1997) is the only other 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. They derive a similar result to ours: the allocation of FDI 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

[8]See Chapter 10, section 10.3.1.

is politicians' re-election concerns. Our and their papers together send a message that political factors have big impact on competition for FDI. In Biglaiser and Mezzetti (1997) 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 FDI are considered explicitly in this paper.

Tax competition for mobile capital, which assuming perfect competition, whilst introducing asymmetries between countries, and studying the interaction between different tax instruments, is one of the most important themes in traditional public finance. However, since profit-maximizing firm is far different from mobile capital, as Fumagalli (2003) notes:[9] this approach is more appropriate when dealing with competition for portfolio investment rather than for FDI.[10] See Wilson (1999), and Wilson and Wildasin (2004) for surveys of tax competition literatures.

Besides the contributions to the existing literatures of competition for FDI, 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."[11]

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."[12]

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

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 discuss the robustness of results obtained in this paper, and the final section concludes. See Appendix for some technical 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

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

[9] Also see the references she cites.

[10] As noted in the above discussion, Persson and Tabellini (1992), and Persson and Tabellini (2000) explore the political economy implications of competition for mobile capital between countries. But for the same reason, we wonder whether their approach is appropriate for studying competition for FDI from a political economy angle.

[11] *Wall Street Journal Europe*, January 31, 2005. Notice that the tax competition that he mentioned is one form of incentive competition for FDI.

[12] *Wall Street Journal Europe*, July 29, 1998.

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 $m_i$ 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, which is immobile between two countries, is the only input for producing $q_i$, and the technology is a Ricardian one:

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

where $\gamma_i$ is the inverse of the input-output coefficient, and the marginal product of labor is $\frac{1}{\gamma_i}$. We assume that the workers' opportunity wage rate, $w_i^c$, is equal to the marginal product of labor.[13] 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 and noncooperatively by giving the government political contributions contingent on the multinational's location.[14] In particular, trade union $i$'s contribution schedule is given by

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

where $C_i^T \geq 0$. Domestic firm $i$'s contribution schedule is given by

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

where $C_i^F \geq 0$. $i = 1, 2$, $j = 1, 2$, $i \neq j$. Notice that the multinational is not allowed to make political contributions.[15]

Stage 2: After observing all contribution schedules, two governments announce simultaneously a lump-sum subsidy $b_i$ to the multinational.[16]

Stage 3: The multinational makes its location choice. We suppose that the multinational wants to establish a subsidiary in country 1 or 2.[17]

[13] We make this assumption in order to simplify analysis. Our key results are not dependent on it. See discussion in section 6.

[14] Notice that in Bernheim and Whinston (1986), (and Grossman and Helpman (1994)), the contract (the contribution schedule) offered to the agent (the government) by a principal (a special interest group) is contingent on the agent's actions (trade policies). Our approach is different from theirs.

[15] See discussion in the Conclusion.

[16] If $b_i$ is negative, it is a lump-sum tax.

[17] We do not consider direct export as one of the multinational's possible options in this paper. See discussion in the Conclusion.

Stage 4: The wage rate and the employment level are determined in each country. The trade union moves first and sets the wage rate. After observing the wage rate, the domestic firm decides how much labor to employ when the multinational does not locate in the country; whilst the domestic firm and the multinational make employment decisions simultaneously and noncooperatively when the multinational locates in the country. (We use a Leontief model to characterize the strategic interactions in this stage.)

Stage 5: Product market competition. We assume that if the multinational locates in country $i$, it will adopt the same technology as firm $i$'s technology. In addition, we suppose that there is no trade between the two countries. In this stage, firm $i$ and the multinational engage in Cournot competition when the multinational locates in country $i$. Otherwise, firm $i$ sets its monopoly outputs.[18]

Then the game is over.

*Payoffs:*

A domestic firm receives its profits minus its political contributions. A trade union receives its economic rents minus its political contributions. The economic rents are defined as the product of the difference between the actual wage rate and the opportunity wage rate and the employment level.

Government $i$'s payoffs are given by

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

$W_i^i$ is country $i$'s national welfare when it wins the competition for the multinational, whilst $W_j^i$ is its national welfare when it loses the competition. National welfare is defined as the sum of (1) consumers' surplus,[19] (2) domestic firm's profits, and (3) economic rents. 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.[20] $\lambda^i$ is a parameter that represents the marginal rate of substitution between political contributions and national welfare. The larger is $\lambda^i$, the more weight is placed on political contributions relative to national welfare, and the more government $i$ is influenced by trade union $i$ and firm $i$.[21] When $\lambda^i$ goes to infinity, government $i$'s payoffs are equivalent to political contributions. When $\lambda^i = 0$, government $i$'s payoffs are national welfare and cannot be influenced by political contributions.[22]

[18] People may argue that a more realistic setting is to consider the case when the multinational is allowed to trade between countries, though domestic firms not. However, we doubt that the basic results derived from the simplest case – the no-trade case – would be changed when considering this more complicated case. See discussion in section 6.

[19] We assume that workers do not consume the good produced by themselves.

[20] When it collects a lump-sum tax from the multinational, the tax revenue is distributed among consumers by a lump-sum subsidy.

[21] Notice that the coefficient of national welfare is 1, so $\lambda^i$ is both an absolute weight and a relative weight.

[22] It should be noted that government $i$'s objective takes a linear form. The use of this is initiated by Grossman and Helpman (1994), in which a government's objective is given by

$$G = C + aW,\ a \geq 0,$$

where $C$ is the sum of political contributions that a government receives, $W$ is a country's national welfare, which includes political contributions, and $a$ is the marginal rate of substitution between national welfare and political contributions.

Other authors, for example, Rama and Tabellini (1998), and Kayalica and Lahiri (2003), write a government's objective as follows:

$$G' = (\rho - 1)\, C + W,\ \rho \geq 1.$$

The multinational receives its profits plus the subsidy that it receives (or minus the tax that it is levied).

We solve the model in section 3 and 4 from backward and use a Coalition-Proof Nash Equilibrium (hereafter CPNE) as the solution concept in the first stage of the game.[23]

# 3 Equilibrium Analysis I: The Last 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:

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

whilst the multinational maximizes its profits:

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

$q_{ii}$ denotes the domestic firm's sales in country $i$, $q_i^M$ denotes the multinational's sales in country $i$, and $w_{ii}$ denotes 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:[24]

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

Hence, the equilibrium employment levels are given by

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

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

In the penultimate stage, trade union $i$ maximizes its economic rents:

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

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Again, $C$ represents total political contributions that a government receives, and $W$ represents a country's national welfare. $\rho - 1$ is the marginal rate of substitution between political contributions and national welfare. Hence, $\rho - 1$ is the inverse of $a$.

Define

$$\lambda \equiv \rho - 1, \; \lambda \geq 0.$$

We have the objective function used in our paper.

[23] One may argue that there is a problem about credibility and commitment on the payments of political contributions. When FDI competition is end, lobbies may have a strict incentive not to give governments the promised political contributions.

But it seems not to be a big problem since as Aidt and Magris (2006) point out: "In reality, ..., one expects that governments would punish lobby groups that do not keep their promises and that this would go some way towards providing proper incentives for the lobbies to keep their promises."

[24] Notice that the first-order conditions are also sufficient in this standard Cournot game.

From the first-order condition for maximization, we can solve for the equilibrium wage rate:

$$w_{ii} = \frac{\alpha_i + 1}{2\gamma_i}. \tag{4}$$

Using expression (4), we can show

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

Notice that $cs_i^i$ denotes the consumers' surplus when the multinational locates in country $i$.[25]

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

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

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

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

Hence, the equilibrium employment levels are given by

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

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

In the penultimate stage, trade union $i$ maximizes its economic rents:

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

From the first-order condition for maximization, we can solve for the equilibrium wage rate:[26]

$$w_{ij} = \frac{\alpha_i + 1}{2\gamma_i}. \tag{5}$$

[25] It should be noted that $q_{ii}$, and $q_i^M$ are not functions of $\gamma_i$ 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 $\gamma_i$ units of labor, and the unit production cost is the product of $\gamma_i$ 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, $\gamma_i$ 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 is 1 in the case that we consider.

[26] Notice that $w_{ii} = w_{ij}$, since the equilibrium employment levels when the multinational locates in country $i$ are proportionate to those when the multinational locates in country $j$.

Using expression (5), we can show

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

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

We shall use the following Definition.

**Definition 1**

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

Notice that we are studying an economic environment with a linear inverse market demand and constant returns to scale production, and marketing technologies. $\Delta_i$ gives social welfare under perfect competition in this setting. It is straightforward to show that

$$\frac{\partial \Delta_i}{\partial \alpha_i} > 0, \; \frac{\partial \Delta_i}{\partial \beta_i} < 0. \tag{6}$$

It is standard that social welfare increases with the market scale, whilst it decreases with the slope of the demand function.

We use $\Delta_i$ to normalize consumers' surplus, economic rents, domestic firm's profits and national welfare and the results are summarized in Table 2. So, every term in the Table is a relative measure rather than an absolute measure.

| **Term** | **FDI** | **NO** | **WELFARE CHANGE** |
|---|---|---|---|
| consumers' surplus | $\frac{1}{9}\Delta_i$ | $\frac{1}{16}\Delta_i$ | $\frac{7}{144}\Delta_i$ |
| economic rents | $\frac{1}{3}\Delta_i$ | $\frac{1}{4}\Delta_i$ | $\frac{1}{12}\Delta_i$ |
| domestic firm's profits | $\frac{1}{18}\Delta_i$ | $\frac{1}{8}\Delta_i$ | $-\frac{5}{72}\Delta_i$ |
| national welfare | $\frac{1}{2}\Delta_i$ | $\frac{7}{16}\Delta_i$ | $\frac{1}{16}\Delta_i$ |

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

Country $i$'s net gain under FDI is $\frac{1}{16}\Delta_i$, which represents government $i$'s economic incentive to attract FDI. Notice that $\pi_i^i = \pi_i^M = \frac{1}{18}\Delta_i$, which represents the multinational's investment incentive in country $i$.

