Trading Blocs and Foreign Direct Investment: Endogenous Coalition Structure*

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Abstract

I examine the relationship between trading blocs and Foreign Direct Investment (FDI). Firms in the model serve foreign markets either by exporting or by setting up plants abroad, which is FDI. I find that countries forming a bloc could attract FDI from non-member countries. However, I show by using a coalition formation game that this FDI-attracting bloc *cannot* be an equilibrium outcome when multilateralism (*i.e.*, the free trade world) is an option for countries. This result is mainly related to the adverse welfare effects of the tariff-jumping FDI.

JEL classifications: F15, F23
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1 Introduction

There has been a dramatic increase in regional trading blocs over the last decade. In many cases, these trading blocs seem to have succeeded in attracting Foreign Direct Investment (FDI). According to a World Trade Organization study, total inflows of FDI into the member countries of the European Community (EC) increased considerably from European Currency Unit (ECU) 10 billion in 1984 to ECU 63 billion in 1989, following the announcement of the Single Market Program in 1985.[1] The Southern Cone Common Market in Latin America, better known as MERCOSUR, observed an increase in FDI inflows from $10 billion in 1995 to $17 billion in 1997.[2] However, traditionally when trade economists discuss trading blocs, they have looked mainly at the trading of goods and have not paid appropriate attention to the importance of FDI, largely out of habit.[3]

This paper brings FDI into the discussion and analyzes the relationship between FDI and trading blocs. I show that two countries that form a bloc may attract FDI from a non-member country. This is because larger and more integrated markets allow firms outside the bloc to recoup sunk costs in setting up plants inside the bloc[4]. Further, the firms can avoid tariffs and transport costs by becoming Multinational Corporations (MNCs), which are the primary source of FDI. However, it is shown that this FDI-attracting bloc *cannot* be an equilibrium outcome when multilateral free trade is an option. The intuitive explanation is that as firms outside the bloc become MNCs in response to integration, there will be no possible way for member countries to extract tariff rents from non-member countries.

Ever since the early formation of the EU, there have been a large number of studies on economic integration.[5] Surprisingly, there has been little work on the connection between economic integration and FDI with a couple exceptions. Motta and Norman (1996) argue in an oligopoly model that a decrease in the intra-regional tariffs of a bloc may induce firms outside the bloc to switch their regional market strategies from export to investment.

[1] *Regionalism and the World Trade System* , 1995, p.47.

[2] *World Investment Report (WIR)*, 1998, p.126.

[3] Panagariya (2000, p.329) remarks, "Equally, in the policy debate, direct foreign investment is frequently cited as a key reason for signing FTAs and Customs Unions. Yet, there is little theoretical work drawing the link between these two phenomena. Issues such as why a regional arrangement might be a better instrument of bringing foreign direct investment than multilateral liberalization have yet to be addressed."

[4] *The Economist* (Feb. 17th 2001, p.104) points out "(market) size matters" based on an annual survey by A.T. Kearney, a management-consulting firm. *World Investment Report* (1998, p.122) remarks that "Increased market size - from national to regional or global - is in itself an efficiency-inducing determinant because it provides the demand dimension that gives rise to the possibility of exploiting economies of scale and scope in production and distribution."

[5] See Panagariya's survey paper (2000).

Ranjan (2001) examines investment creation and diversion[6] using a three-country general-equilibrium model. However, the above authors do not take account of endogenous bloc formation. Although there are several writers who have studied endogenous bloc formation, none of them allows multi-national production operations (Riezman, 1985; Yi, 1996; Burbidge et al., 1997; McLaren, 2002). Therefore, this paper is the first study to examine the effect of trading blocs on FDI *with* endogenous coalition formation.[7]

There are two parts to the analysis. First, I will build a three-country general-equilibrium model and, second, I will analyze a coalition formation game. Firms in the model compete in a monopolistically competitive market and serve foreign markets either by exporting or by setting up plants abroad. The latter is the operation of MNCs or FDI[8]. When a firm decides to become an MNC, it faces trade-offs: incurring sunk costs for building plants abroad but saving the tariffs and transport costs of exporting. The model discusses various types of equilibrium that characterize firms in the pre- and post-Free Trade Agreement (FTA)[9] scenario. Further, the model permits explicit welfare calculations for various equilibria.

The varied welfare allows each country to form a preference ordering over three trading regimes; (i) the Most-Favored-Nation (MFN) regime in which each country sets tariffs against the others, (ii) bilateralism (*i.e.*, a trading bloc) in which two countries reach an FTA and (iii) multilateralism (*i.e.*, the free trade world) in which all reach an FTA. The ordering shapes a strategic partnership plan for each country in the coalition formation game. Countries in the game can form a bloc if and only if all of its members are unanimous on the bloc. However, under the unanimity rule, bilateralism is always trivially a Nash equilibrium, even when all countries strictly prefer the free trade regime. Hence, I employ one of its refinements, Coalition Proof Nash Equilibrium (CPNE), originally suggested by Berheim et al. (1987). Thus, the game is a simple application of CPNE. The goal of the game is to discover under what conditions bilateralism can be an equilibrium coalition structure rather than multilateralism. I will use these conditions

[6]Investment is created in the sense that the Single Market Program leads individuals and firms in a member country to invest in their country or their member countries when they otherwise would not have invested at all. However, investment diversion occurs when investment of non-member countries in a member country displaces investment in the rest of world (*Reflection on Regionalism*, 1997, p.14).

[7]Krueger (1997, p.177) writes, "There are, however, a large number of questions that arise about the impact of FDI on preferential arrangements and vice versa that, to the author's knowledge, have not been addressed in the literature.

[8]In this paper, I focus on the horizontal investment component of FDI. Horizontal investment is aimed at producing goods for and serving the host country or exporting to neighboring countries in the same region, as opposed to vertical investment which is aimed at usually outsourcing production activities to the host country and exporting products back to the source country (Brenton et al., 1999, p.108).

[9]If two countries sign an FTA, they eliminate tariffs between them while preserving their own tariffs against the rest of world.

in simulations to determine whether or not a trading bloc will form with the possibility of FDI.

Section 2 introduces a three-country general-equilibrium model to consider the effects of FTAs on the strategies of the firms of serving foreign markets. Section 3 endogenizes the decisions of the countries to form an FTA by analyzing a coalition formation game. Section 4 discusses numerical results and draws conclusions. Section 5 gives directions for future research.

2 The Three-Country Model

I introduce a symmetric three-country model. The economy has two sectors: one numeraire sector and one industry producing differentiated goods. Labor is the only factor in the economy.[10] I employ a monopolistic-competition model for production. The structure of the model follows Helpman and Krugman (1985), Brainard (1993), and Ranjan (2001). I review the basic model first. Then, I consider pre-FTA and post-FTA equilibria, respectively.

2.1 The Basic Model

Here I consider a closed economy. The representative consumer in the economy has an additively separable CES utility function[11]:

$$U\left(D_1,...,D_n;D_0\right)=\frac{1}{\rho}\ln\left(\sum_{\omega=1}D_\omega^\rho\right)+D_0 \tag{1}$$

for $\omega=1,...,n$ and $\rho\in(0,1)$. ω is an index for variety. D_w is the quantity consumed of variety ω. D_0 is the quantity consumed of the numeraire. ρ measures the consumer's preference for variety.[12] The lower ρ, the greater the love for variety. The budget constraint of the consumer is

$$\sum_\omega p_\omega D_\omega+D_0=Y$$

where p_ω is the price of variety ω, and Y is the income of the consumer.

The consumer's maximization problem yields a demand function for variety ω and a demand for the numeraire, respectively:

$$\begin{aligned} D_\omega &= \frac{p_\omega^{-\lambda-1}}{\sum_\omega p_\omega^{-\lambda}}, \quad \text{and} \\ D_0 &= Y-1 \end{aligned}$$

[10] Since I do not have capital in the model, FDI in my model represents establishing control rather than capital flow (Krugman, 1983, p.62).