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

**Assumption 1**

$$\Delta_i > \Delta_j.$$

According to Assumption 1, $\frac{1}{16}\Delta_i - \frac{1}{16}\Delta_j > 0$. Hence, Assumption 1 says that country $i$ benefits more than country $j$ from FDI, and government $i$ has a greater economic incentive to attract FDI. According to Assumption 1, $\frac{1}{18}\Delta_i - \frac{1}{18}\Delta_j > 0$. Hence, the multinational's investment incentive in country $i$ is greater than its investment incentive in country $j$.

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

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

Otherwise, it locates in country $j$.[27] Notice that if $b_i = b_j$, it locates in country $i$.[28]

# 4 Equilibrium Analysis II: The First Two Stages

## 4.1 The second stage

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

$$G^i = \begin{cases} \lambda^i \left(C_{ii}^T + C_{ii}^F\right) + \left(W_i^i - b_i\right) & if \quad FDI\ in\ country\ i, \\ \lambda^i \left(C_{ij}^T + C_{ij}^F\right) + W_j^i & if \quad FDI\ in\ country\ j. \end{cases} \tag{7}$$

Setting

$$\lambda^i \left(C_{ii}^T + C_{ii}^F\right) + \left(W_i^i - b_i\right) = \lambda^i \left(C_{ij}^T + C_{ij}^F\right) + W_j^i,$$

we can solve for government $i$'s willingness to pay to attract the multinational, $S_i$.[29]

$$\begin{aligned} S_i &= \lambda^i \left[\left(C_{ii}^T + C_{ii}^F\right) - \left(C_{ij}^T + C_{ij}^F\right)\right] + \left(W_i^i - W_j^i\right) \\ &= \lambda^i \left[\left(C_{ii}^T + C_{ii}^F\right) - \left(C_{ij}^T + C_{ij}^F\right)\right] + \frac{1}{16}\Delta_i. \end{aligned} \tag{8}$$

$S_i$ consists of two terms. The second term is familiar: it represents government $i$'s economic incentive to attract FDI. The first term represents an extra political incentive (or disincentive) for government $i$ to attract FDI, which is provided by special interest groups via the domestic political competition. When the multinational locates in country $i$, the amount of political contributions that government $i$ receives is equal to $\left(C_{ii}^T + C_{ii}^F\right)$. When the multinational locates in country $j$, it receives $\left(C_{ij}^T + C_{ij}^F\right)$. So, in case when it attracts FDI, it receives $\left(C_{ii}^T + C_{ii}^F\right)$ at the expense of $\left(C_{ij}^T + C_{ij}^F\right)$. The net political contributions that it receives are equal to $\left(C_{ii}^T + C_{ii}^F\right) - \left(C_{ij}^T + C_{ij}^F\right)$. Since government $i$'s marginal rate of substitution between political contributions and national welfare is $\lambda^i$, it is willing to pay an extra amount, $\lambda^i \left[\left(C_{ii}^T + C_{ii}^F\right) - \left(C_{ij}^T + C_{ij}^F\right)\right]$, to the multinational in order to receive $\left(C_{ii}^T + C_{ii}^F\right) - \left(C_{ij}^T + C_{ij}^F\right)$. If $\left(C_{ii}^T + C_{ii}^F\right) - \left(C_{ij}^T + C_{ij}^F\right)$ is

[27] We prescribe that the multinational locates in country $i$ if $\pi_i^M + b_i = \pi_j^M + b_j$.

[28] Of course, if $\max\left\{\pi_i^M + b_i,\ \pi_j^M + b_j\right\} \leq 0$, the multinational does not invest in any countries. As we will see, this does not happen in an equilibrium.

[29] Notice that the gross value of FDI to government $i$ is $\left[\lambda^i \left(C_{ii}^T + C_{ii}^F\right) + W_i^i\right] - \left[\lambda^i \left(C_{ij}^T + C_{ij}^F\right) + W_j^i\right]$. However, government $i$ pays $b_i$ to the multinational when the multinational locates in country $i$. Therefore, the net value of FDI to government $i$ is $\left[\lambda^i \left(C_{ii}^T + C_{ii}^F\right) + W_i^i\right] - \left[\lambda^i \left(C_{ij}^T + C_{ij}^F\right) + W_j^i\right] - b_i = \left[\lambda^i \left(C_{ii}^T + C_{ii}^F\right) + \left(W_i^i - b_i\right)\right] - \left[\lambda^i \left(C_{ij}^T + C_{ij}^F\right) + W_j^i\right]$. Let this expression be equal to zero, we can solve for government $i$'s willingness to pay to attract the multinational.

positive, so, $\lambda^i\left[\left(C_{ii}^T+C_{ii}^F\right)-\left(C_{ij}^T+C_{ij}^F\right)\right]$ is positive, then government $i$ is provided a political incentive to attract FDI. Otherwise, it is provided a political disincentive to attract FDI. Notice that $S_i$ increases with $C_{ii}^T$ and $C_{ii}^F$, decreases with $C_{ij}^T$ and $C_{ij}^F$. So, there is a chance for special interest groups to manipulate government $i$'s willingness to pay to attract the multinational.

Similarly, government $j$'s willingness to pay to attract the multinational is given by

$$\begin{aligned} S_j &= \lambda^j\left[\left(C_{jj}^T+C_{jj}^F\right)-\left(C_{ji}^T+C_{ji}^F\right)\right]+\left(W_j^j-W_i^j\right) \\ &= \lambda^j\left[\left(C_{jj}^T+C_{jj}^F\right)-\left(C_{ji}^T+C_{ji}^F\right)\right]+\frac{1}{16}\Delta_j. \end{aligned} \tag{9}$$

And a similar discussion applies.

Therefore, given contribution schedules, and given the governments' anticipation of how the game evolves from the second stage, the equilibrium in this stage is characterized as follows:[30] country $i$ wins the competition, and pays the amount $b_i=S_j-\left(\frac{1}{18}\Delta_i-\frac{1}{18}\Delta_j\right)$, to the multinational if and only if

$$S_i+\frac{1}{18}\Delta_i\geq S_j+\frac{1}{18}\Delta_j, \tag{10}$$

Otherwise government $j$ wins the competition, and pays the multinational $b_j=S_i+\left(\frac{1}{18}\Delta_i-\frac{1}{18}\Delta_j\right)$.

Notice that the necessary and sufficient condition – condition (10) – for country $i$ to win FDI competition in an equilibrium is that government $i$'s political incentive (or disincentive) plus its economic incentive to attract FDI , plus the multinational's investment incentive in country $i$ (weakly) dominates government $j$'s political incentive (or disincentive) plus its economic incentive to attract FDI, plus the multinational's investment incentive in country $j$. Otherwise, country $j$ wins FDI competition in an equilibrium.

It is useful to note the following Remark.

**Remark 1** *(Benchmark: No Politics) If government i and j maximize national welfare, i.e.,* $\lambda^i,\lambda^j=0$, *then a government's political incentive or disincentive to attract FDI disappears. So,* $S_i=\frac{1}{16}\Delta_i$, *and* $S_j=\frac{1}{16}\Delta_j$. *Since* $\frac{1}{16}\Delta_i+\frac{1}{18}\Delta_i>\frac{1}{16}\Delta_j+\frac{1}{18}\Delta_j$, *country i always wins FDI competition. The equilibrium price for attracting the multinational is equal to country j's economic incentive to attract FDI minus the multinational's investment premium in country i,* $b_i=\frac{1}{16}\Delta_j-\left(\frac{1}{18}\Delta_i-\frac{1}{18}\Delta_j\right)$. *This shows a general result that previous literatures had obtained: without political economy, a country wins FDI competition in an equilibrium if and only if its economic incentive to attract FDI plus the multinational's investment incentive in this country is greater than the other country's economic incentive to attract FDI plus the multinational's investment incentive in the other country. In this sense, the difference between these two sums,* $\left(\frac{1}{16}\Delta_i+\frac{1}{18}\Delta_i\right)-\left(\frac{1}{16}\Delta_j+\frac{1}{18}\Delta_j\right)=\left(\frac{1}{16}+\frac{1}{18}\right)\left(\Delta_i-\Delta_j\right)>0$, *represents country i's economic advantage over country j in competition for FDI. Now, the result can also be stated as follows: without politics, an economically advantageous country wins the competition in an equilibrium for sure.*

Now, government $i$'s and $j$'s economic incentive to attract FDI, the multinational's investment incentive in country $i$ and $j$, are summarized by country $i$'s economic advantage in FDI competition. Rearranging condition (10), we have the following condition,

$$\lambda^i\left[\left(C_{ii}^T+C_{ii}^F\right)-\left(C_{ij}^T+C_{ij}^F\right)\right]+\left(\frac{1}{16}+\frac{1}{18}\right)\left(\Delta_i-\Delta_j\right)\geq\lambda^j\left[\left(C_{jj}^T+C_{jj}^F\right)-\left(C_{ji}^T+C_{ji}^F\right)\right]. \tag{11}$$

[30]Here we concentrate on the standard Bertrand equilibrium in which players do not play weakly dominated strategies.

It implies that given political contributions, whether a country wins FDI competition is determined by the interactions of whether it has an economic advantage in FDI competition, and its government's political incentive (or disincentive) and the other government's political incentive (or disincentive) to attract FDI. With this condition in mind, we turn to analyze how special interest groups play the first stage of the game.

## 4.2 The first stage

First of all, notice that no interest group will make strictly positive political contributions for both locations. Any interest group may gain or lose from FDI, or may be indifferent between the two locations. Obviously, it does not have an incentive to make strictly positive political contributions when its unfavorable outcome occurs, whilst it may do that when its favorable outcome occurs. If this interest group is indifferent between the two outcomes, it surely does not have an incentive to make strictly positive political contributions irrespective of in which country the multinational locates. In addition, it is quite natural to think that the political contributions, which this interest group makes when its favorable outcome occurs, should not be strictly greater than its net gain under that outcome.[31]

See Table 2. In country $i$, trade union $i$ gains, whilst firm $i$ loses from FDI. Trade union $i$'s net gain is $\frac{1}{12}\Delta_i$ if the multinational locates in country $i$. Hence we have

$$0 \leq C_{ii}^T \leq \frac{1}{12}\Delta_i,\ C_{ij}^T = 0. \tag{12}$$

If the multinational locates in country $j$, firm $i$'s net gain is $\frac{5}{72}\Delta_i$. Hence we have

$$C_{ii}^F = 0,\ 0 \leq C_{ij}^F \leq \frac{5}{72}\Delta_i. \tag{13}$$

Country $j$'s case is very much similar to country $i$'s. Replacing subscript $i$ with $j$, subscript $ii$ with $jj$, and subscript $ij$ with $ji$, we have country $j$'s case.

Moreover, condition (11) reduces to

$$\lambda^i \left(C_{ii}^T - C_{ij}^F\right) + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j \left(C_{jj}^T - C_{ji}^F\right). \tag{14}$$

Whether a government has a political incentive or disincentive to attract FDI is determined by which special interest group wins the domestic political competition in the sense that its political contributions are bigger than its rival's.

The highest incentive that trade union $k$ can provide for government $k$ to attract FDI is given by $\frac{1}{12}\lambda^k\Delta_k$, since $\lambda^k\left(C_{kk}^T - C_{kl}^F\right)$ increases with trade union $k$'s political contributions, which is not strictly greater than its net gain under FDI. The highest disincentive that firm $k$ can provide for government $k$ to attract FDI is given by $\frac{5}{72}\lambda^k\Delta_k$, since $\lambda^k\left(C_{kk}^T - C_{kl}^F\right)$ decreases with firm $k$'s political contributions, which is not strictly greater than its net gain when the multinational locating in country $l$. $k = i, j$, $l = i, j$, $k \neq l$.

This implies that in each country the trade union is always able to win the domestic political competition. Since the trade union gains more than the domestic firm loses from FDI, whatever a disincentive to attract FDI is provided by the domestic firm, it would be beaten by an incentive to attract FDI provided by the trade union if doing so is profitable.

[31] 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).

We say that government $k$'s political-competition-proof highest political incentive to attract FDI is given by $\frac{1}{12}\lambda^k\Delta_k - \frac{5}{72}\lambda^k\Delta_k = \frac{1}{72}\lambda^k\Delta_k$, since trade union $k$ cannot increase government $k$'s incentive, at the same time firm $k$ cannot increase government $k$'s disincentive to attract FDI, and trade union $k$ wins the domestic political competition, $k = i, j$.

Before going further, it is useful to note every interest group's payoff function in the first stage of the game.

Trade union $i$'s payoffs are as follows: it gets $\frac{1}{4}\Delta_i + \left(\frac{1}{12}\Delta_i - C_{ii}^T\right)$ if the multinational locates in country $i$; it gets $\frac{1}{4}\Delta_i$ if the multinational locates in country $j$.

Firm $i$'s payoffs are as follows: it gets $\frac{1}{18}\Delta_i$ if the multinational locates in country $i$; it gets $\frac{1}{18}\Delta_i + \left(\frac{5}{72}\Delta_i - C_{ij}^F\right)$ if the multinational locates in country $j$.

Trade union $j$'s payoffs are as follows: it gets $\frac{1}{4}\Delta_j$ if the multinational locates in country $i$; it gets $\frac{1}{4}\Delta_j + \left(\frac{1}{12}\Delta_j - C_{jj}^T\right)$ if the multinational locates in country $j$.

Firm $j$'s payoffs are as follows: it gets $\frac{1}{18}\Delta_j + \left(\frac{5}{72}\Delta_j - C_{ji}^F\right)$ if the multinational locates in country $i$; it gets $\frac{1}{18}\Delta_j$ if the multinational locates in country $j$.

#### 4.2.1 Equilibrium characterization

First we derive the best response for each special interest group. See Lemma 1 in Appendix. A combination of special interest groups' contribution schedules is a Nash equilibrium, if and only if given other three special interest groups' contribution schedules, any special interest group's contribution schedule is its best response. But Nash equilibria are too many. So, we characterize the CPNE (CPNEs) in the first stage of the game.

We prove that there are three forms of CPNEs depending on parameter configurations. Firstly, consider the case where

$$-\frac{5}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \frac{1}{12}\lambda^j\Delta_j. \qquad (15)$$

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

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

*where* $C_{ij}^F \in \left[0, \frac{5}{72}\Delta_i\right]$*;*

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

*where* $C_{jj}^T \in \left[0, \frac{1}{12}\Delta_j\right]$*; constitute a CPNE in the first stage of the game, in which country $i$ wins the competition for the multinational.*

**Proof.** See Appendix. ■

Condition (15) says that country $i$'s economic advantage in FDI competition minus government $i$'s highest political disincentive to attract FDI (weakly) dominates government $j$'s highest political incentive to attract FDI, when trade union $i$ and firm $j$ do not make political contributions. This happens when both $\lambda^i$ and $\lambda^j$ are sufficiently small, in other words, the extent to which each government is influenced by special interest groups is sufficiently small; and country $i$'s economic advantage is sufficiently big. As a result, even if pre-play communication is allowed, firm $i$ and trade union $j$ cannot coordinate and help country $j$ win the competition noncooperatively: firm $i$ cannot increase government $i$'s political disincentive, at the same time trade union $j$ cannot increase government $j$'s political incentive enough to offset country $i$'s economic advantage. Clearly trade union $i$ and firm $j$ will not make strictly positive political contributions. Firm $i$ and trade union $j$ can choose arbitrary political contributions.[32]

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

$$b_{i1} = \lambda^j C_{jj}^T + \frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j), \tag{16}$$

where $C_{jj}^T \in \left[0, \frac{1}{12}\Delta_j\right]$, to the multinational. $b_{i1}$ takes the minimum value at $C_{jj}^T = 0$, so that the minimum payment to the multinational is given by[33]

$$b_{i1}^{\min} = \frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j). \tag{17}$$

Secondly, consider the case where

$$\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \frac{1}{72}\lambda^j\Delta_j, \text{ but } -\frac{5}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{12}\lambda^j\Delta_j. \tag{18}$$

**Proposition 2** *The following contribution schedules*

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

$$C_i^F = \begin{cases} 0 & if \quad FDI \text{ in country } i, \\ \frac{5}{72}\Delta_i & if \quad FDI \text{ in country } j; \end{cases}$$

$$C_j^T = \begin{cases} 0 & if \quad FDI \text{ in country } i, \\ \frac{1}{12}\Delta_j & if \quad FDI \text{ in country } j; \end{cases}$$

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

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

$$\lambda^i\left(C_{ii}^T - \frac{5}{72}\Delta_i\right) + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) = \lambda^j\left(\frac{1}{12}\Delta_j - C_{ji}^F\right), \tag{19}$$

*constitute a CPNE in the first stage of the game, in which country $i$ wins the competition for the multinational.*

[32] Notice that condition (15) is also necessary. Suppose not. Then given trade union $i$ and firm $j$ do not make political contributions, clearly firm $i$ and trade union $j$ can coordinate and help country $j$ win the competition in a noncooperative way if pre-play communication is allowed.

[33] Notice that the multinational receives at least, $\frac{1}{18}\Delta_i + \frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j) = \left(\frac{1}{16} + \frac{1}{18}\right)\Delta_j > 0$, in this case.

**Proof.** See Appendix. ■

The second strict inequality of condition (18) implies that the contribution schedules given in Proposition 1 cannot form CPNEs now. The first inequality says that government $i$'s political-competition-proof highest political incentive to attract FDI plus country $i$'s economic advantage in FDI competition (weakly) dominates government $j$'s political-competition-proof highest political incentive to attract FDI. In this case, country $i$ still wins the competition since again, even if pre-play communication is allowed, it is impossible for firm $i$ and trade union $j$ to coordinate profitably and help country $j$ win the competition in a noncooperative way. Intuitively, they may form a self-enforcing conspiracy via pre-play communication, but trade union $i$ and domestic firm $j$ can do this also. The above condition guarantees that even if they make their highest political contributions, the self-enforcing conspiracy formed by trade union $i$ and firm $j$ can find a way to defeat them.

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

$$b_{i2} = \lambda^j \left( \frac{1}{12}\Delta_j - C_{ji}^F \right) + \frac{1}{16}\Delta_j - \frac{1}{18}\left(\Delta_i - \Delta_j\right), \tag{20}$$

to the multinational. $b_{i2}$ takes the minimum value at $C_{ji}^F = \frac{5}{72}\Delta_j$, so that the minimum payment to the multinational is given by[34]

$$b_{i2}^{\min} = \frac{1}{72}\lambda^j \Delta_j + \frac{1}{16}\Delta_j - \frac{1}{18}\left(\Delta_i - \Delta_j\right). \tag{21}$$

Finally, consider the case where

$$\frac{1}{72}\lambda^i \Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)\left(\Delta_i - \Delta_j\right) < \frac{1}{72}\lambda^j \Delta_j. \tag{22}$$

**Proposition 3** *The following contribution schedules*

$$C_i^T = \begin{cases} \frac{1}{12}\Delta_i & if \quad FDI \text{ in country } i, \\ 0 & if \quad FDI \text{ in country } j; \end{cases}$$

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

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

$$C_j^F = \begin{cases} \frac{5}{72}\Delta_j & if \quad FDI \text{ in country } i, \\ 0 & if \quad FDI \text{ in country } j; \end{cases}$$

*where* $C_{ij}^F$*, and* $C_{jj}^T > \frac{5}{72}\Delta_j$ *satisfy*

$$\lambda^i \left(\frac{1}{12}\Delta_i - C_{ij}^F\right) + \left(\frac{1}{16} + \frac{1}{18}\right)\left(\Delta_i - \Delta_j\right) = \lambda^j \left(C_{jj}^T - \frac{5}{72}\Delta_j\right), \tag{23}$$

*constitute a CPNE in the first stage of the game, in which country $j$ wins the competition for the multinational.*

[34]Notice that the multinational receives at least, $\frac{1}{18}\Delta_i + \frac{1}{72}\lambda^j\Delta_j + \frac{1}{16}\Delta_j - \frac{1}{18}\left(\Delta_i - \Delta_j\right) = \frac{1}{72}\lambda^j\Delta_j + \left(\frac{1}{16} + \frac{1}{18}\right)\Delta_j > 0$, in this case.

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

Condition (22) says that government $i$'s political-competition-proof highest political incentive to attract FDI plus country $i$'s economic advantage in FDI competition is (strictly) dominated by government $j$'s political-competition-proof highest political incentive to attract FDI. Now even if pre-play communication is allowed, there is no chance for trade union $i$ and firm $j$ to coordinate profitably and help country $i$ win the competition noncooperatively. Also, notice that in a CPNE, trade union $j$ always wins the domestic political competition.

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

$$b_j = \lambda^i \left( \frac{1}{12}\Delta_i - C_{ij}^F \right) + \frac{1}{16}\Delta_i + \frac{1}{18}\left(\Delta_i - \Delta_j\right), \tag{24}$$

to the multinational. $b_j$ takes the minimum value at $C_{ij}^F = \frac{5}{72}\Delta_i$, so that the minimum payment to the multinational is given by[35]

$$b_j^{\min} = \frac{1}{72}\lambda^i\Delta_i + \frac{1}{16}\Delta_i + \frac{1}{18}\left(\Delta_i - \Delta_j\right). \tag{25}$$

**Remark 2** *Before going further, notice that using a CPNE as the solution concept in the first stage of the game helps us eliminate some 'unpleasant' equilibria. For instance, it is easy to show that a combination of contribution schedules, in which every special interest group contributes zero, is a Nash equilibrium, if* $\left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \max\left\{\frac{5}{72}\lambda^i\Delta_i, \frac{1}{12}\lambda^j\Delta_j\right\}$. *However, if* $\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \frac{1}{72}\lambda^j\Delta_j$, *but* $-\frac{5}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{12}\lambda^j\Delta_j$, *and pre-play communication is allowed, then this equilibrium is not a CPNE.*

### 4.2.2 Further discussion

The analysis so far implies immediately the following Theorem, which states the necessary and sufficient condition for a country to win FDI competition in an equilibrium.

**Theorem 1** *(Winner Selection.) Country $i$ wins the competition for the multinational in a CPNE, if and only if*

$$\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \frac{1}{72}\lambda^j\Delta_j. \tag{*}$$

*Otherwise, Country $j$ wins the competition for the multinational in a CPNE.*

**Proof.** The necessity part of the Theorem is implied by Lemma 2 and 3 in Appendix, whilst the sufficiency part of the Theorem is implied by Proposition 1, 2 and 3. ■

Theorem 1 says that both countries have a chance to win FDI competition in an equilibrium. If in the economically disadvantageous country, the political incentive provided is great enough to dominate both the other country's economic advantage and the other government's political incentive to attract FDI, then the economically disadvantageous country wins competition for FDI. Otherwise, the economically advantageous country wins the competition.

We can derive two testable implications from Theorem 1.

**Corollary 1** *If country $j$ wins the competition for the multinational in a CPNE, then $\lambda^i < \lambda^j$.*

[35] Notice that the multinational receives at least, $\frac{1}{18}\Delta_j + \frac{1}{72}\lambda^i\Delta_i + \frac{1}{16}\Delta_i + \frac{1}{18}(\Delta_i - \Delta_j) = \frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)\Delta_i > 0$, in this case.

**Proof.** Suppose not. According to Theorem 1, if country $j$ wins the competition for the multinational in a CPNE, we must have $\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{72}\lambda^j\Delta_j$. And this strict inequality holds if and only if $\left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{72}\lambda^j\Delta_j - \frac{1}{72}\lambda^i\Delta_i$. Since by Assumption 1, $\Delta_i > \Delta_j$, $\left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) > 0$. Now if $\lambda^i \geq \lambda^j$, then $\frac{1}{72}\lambda^j\Delta_j - \frac{1}{72}\lambda^i\Delta_i \leq 0$. A contradiction. ■

If the economically disadvantageous country wins FDI competition, then the extent to which its government is influenced by special interest groups must be greater than the extent to which the other government is influenced.

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

**Proof.** According to Theorem 1, country $i$ wins the competition for the multinational in a CPNE, if and only if

$$\begin{gathered}\text{condition (*) holds}\\ \Leftrightarrow\\ \frac{1}{72}\lambda^i\Delta \geq \frac{1}{72}\lambda^j\Delta, \text{ since } \Delta_i = \Delta_j = \Delta\\ \Leftrightarrow\\ \lambda^i \geq \lambda^j.\end{gathered}$$

■

If no country has an economic advantage over the other country in FDI competition, then the country whose government is more influenced by special interest groups wins FDI competition.

Next, let us examine boundary cases.

**Corollary 3** *(Boundary Cases)*

1. *When $\lambda^i = 0$, country $j$ wins the competition for the multinational in a CPNE, if and only if*
$$\lambda^j > \frac{17}{2}\left(\frac{\Delta_i}{\Delta_j} - 1\right);$$
2. *When $\lambda^j = 0$, country $i$ always wins the competition for the multinational in a CPNE.*

**Proof.** (The first part.) According to Theorem 1, country $j$ wins the FDI competition in a CPNE, if and only if

$$\begin{gathered}\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{72}\lambda^j\Delta_j\\ \Leftrightarrow\\ \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{72}\lambda^j\Delta_j, \text{ since } \lambda^i = 0\\ \Leftrightarrow\\ \lambda^j > \frac{17}{2}\left(\frac{\Delta_i}{\Delta_j} - 1\right).\end{gathered}$$

(The second part.) Condition (*) implies this immediately. ■

The first part of Corollary 3 says that when government $i$ maximizes national welfare, country $j$ wins FDI competition if and only if the extent to which government $j$ is influenced by special interest groups is strictly greater than a threshold value, so that the domestic political competition can provide enough political incentive for government $j$ to attract FDI to dominate country $i$'s economic advantage. The second part says that when government $j$ maximizes national welfare, since country $i$ has an economic advantage in FDI competition, and trade union $i$ is always able to win the domestic political competition, there is no chance for country $j$ to win the competition.

**Corollary 4** *(An Extreme Case) When $\lambda^i \to \infty$, and $\lambda^j \to \infty$, country $i$ wins the competition for the multinational in a CPNE, if and only if*

$$\frac{\Delta_i}{\Delta_j} \geq \frac{\lambda^j}{\lambda^i}.$$

*Otherwise, country $j$ wins the competition for the multinational in a CPNE.*

**Proof.** According to Theorem 1, country $i$ wins the competition for the multinational in a CPNE, if and only if

$$\text{condition (*) holds}$$
$$\Leftrightarrow$$
$$\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \frac{1}{72}\lambda^j\Delta_j$$
$$\Leftrightarrow$$
$$\frac{\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j)}{\frac{1}{72}\lambda^j\Delta_j} \geq 1$$
$$\Leftrightarrow$$
$$\frac{\lambda^i\frac{\Delta_i}{\Delta_j}}{\lambda^j} + \frac{\frac{17}{2}\left(\frac{\Delta_i}{\Delta_j} - 1\right)}{\lambda^j} \geq 1. \tag{26}$$

When $\lambda^i \to \infty$, and $\lambda^j \to \infty$, the second term in the LHS of condition (26) vanishes. Hence, country $i$ wins the competition in a CPNE, if and only if

$$\frac{\lambda^i\frac{\Delta_i}{\Delta_j}}{\lambda^j} \geq 1 \Leftrightarrow \frac{\Delta_i}{\Delta_j} \geq \frac{\lambda^j}{\lambda^i}.$$

■

Corollary 4 says that when both governments maximize political contributions, country $i$'s economic advantage in FDI competition can be neglected. Now, the government with a 'bigger' political incentive to attract FDI, (given by the ratio stated in the Corollary), wins the competition.

We use Figure 2 to summarize the above discussion.

Define $\Delta \equiv \frac{\Delta_i}{\Delta_j} > 1$. Now, condition (*) reduces to

$$\lambda^i\Delta + \frac{17}{2}(\Delta - 1) \geq \lambda^j. \tag{*'}$$

Condition (15) reduces to

$$-5\lambda^i\Delta + \frac{17}{2}(\Delta - 1) \geq 6\lambda^j. \tag{2.15'}$$

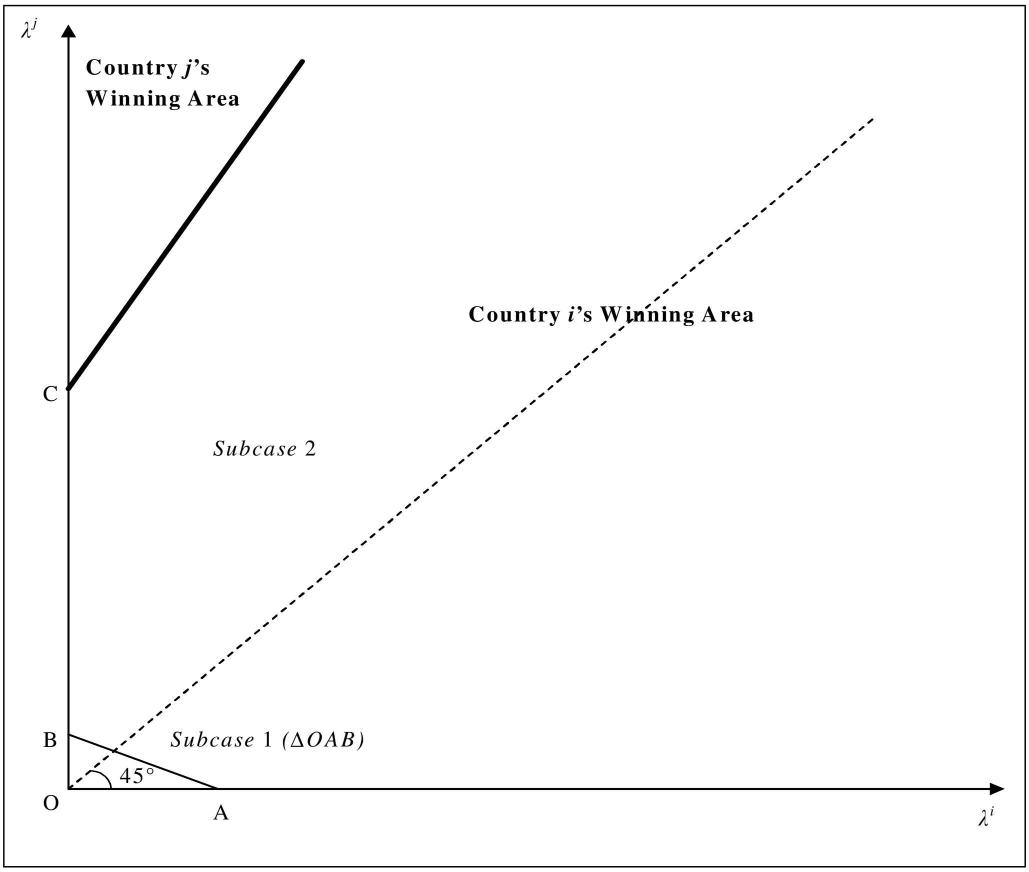


Figure 2: Winner selection

See Figure 2. The horizontal axis represents $\lambda^i$, and the vertical axis represents $\lambda^j$. The bold line represents when condition (*') holds with equality. This line divides the nonnegative quadrant into two parts. When parameter configurations fall into the big part, country $i$ wins FDI competition in an equilibrium. There are two subcases. Notice that line segment AB represents when condition (15') holds with equality.[36] Now the triangle $\triangle OAB$ represents the case given by Proposition 1. Subcase 2 represents the case given by Proposition 2. When parameter configurations fall into the small part above the bold line, country $j$ wins the competition in an equilibrium. This is described in Proposition 3.

When country $j$ wins FDI competition in an equilibrium, it must be the case that $\lambda^i < \lambda^j$. This is stated in Corollary 1. When one country does not have an economic advantage over the other country, the bold line and the forty-five degree line coincide. Now, the government which is more influenced by special interest groups wins the competition in an equilibrium. This is stated in Corollary 2.

[36] The coordinate of point $A$ is given by $(\lambda^i, \lambda^j) = \left(\frac{17}{10\Delta}(\Delta - 1), 0\right)$. The coordinate of point $B$ is given by $(\lambda^i, \lambda^j) = \left(0, \frac{17}{12}(\Delta - 1)\right)$.

As to boundary cases, first of all, notice that the coordinate of point $C$ is given by $\left(\lambda^i, \lambda^j\right) = \left(0, \frac{17}{2}(\Delta - 1)\right)$. Now, keeping $\lambda^i = 0$, if $\lambda^j$ is slightly bigger than $\frac{17}{2}(\Delta - 1)$, parameter configurations fall into country $j$'s winning area. This represents the first part of Corollary 3. It is easy to see that the horizontal axis lies in country $i$'s winning area. This represents the second part of Corollary 3. It is clear from Figure 2 that when $\lambda^i$ and $\lambda^j$ go to infinity, which country wins FDI competition in an equilibrium is determined by the relative size of the slope of the bold line, $\Delta$, and the ratio of $\lambda^j$ to $\lambda^i$ since country $i$'s economic advantage can be neglected in this case. This is stated in Corollary 4.

From Figure 2, it is also easy to see that when $\lambda^k$ goes to infinity, whilst $\lambda^l$ is bounded, $k = i, j$, $l = i, j$, $i \neq j$, country $k$ always wins the competition in an equilibrium.

Next, we have the following Theorem.

**Theorem 2** *The equilibrium price for attracting FDI is higher than in the benchmark case.*

**Proof.** In the benchmark case, which is given by Remark 1, country $i$ wins the competition for the multinational, and the equilibrium price for attracting FDI is $b_i = \frac{1}{16}\Delta_j - \left(\frac{1}{18}\Delta_i - \frac{1}{18}\Delta_j\right)$. The Theorem is implied immediately when comparing this price to the prices given by expression (17), (21) and (25). ■

The competition for the multinational can be viewed as a Bertrand game. When special interest lobbying is present, each government is provided an extra political inventive to attract FDI besides an economic incentive. So, irrespective of who wins the competition in an equilibrium, the payments to the multinational must be higher than before.

## 5 Welfare Analysis

We consider welfare effects in this section. Our benchmark is the case discussed in Remark 1. In this case country $i$ always wins FDI competition.[37] Country $i$'s national welfare is given by $W_i^i = \frac{1}{2}\Delta_i - \left[\frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j)\right]$, whilst country $j$'s national welfare is given by $W_i^j = \frac{7}{16}\Delta_j$. Allocative efficiency is always achieved.[38]

Now consider the case where

$$-\frac{5}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \frac{1}{12}\lambda^j\Delta_j.$$

**Proposition 4** *Country i's national welfare is the same as in the benchmark case when it pays $b_{i1}^{\min}$ to the multinational, otherwise its national welfare is strictly smaller than in the benchmark case. Country j's national welfare is the same as in the benchmark case. Allocative efficiency is achieved.*

**Proof.** According to Proposition 1, country $i$ wins the competition in a CPNE in this case. Country $i$ pays the multinational $b_{i1}$, which is given by expression (16). Country $i$'s national welfare, $\frac{1}{2}\Delta_i - b_{i1}$, decreases strictly with $b_{i1}$. It takes its maximum value at $b_{i1}^{\min}$, which is given by expression (17). And $\frac{1}{2}\Delta_i - b_{i1}^{\min} = \frac{1}{2}\Delta_i - \left[\frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j)\right]$, which is equal to country $i$'s national welfare in the benchmark case. Otherwise, $\frac{1}{2}\Delta_i - b_{i1} < \frac{1}{2}\Delta_i - \left[\frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j)\right]$. Since country $j$ loses the competition for the multinational, it gets $\frac{7}{16}\Delta_j$, which is equal to its national welfare in the benchmark case.

[37] Notice that the benchmark case is represented by the origin point in Figure 2.

[38] Allocative efficiency requires that the multinational locates in a country such that the country's economic incentive to attract FDI and the multinational's investment incentive in the country are jointly maximized.

Notice that $b_{i1}$ is a transfer payment. 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 in the benchmark case.

Consider the case where

$$\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \frac{1}{72}\lambda^j\Delta_j, \text{ but } -\frac{5}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{12}\lambda^j\Delta_j.$$

**Proposition 5** *Country i's national welfare is strictly smaller than in the benchmark case. Country j's national welfare is the same as in the benchmark case. Allocative efficiency is achieved.*

**Proof.** According to Proposition 2, country $i$ wins the competition in a CPNE in this case. Country $i$ pays the multinational $b_{i2}$, which is given by expression (20). Country $i$'s national welfare, $\frac{1}{2}\Delta_i - b_{i2}$, decreases strictly with $b_{i2}$. It takes its maximum value at $b_{i2}^{\min}$, which is given by expression (21). We have $\frac{1}{2}\Delta_i - b_{i2}^{\min} = \frac{1}{2}\Delta_i - \left[\frac{1}{72}\lambda^j\Delta_j + \frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j)\right]$, which is strictly smaller than its national welfare in the benchmark case: $\frac{1}{2}\Delta_i - \left[\frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j)\right]$. Since country $j$ loses the competition for the multinational, it gets $\frac{7}{16}\Delta_j$, which is equal to its national welfare in the benchmark case.

Notice that $b_{i2}$ is a transfer payment. 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 in the benchmark case.

In Propositions 4 and 5, allocative efficiency is achieved. This is simply because that country $i$ wins FDI competition in an equilibrium.

The remaining case is when country $j$ wins FDI competition. This occurs when

$$\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{72}\lambda^j\Delta_j.$$

In this case, Proposition 6 holds.

**Proposition 6** *Country i's national welfare is strictly smaller than in the benchmark case. Country j's national welfare is strictly smaller than in the benchmark case. Allocative efficiency is not achieved.*

**Proof.** According to Proposition 3, country $j$ wins the competition in a CPNE in this case. Country $j$ pays the multinational $b_j$, which is given by expression (24). Country $i$'s national welfare is $\frac{7}{16}\Delta_i$. It is straightforward to show that this is strictly smaller than its national welfare in the benchmark case: $\frac{1}{2}\Delta_i - \left[\frac{1}{16}\Delta_j - \frac{1}{18}(\Delta_i - \Delta_j)\right]$. Country $j$'s national welfare, $\frac{1}{2}\Delta_j - b_j$, decreases strictly with $b_j$. It takes its maximum value at $b_j^{\min}$, which is given by expression (25). And $\frac{1}{2}\Delta_j - b_j^{\min} = \frac{1}{2}\Delta_j - \left[\frac{1}{72}\lambda^i\Delta_i + \frac{1}{16}\Delta_i + \frac{1}{18}(\Delta_i - \Delta_j)\right]$. It is straightforward to show that this is strictly smaller than $\frac{7}{16}\Delta_j$, its national welfare in the benchmark case.

Notice that $b_j$ is a transfer payment. It is straightforward to show that allocative efficiency is not achieved. ■

Given that trade union $j$ wins the domestic political competition in an equilibrium, if government $j$ is far more influenced by special interest groups, then its political incentive to attract

FDI may be sufficiently great such that its willingness to pay to attract the multinational can be greater than government $i$'s willingness to pay; country $j$ then wins FDI competition in an equilibrium. Therefore, allocative efficiency is not achieved. Country $i$'s potential gain from FDI is not achieved, 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.

## 6 Discussion

This section discusses the robustness of results obtained in the current model.

First of all, what a trade union gains more than a domestic firm loses from FDI, and therefore the former is always able to win the domestic political competition, is a key point emerging from the current model. But we use a simplest approach to modelling the wage-setting procedure and it has two assumptions: (i) a trade union sets the wage rate unilaterally, (ii) the objective function of a trade union is its economic rents.

Keeping the first assumption, consider the case where the objective function of a trade union is a wage bill, which is equal to the actual wage rate times the employment levels, or the case where a trade union receives its economic rents plus a share in profits. Then it can be shown that a trade union is still able to win the domestic political competition.[39]

Consider the case where a rent-seeking trade union bargains over the wage rate with a firm/firms, but a firm/firms sets/set the employment levels unilaterally. The process of wage rate determination is modelled as a Nash bargaining game. Assume that (i) when the multinational locates in a country, the trade union, the domestic firm and the multinational bargain over the wage rate simultaneously;[40] (ii) the multinational has the same bargaining strength as that of the domestic firm.[41] Then it can be shown that if the bargaining strength of a trade union is sufficient, it is still able to win the domestic political competition.[42]

Secondly, in our model, we treat the marginal product of labor as the opportunity wage rate for workers. The purpose of doing this is to simplify analysis. We can introduce a workers' outside option, which is determined in the rest of the economy, and is not necessarily equal to the marginal product of labor, into the basic model. But our key results are unlikely to change.

Thirdly, our model uses a linear inverse market demand and constant returns to scale production, and marketing technologies. However, we normalize all economic terms in terms of social welfare under perfect competition. Since economic terms appear in relative forms, we doubt whether specific functional forms matter that much in our model. When we use general functional forms, we can do a similar normalization. We may have different coefficients from those obtained in the current model; or coefficients may be functions of fundamental parameters of new models rather than constants. But, notice that provided in general cases, a trade union gains more than a domestic firm loses from FDI, then our key results are unlikely to change.

Fourthly, we consider the no-trade case in this paper. But people may argue that a more realistic setting is to consider the case when the multinational is able to trade between countries,

[39] In the latter case, we assume that a trade union's share in the domestic firm's profits is the same as that in the multinational's profits when its country wins FDI competition. We make this assumption in order to simplify analysis. The results are not dependent on it.

[40] When a trade union bargains over the wage rate with two or more firms, it prefers simultaneous bargaining to sequential bargaining. And in many industries, it is not firms but the trade union that decides the timing of negotiation. See Bárcena-Ruiz (2003) and references cited.

[41] We make this assumption in order to simplify analysis. Our results are not dependent on it.

[42] This result carries over to the case where a trade union receives a wage bill.

though domestic firms not. But we doubt whether the basic results derived from the no-trade case would be changed when considering this more complicated case. When we allow the multinational to trade between countries, on the one hand, a trade union would gain from FDI more than in the current model, on the other hand a domestic firm would lose from FDI more than in the current model. The status of a trade union, the special interest group lobbying for FDI, in the domestic political competition would be reinforced.

Fifthly, in our model when a country wins the competition for the multinational, its government pays a lump-sum subsidy to the multinational, which is collected from consumers by lump-sum taxation. Now, what will happen when the domestic firm and the trade union share costs for attracting FDI. On the one hand, a trade union's net gains under FDI decrease. On the other hand, a domestic firm's net gains under no FDI increase. But provided a trade union's net gains under FDI are bigger than a domestic firm's net gains under no FDI, then our key results are unlikely to change.

Finally, notice that when both governments maximize political contributions, the equilibrium price for attracting FDI goes to infinity.[43] This unpleasant result is due to the fact that governments' budget constraints are not included in our model. When these constraints are explicitly modeled, an infinite equilibrium price will not appear.

# 7 Conclusion

We have studied the impact of special interest lobbying on competition between two countries for a multinational in a common agency framework. We argue that special interest groups provide a government an extra political incentive to attract FDI via the domestic political competition. If in the economically disadvantageous country, the political incentive provided is great enough to dominate both the other country's economic advantage and the other government's political incentive to attract FDI, then the economically disadvantageous country wins competition for FDI. Otherwise, the economically advantageous country wins the competition. The equilibrium price for attracting FDI is higher than in the case when governments maximize national welfare. We also show that allocative efficiency cannot be always achieved. This happens when the economically disadvantageous country wins the competition.

We may extend the basic model in several ways. First of all, an interesting case is where direct export is one of the multinational's options. Now, a trade union may lobby for a high tariff and a high subsidy; whilst a domestic firm may lobby for a low tariff and a low subsidy. Another possible extension is to consider the case where the multinational is allowed to make political contributions. As a first step, we need to figure out what the multinational's contribution schedule would look like. In addition, notice that people often argue that FDI has a technological spillover effect, which is not considered in our model. What would happen when introducing this effect to the basic model? If the technological spillover effect is small, then a trade union gains from, whilst a domestic firm loses from FDI. But the more interesting case is when this effect is large enough such that both a trade union and a domestic firm in each country gain from FDI. Now, the political climate changes. As a result, competition for FDI would become more fierce. Finally, in the basic model, the extent to which a government is influenced by domestic special interest groups is exogenously given. An interesting extension is to endogenize this parameter, say, in a probabilistic voting model. At the first place, we need to figure out how to embed this into the basic model.

We plan to analyze these issues in future work.

[43]Notice that Corollary 4 implies this immediately.

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# Appendix

## Proof of Lemma 1

**Lemma 1** *(Best Response)*

1. *Given the other players' strategies, $C_i^T$ is trade union i's best response, in which*

$$\begin{array}{lll} C_{ii}^T = \max\left\{0, z_i^T\right\} & if & \lambda^i\left(\frac{1}{12}\Delta_i - C_{ij}^F\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j\left(C_{jj}^T - C_{ji}^F\right) \\ C_{ii}^T \in \left[0, \frac{1}{12}\Delta_i\right] & if & otherwise \end{array},$$

*where $z_i^T$ is determined by*

$$\lambda^i\left(z_i^T - C_{ij}^F\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) = \lambda^j\left(C_{jj}^T - C_{ji}^F\right).$$

2. *Given the other players' strategies, $C_i^F$ is firm i's best response, in which*

$$\begin{array}{lll} C_{ij}^F \in \left[0, \frac{5}{72}\Delta_i\right] & if & \lambda^i\left(C_{ii}^T - \frac{5}{72}\Delta_i\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j\left(C_{jj}^T - C_{ji}^F\right) \\ C_{ij}^F = \max\left\{0, z_i^F\right\} & if & otherwise \end{array},$$

*where $z_i^F$ is determined by*

$$\lambda^i\left(C_{ii}^T - z_i^F\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) = \lambda^j\left(C_{jj}^T - C_{ji}^F\right).$$

3. *Given the other players' strategies, $C_j^T$ is trade union j's best response, in which*

$$\begin{array}{lll} C_{jj}^T \in \left[0, \frac{1}{12}\Delta_j\right] & if & \lambda^i\left(C_{ii}^T - C_{ij}^F\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j\left(\frac{1}{12}\Delta_j - C_{ji}^F\right) \\ C_{jj}^T = \max\left\{0, z_j^T\right\} & & otherwise \end{array},$$

*where $z_j^T$ is determined by*

$$\lambda^i\left(C_{ii}^T - C_{ij}^F\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) = \lambda^j\left(z_j^T - C_{ji}^F\right).$$

4. *Given the other players' strategies, $C_j^F$ is firm j's best response, in which*

$$\begin{array}{lll} C_{ji}^F = \max\left\{0, z_j^F\right\} & if & \lambda^i\left(C_{ii}^T - C_{ij}^F\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j\left(C_{jj}^T - \frac{5}{72}\Delta_j\right) \\ C_{ji}^F \in \left[0, \frac{5}{72}\Delta_j\right] & if & otherwise \end{array},$$

*where $z_j^F$ is determined by*

$$\lambda^i\left(C_{ii}^T - C_{ij}^F\right) + \left(\frac{1}{16}+\frac{1}{18}\right)(\Delta_i - \Delta_j) = \lambda^j\left(C_{jj}^T - z_j^F\right).$$

**Proof.** First, let us establish trade union $i$'s best response. Given trade union $j$'s political contributions, and firm $j$'s political contributions, government $j$'s political incentive (or disincentive) to attract the multinational is determined. Given that and given firm $i$'s political contributions, can trade union $i$ make country $i$ win the competition? If

$$\lambda^i \left( \frac{1}{12}\Delta_i - C_{ij}^F \right) + \left( \frac{1}{16} + \frac{1}{18} \right) (\Delta_i - \Delta_j) \geq \lambda^j \left( C_{jj}^T - C_{ji}^F \right),$$

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

$$\lambda^i \left( z_i^T - C_{ij}^F \right) + \left( \frac{1}{16} + \frac{1}{18} \right) (\Delta_i - \Delta_j) = \lambda^j \left( C_{jj}^T - C_{ji}^F \right).$$

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

$$\lambda^i \left( \frac{1}{12}\Delta_i - C_{ij}^F \right) + \left( \frac{1}{16} + \frac{1}{18} \right) (\Delta_i - \Delta_j) < \lambda^j \left( C_{jj}^T - C_{ji}^F \right),$$

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. ■

## Proof of Lemma 2

**Lemma 2** *In the first stage of the game, if there exists a CPNE, in which country $i$ wins FDI competition, the following condition*

$$\frac{1}{72}\lambda^i \Delta_i + \left( \frac{1}{16} + \frac{1}{18} \right) (\Delta_i - \Delta_j) \geq \frac{1}{72}\lambda^j \Delta_j,$$

*must hold.*

**Proof.** Suppose that there is such a CPNE $\left( C_i^T, C_i^F, C_j^T, C_j^F \right)$, but $\frac{1}{72}\lambda^i \Delta_i + \left( \frac{1}{16} + \frac{1}{18} \right) (\Delta_i - \Delta_j) < \frac{1}{72}\lambda^j \Delta_j$. We want to show that $\left( C_i^T, C_i^F, C_j^T, C_j^F \right)$ is not self-enforcing, and hence is not a CPNE since given $C_i^T$ and $C_j^F$, $\left( C_i^F, C_j^T \right)$ is not a CPNE of the game played by firm $i$ and trade union $j$.

There are two nonempty proper subcoalitions: one formed by firm $i$ and another formed by trade union $j$. It is easy to show that $\left( C_i^F, C_j^T \right)$ is self-enforcing. Since by supposition that $\left( C_i^T, C_i^F, C_j^T, C_j^F \right)$ is a CPNE, given $C_i^T$, $C_j^F$, and given $C_j^T$, $C_i^F$ is an optimal strategy for firm $i$; given $C_i^T$, $C_j^F$, and given $C_i^F$, $C_j^T$ is an optimal strategy for trade union $j$. Firm $i$ receives $\frac{1}{18}\Delta_i$, and trade union $j$ receives $\frac{1}{4}\Delta_j$.

But there are other self-enforcing strategy profiles, in which $C_{ij}^F$ and $C_{jj}^T$ satisfy

$$\lambda^i \left( C_{ii}^T - C_{ij}^F \right) + \left( \frac{1}{16} + \frac{1}{18} \right) (\Delta_i - \Delta_j) = \lambda^j \left( C_{jj}^T - C_{ji}^F \right),$$

where $0 < C_{ij}^F < \frac{5}{72}\Delta_i$, and $0 < C_{jj}^T < \frac{1}{12}\Delta_j$. I.e., given $C_i^T$ and $C_j^F$, firm $i$ and trade union $j$ can coordinate and help country $j$ win FDI competition noncooperatively. Firm $i$ receives $\frac{1}{8}\Delta_i - C_{ij}^F > \frac{1}{18}\Delta_i$, and trade union $j$ receives $\frac{1}{3}\Delta_j - C_{jj}^T > \frac{1}{4}\Delta_j$.

So, $\left(C_i^F, C_j^T\right)$ is strongly Pareto dominated by other self-enforcing strategy profiles described in the above, and hence is not a CPNE of the game played by firm $i$ and trade union $j$, given $C_i^T$ and $C_j^F$. Therefore, $\left(C_i^T, C_i^F, C_j^T, C_j^F\right)$ is not self-enforcing, and hence is not a CPNE. A contradiction. ■

## Proof of Lemma 3

**Lemma 3** *In the first stage of the game, if there exists a CPNE, in which country $j$ wins FDI competition, the following condition*

$$\frac{1}{72}\lambda^i\Delta_i + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) < \frac{1}{72}\lambda^j\Delta_j,$$

*must hold.*

**Proof.** This Lemma is proved by similar arguments to those in the Proof of Lemma 2. ■

## Proof of Proposition 1

Step 1. We show that any strategy profile is self-enforcing. There are 14 nonempty proper subcoalitions. Four subcoalitions are formed by one player. Six subcoalitions are formed by two players. Four subcoalitions are formed by three players.

1. Let us consider the subcoalitions formed by one player. Given condition (15) holds, according to Lemma 1, the proposed strategy profiles are Nash equilibria. So, given any other three players' strategies, the strategy prescribed for the left player is a CPNE of the one-player game played by itself.

2. Let us consider the subcoalitions formed by two players.

   a. The subcoalitions formed by trade union $i$ and firm $i$. Consider the game played by these two players when $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, and $C_j^F = 0$. There are two nonempty proper subcoalitions: one formed by trade union $i$ and another formed by firm $i$. Given $C_i^F = \left(0, C_{ij}^F\right)$, where $C_{ij}^F$ is arbitrarily chosen, since condition (15) holds, we always have $\lambda^i\left(0 - C_{ij}^F\right) + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j\left(C_{jj}^T - 0\right)$, so, $C_i^T = 0$ is a CPNE of the one-player game played by trade union $i$. Given $C_i^T = 0$, since condition (15) holds, we always have $\lambda^i\left(0 - \frac{5}{72}\Delta_i\right) + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j\left(C_{jj}^T - 0\right)$, so, $C_i^F = \left(0, C_{ij}^F\right)$, where $C_{ij}^F$ is arbitrarily chosen, is a CPNE of the one-player game played by firm $i$. So, the strategy profile consisting of $C_i^T = 0$ and $C_i^F = \left(0, C_{ij}^F\right)$ is self-enforcing. Notice that any strategy profile consisting of $C_i^T = 0$ and $C_i^{F\prime} = \left(0, C_{ij}^{F\prime}\right)$, where $C_{ij}^F \neq C_{ij}^{F\prime}$, is also self-enforcing. But trade union $i$ receives $\frac{1}{3}\Delta_i$, and firm $i$ receives $\frac{1}{18}\Delta_i$, irrespective of self-enforcing strategy profiles. So, $C_i^T = 0$ and $C_i^F = \left(0, C_{ij}^F\right)$ are a CPNE of the game played by trade union $i$ and firm $i$.

b. The subcoalitions formed by trade union $i$ and trade union $j$. Using the similar arguments to those in 1.2.a, it proves that $C_i^T = 0$ and $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, are a CPNE of the game played by trade union $i$ and trade union $j$.

c. The subcoalitions formed by trade union $i$ and firm $j$. Consider the game played by these two players when $C_i^F = \left(0, C_{ij}^F\right)$, where $C_{ij}^F$ is arbitrarily chosen, and $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen. There are two nonempty proper subcoalitions: one formed by trade union $i$ and another formed by firm $j$. Given $C_j^F = 0$, since condition (15) holds, we always have $\lambda^i \left(0 - C_{ij}^F\right) + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j \left(C_{jj}^T - 0\right)$, so, $C_i^T = 0$ is a CPNE of the one-player game played by trade union $i$. By the same token, given $C_i^T = 0$, $C_j^F = 0$ is a CPNE of the one-player game played by firm $j$. So, the strategy profile consisting of $C_i^T = 0$ and $C_j^F = 0$ is self-enforcing. This is the only self-enforcing strategy profile since no player has an incentive to make strictly positive political contributions. So, it is a CPNE of the game played by trade union $i$ and firm $j$.

d. The subcoalitions formed by firm $i$ and trade union $j$. Consider the game played by these two players when $C_i^T = 0$ and $C_j^F = 0$. There are two nonempty proper subcoalitions: one formed by firm $i$ and another formed by trade union $j$. Given $C_i^F = \left(0, C_{ij}^F\right)$, where $C_{ij}^F$ is arbitrarily chosen, since condition (15) holds, we always have $\lambda^i \left(0 - C_{ij}^F\right) + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j \left(\frac{1}{12}\Delta_j - 0\right)$, so, $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, is a CPNE of the one-player game played by trade union $j$. Given $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, since condition (15) holds, we always have $\lambda^i \left(0 - \frac{5}{72}\Delta_i\right) + \left(\frac{1}{16} + \frac{1}{18}\right)(\Delta_i - \Delta_j) \geq \lambda^j \left(C_{jj}^T - 0\right)$, so, $C_i^F = \left(0, C_{ij}^F\right)$, where $C_{ij}^F$ is arbitrarily chosen, is a CPNE of the one-player game played by firm $i$. So, the strategy profile consisting of $C_i^F = \left(0, C_{ij}^F\right)$ and $C_j^T = \left(0, C_{jj}^T\right)$ is self-enforcing. Notice that any strategy profile consisting of $C_i^{F\prime} = \left(0, C_{ij}^{F\prime}\right)$, where $C_{ij}^F \neq C_{ij}^{F\prime}$, or $C_j^{T\prime} = \left(0, C_{jj}^{T\prime}\right)$, where $C_{jj}^T \neq C_{jj}^{T\prime}$, or both is also self-enforcing. But firm $i$ receives $\frac{1}{18}\Delta_i$, and trade union $j$ receives $\frac{1}{4}\Delta_j$, irrespective of self-enforcing strategy profiles. So, $C_i^F = \left(0, C_{ij}^F\right)$ and $C_j^T = \left(0, C_{jj}^T\right)$ are a CPNE of the game played by firm $i$ and trade union $j$.

e. The subcoalitions formed by firm $i$ and firm $j$. Using the similar arguments to those in 1.2.a, it proves that $C_i^F = \left(0, C_{ij}^F\right)$, where $C_{ij}^F$ is arbitrarily chosen, and $C_j^F = 0$, are a CPNE of the game played by firm $i$ and firm $j$.

f. The subcoalitions formed by trade union $j$ and firm $j$. Using the similar arguments to those in 1.2.a, it proves that $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, and $C_j^F = 0$, are a CPNE of the game played by trade union $j$ and firm $j$.

3. Let us consider the subcoalitions formed by three players.

   a. The subcoalitions formed by trade union $i$, firm $i$ and trade union $j$. Consider the game played by these three players when $C_j^F = 0$. There are six nonempty proper subcoalitions: three formed by one player and three formed by two players.

      i. Let us consider the three subcoalitions formed by one player. According to step 1.1, it is easy to show that fixing $C_j^F = 0$, given any other two players' strategies, the strategy prescribed for the left player is a CPNE of the one-player game played by itself.

      ii. Let us consider the three subcoalitions formed by two players. According to step 1.2.a, 1.2.b and 1.2.d, it is easy to show that fixing $C_j^F = 0$, given any player's strategy, the strategies prescribed for the left two players are a CPNE of the two-player game played by themselves.

      iii. So, fixing $C_j^F = 0$, the strategies prescribed for the left three players are self-enforcing. Notice that any strategy profile consisting of $C_i^{F\prime} = \left(0, C_{ij}^{F\prime}\right)$, where $C_{ij}^F \neq C_{ij}^{F\prime}$, or $C_j^{T\prime} = \left(0, C_{jj}^{T\prime}\right)$, where $C_{jj}^T \neq C_{jj}^{T\prime}$, or both is also self-enforcing. But trade union $i$ receives $\frac{1}{3}\Delta_i$, firm $i$ receives $\frac{1}{18}\Delta_i$, and trade union $j$ receives $\frac{1}{4}\Delta_j$, irrespective of self-enforcing strategy profiles. So, $C_i^T = 0$, $C_i^F = \left(0, C_{ij}^F\right)$ and $C_j^T = \left(0, C_{jj}^T\right)$ are a CPNE in this case.

   b. The subcoalitions formed by trade union $i$, firm $i$ and firm $j$. Consider the game played by these three players when $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen. There are six nonempty proper subcoalitions: three formed by one player and three formed by two players.

      i. Let us consider the three subcoalitions formed by one player. According to step 1.1, it is easy to show that fixing $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, given any other two players' strategies, the strategy prescribed for the left player is a CPNE of the one-player game played by itself.

      ii. Let us consider the three subcoalitions formed by two players. According to step 1.2.a, 1.2.c and 1.2.e, it is easy to show that fixing $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, given any player's strategy, the strategies prescribed for the left two players are a CPNE of the two-player game played by themselves.

      iii. So, fixing $C_j^T = \left(0, C_{jj}^T\right)$, where $C_{jj}^T$ is arbitrarily chosen, the strategies prescribed for the left three players are self-enforcing. Notice that any strategy profile consisting of $C_i^{F\prime} = \left(0, C_{ij}^{F\prime}\right)$, where $C_{ij}^F \neq C_{ij}^{F\prime}$, is also self-enforcing. But trade union $i$ receives $\frac{1}{3}\Delta_i$, firm $i$ receives $\frac{1}{18}\Delta_i$, and firm $j$ receives $\frac{1}{8}\Delta_j$, irrespective of self-enforcing strategy profiles. So, the proposed strategy profile is a CPNE in this case.

   c. The subcoalitions formed by trade union $i$, trade union $j$ and firm $j$. Using the similar arguments to those in step 1.3.b, it proves that the proposed strategies are a CPNE of the game played by themselves.

   d. The subcoalitions formed by firm $i$, trade union $j$ and firm $j$. Using the similar arguments to those in step 1.3.a, it proves that the proposed strategies are a CPNE of the game played by themselves.

So far, we have established that any strategy profiles prescribed in Proposition 1 are self-enforcing.

Step 2. Are there any other self-enforcing strategy profiles? Since given condition (15) holds, both trade union $i$ and firm $j$ do not have an incentive to make strictly positive political contributions, there is no other self-enforcing strategy profile.

Step 3. Finally, it is easy to show that given any proposed strategy profile, trade union $i$ receives $\frac{1}{3}\Delta_i$, firm $i$ receives $\frac{1}{18}\Delta_i$, trade union $j$ receives $\frac{1}{4}\Delta_j$, and firm $j$ receives $\frac{1}{8}\Delta_j$.

We conclude that any proposed strategy profile is a CPNE in the first stage of the game. ■

## Proof of Proposition 2

Step 1. We show that any strategy profile is self-enforcing. There are 14 nonempty proper subcoalitions. Four subcoalitions are formed by one player. Six subcoalitions are formed by two players. Four subcoalitions are formed by three players.

1. Let us consider the subcoalitions formed by one player. Given condition (18) holds, according to Lemma 1, the proposed strategy profiles are Nash equilibria. So, given any other three players' strategies, the strategy prescribed for the left player is a CPNE of the one-player game played by itself.

2. Let us consider the subcoalitions formed by two players.

   a. The subcoalitions formed by trade union $i$ and firm $i$. Consider the game played by these two players when $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$, and $C_j^F = \left(C_{ji}^F, 0\right)$. There are two nonempty proper subcoalitions: one formed by trade union $i$ and another formed by firm $i$. Given $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$, it is optimal for trade union $i$ to choose $C_i^T = \left(C_{ii}^T, 0\right)$, such that condition (19) holds. Given $C_i^T = \left(C_{ii}^T, 0\right)$, $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ is a CPNE of the one-player game played by firm $i$. So, the strategy profile consisting of $C_i^T = \left(C_{ii}^T, 0\right)$ and $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ is self-enforcing. Notice that any other strategy profiles are not self-enforcing since $C_i^T = \left(C_{ii}^T, 0\right)$ and $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ are a unique Nash equilibrium of this two-player game. (The nature of this game is a standard Bertrand game with cost asymmetries.) So, it is a CPNE of the game played by trade union $i$ and firm $i$.

   b. The subcoalitions formed by trade union $i$ and trade union $j$. Using the similar arguments to those in 1.2.a, it proves that $C_i^T = \left(C_{ii}^T, 0\right)$ and $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$ are a CPNE of the game played by trade union $i$ and trade union $j$.

   c. The subcoalitions formed by trade union $i$ and firm $j$. Consider the game played by these two players when $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ and $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$. There are two nonempty proper subcoalitions: one formed by trade union $i$ and another formed by firm $j$. Given $C_j^F = \left(C_{ji}^F, 0\right)$, it is optimal for trade union $i$ to choose $C_i^T = \left(C_{ii}^T, 0\right)$, such that condition (19) holds. Given $C_i^T = \left(C_{ii}^T, 0\right)$, it is optimal for firm $j$ to choose $C_j^F = \left(C_{ji}^F, 0\right)$, such that condition (19) holds. So, the strategy profile consisting of $C_i^T = \left(C_{ii}^T, 0\right)$ and $C_j^F = \left(C_{ji}^F, 0\right)$ is self-enforcing. Notice that there are other self-enforcing strategy profiles. First of all, any strategy profile consisting of $C_i^{T\prime} = \left(C_{ii}^{T\prime}, 0\right)$ and $C_j^{F\prime} = \left(C_{ji}^{F\prime}, 0\right)$, such that $C_{ii}^{T\prime}$ and $C_{ji}^{F\prime}$ satisfy condition (19), is self-enforcing. But $C_{ii}^{T\prime}$ and $C_{ji}^{F\prime}$ cannot be both strictly smaller than $C_{ii}^T$ and $C_{ji}^F$. Otherwise, condition (19) does not hold. So, the proposed strategy profile cannot be strictly Pareto dominated by these self-enforcing strategy profiles. Also we may have a Nash equilibrium, in which trade union $i$ and firm $j$ free-ride on each other. But the payoffs received in this case are strictly smaller than the payoffs received in the case when $C_{ii}^{T\prime}$ and $C_{ji}^{F\prime}$ satisfy condition (19), where $0 < C_{ii}^{T\prime} < \frac{1}{12}\Delta_i$, and $0 < C_{ji}^{F\prime} < \frac{5}{72}\Delta_j$. In summary, the proposed strategy profile is a CPNE of the game played by trade union $i$ and firm $j$.

d. The subcoalitions formed by firm $i$ and trade union $j$. Consider the game played by these two players when $C_i^T = \left(C_{ii}^T, 0\right)$ and $C_j^F = \left(C_{ji}^F, 0\right)$, such that condition (19) holds. It is easy to show that any strategy profiles are Nash equilibria, and hence self-enforcing, since firm $i$ receives $\frac{1}{18}\Delta_i$, and trade union $j$ receives $\frac{1}{4}\Delta_j$, irrespective of strategy profiles. So, $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ and $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$ are self-enforcing and are not strongly Pareto dominated by any other self-enforcing strategy profiles. They are a CPNE of the game played by firm $i$ and trade union $j$.

e. The subcoalitions formed by firm $i$ and firm $j$. Using the similar arguments to those in 1.2.a, it proves that $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ and $C_j^F = \left(C_{ji}^F, 0\right)$ are a CPNE of the game played by firm $i$ and firm $j$.

f. The subcoalitions formed by trade union $j$ and firm $j$. Using the similar arguments to those in 1.2.a, it proves that $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$ and $C_j^F = \left(C_{ji}^F, 0\right)$ are a CPNE of the game played by trade union $j$ and firm $j$.

3. Let us consider the subcoalitions formed by three players.

a. The subcoalitions formed by trade union $i$, firm $i$ and trade union $j$. Consider the game played by these three players when $C_j^F = \left(C_{ji}^F, 0\right)$. There are six nonempty proper subcoalitions: three formed by one player and three formed by two players.

i. Let us consider the three subcoalitions formed by one player. According to step 1.1, it is easy to show that fixing $C_j^F = \left(C_{ji}^F, 0\right)$, given any other two players' strategies, the strategy prescribed for the left player is a CPNE of the one-player game played by itself.

ii. Let us consider the three subcoalitions formed by two players. According to step 1.2.a, 1.2.b and 1.2.d, it is easy to show that fixing $C_j^F = \left(C_{ji}^F, 0\right)$, given any player's strategy, the strategies prescribed for the left two players are a CPNE of the two-player game played by themselves.

iii. So, fixing $C_j^F = \left(C_{ji}^F, 0\right)$, the strategies prescribed for the left three players are self-enforcing. Are there any other self-enforcing strategy profiles? Notice that if a strategy profile is self-enforcing, it must be the case that $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ and $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$. Otherwise, this strategy profile will not induce a CPNE either in the game played by trade union $i$ and firm $i$, (see step 1.2.a), or the game played by trade union $i$ and trade union $j$, (see step 1.2.b), or both. Since $C_j^F = \left(C_{ji}^F, 0\right)$ is fixed, given $C_i^F = \left(0, \frac{5}{72}\Delta_i\right)$ and $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$, it must be the case that trade union $i$ chooses $C_i^T = \left(C_{ii}^T, 0\right)$, such that $C_{ii}^T$ satisfies condition (19). So, the self-enforcing strategy profile in this case is unique, and hence a CPNE.

b. The subcoalitions formed by trade union $i$, firm $i$ and firm $j$. Consider the game played by these three players when $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$. There are six nonempty proper subcoalitions: three formed by one player and three formed by two players.

   i. Let us consider the three subcoalitions formed by one player. According to step 1.1, it is easy to show that fixing $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$, given any other two players' strategies, the strategy prescribed for the left player is a CPNE of the one-player game played by itself.

   ii. Let us consider the three subcoalitions formed by two players. According to step 1.2.a, 1.2.c and 1.2.e, it is easy to show that fixing $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$, given any player's strategy, the strategies prescribed for the left two players are a CPNE of the two-player game played by themselves.

   iii. So, fixing $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$, the strategies prescribed for the left three players are self-enforcing. Are there any other self-enforcing strategy profiles? Notice that if a strategy profile is self-enforcing, it must be the case that $C_i^F = \left(\frac{5}{72}\Delta_i, 0\right)$. Otherwise, this strategy profile will not induce a CPNE either in the game played by trade union $i$ and firm $i$, (see step 1.2.a), or the game played by firm $i$ and firm $j$, (see step 1.2.e), or both. Since $C_j^T = \left(0, \frac{1}{12}\Delta_j\right)$ is fixed, it must be the case that any strategy profile consisting of $C_i^{T\prime} = \left(C_{ii}^{T\prime}, 0\right)$ and $C_j^{F\prime} = \left(C_{ji}^{F\prime}, 0\right)$, such that $C_{ii}^{T\prime}$ and $C_{ji}^{F\prime}$ satisfy condition (19), is self-enforcing. But the proposed strategy profile is not strongly Pareto dominated by any other self-enforcing strategy profiles. Hence, the proposed strategy profile is a CPNE in this case.

c. The subcoalitions formed by trade union $i$, trade union $j$ and firm $j$. Using the similar arguments to those in step 1.3.b, it proves that the proposed strategies are a CPNE of the game played by themselves.

d. The subcoalitions formed by firm $i$, trade union $j$ and firm $j$. Using the similar arguments to those in step 1.3.a, it proves that the proposed strategies are a CPNE of the game played by themselves.

So far, we have established that any strategy profiles prescribed in Proposition 2 are self-enforcing.

Step 2. Are there any other self-enforcing strategy profiles? Since given a self-enforcing strategy profile, it must be the case that $C_{ij}^F = \frac{5}{72}\Delta_i$, $C_{jj}^T = \frac{1}{12}\Delta_j$, and $C_{ii}^T$ and $C_{ji}^F$ satisfy condition (19), there is no other self-enforcing strategy profile.

Step 3. Finally, it is easy to show that given any strategy profile, trade union $i$ receives $\frac{1}{3}\Delta_i - C_{ii}^T$, firm $i$ receives $\frac{1}{18}\Delta_i$, trade union $j$ receives $\frac{1}{4}\Delta_j$, and firm $j$ receives $\frac{1}{8}\Delta_j - C_{ji}^F$. Notice that $C_{ii}^T$ and $C_{ji}^F$ cannot be lowered simultaneously. Otherwise, condition (19) does not hold. This means that any self-enforcing strategy profile is not strongly Pareto dominated by any other self-enforcing strategy profiles.

We conclude that any proposed strategy profile is a CPNE in the first stage of the game. ■