[11] Anderson et al. (1997) introduce a similar utility function with two sectors (a differentiated and a numeraire sector).

[12] $\rho\equiv\frac{\epsilon-1}{\epsilon};\epsilon>1$ where ϵ is is the degree of substitutability, or the elasticity of substitution, between any two products. In the limit of perfect substitutability, *i.e.*, $\epsilon\to\infty$, $\rho\to1$: there is no love for variety, and products are perfect substitutes.

where $\lambda \equiv \frac{\rho}{1-\rho}$ and $\lambda \in (0, \infty)$.[13] Note that the smaller λ, the greater the love for variety. Notice that the total expenditure on differentiated goods is fixed to one. Therefore, I make an assumption that $Y > 1$ in order to have an interior solution to the maximization problem.

Consider the production side. There are two kinds of sunk costs in the production of the differentiated goods: F is the firm-specific sunk cost, and G is the plant-specific sunk cost. The firm-specific cost is incurred once when a firm comes into existence. The cost for blueprints and R&D is an example of F. The plant-specific cost is incurred whenever a plant is built (Markusen and Venables, 1996 and 1998). Also, there is a constant marginal cost c. A firm's profit function producing variety ω with one plant is

$$\pi_\omega = (p_\omega - c_\omega) D_\omega - (F + G).$$

From the firm's maximization problem, I can get the symmetric equilibrium price, which is the same for all varieties:

$$p = p_\omega = \frac{c}{\rho} \text{ for } \omega = 1, ..., n.$$

Given the equilibrium price, output per firm is also the same for all varieties:

$$D = D_\omega = \frac{1}{np} = \frac{1}{n}\frac{\rho}{c} \quad \text{for } \omega = 1, ..., n.$$

Finally, the zero-profit condition from free entry and exit in the economy pins down the number of firms[14],

$$n^* = \frac{1-\rho}{F+G}.$$

2.2 The Pre-FTA Scenario

Consider an open economy prior to any Free Trade Agreement (FTA). There are three identical countries in terms of technology, tastes, and labor endowments: Country 1, Country 2, and Country 3. Firms in the differentiated sector can penetrate foreign markets either by exporting or by setting up plants and supplying the goods in the local markets. Thus, there are two possible types of firms: exporting or national firms with a single plant and

[13] One assumption made for the derivation of the demand function is that, when there are many firms in the differentiated sector, the elasticity of the demand of variety ω can be approximated as a constant:

$$-\frac{D_\omega}{p_\omega}\frac{\partial p_\omega}{\partial D_\omega} \simeq \frac{1}{1-\rho}, \quad \omega = 1, ..., n.$$

[14] In equilibrium, each variety is produced by only one firm. Thus, the number of firms equals the number of varieties.

Multinational Corporations (MNCs) with multiple plants.[15] In the pre-FTA I show the existence of three possible equilibria. In the single-plant equilibrium, only national firms exist, in the multiple-plant equilibrium only MNCs exist, and in the mixed equilibrium both types of firms coexist. However, the mixed equilibrium is possible only under "knife-edge" conditions so that the economy tips from the single-plant equilibrium to the multiple-pant equilibrium by crossing a border line and vice versa.

2.2.1 The Single-Plant Equilibrium

In this subsection I consider the economy where only national firms exist. I assume exogenous and uniform "iceberg" transport costs and ad valorem tariffs for the differentiated products across countries throughout the paper. Here, the tariffs are exogenous and uniform partly for simplicity and partly to reflect rules of the GATT (now the WTO) pertaining to the Most-Favored-Nation (MFN) principle and preferential trade agreements (Stein and Frankel, 1994).[16]

The transport costs and tariffs causes consumer prices for imported goods to exceed producer's prices. For example, consumer's price in Country 1 for imported goods from Country 2 is

$$p_{21} = \frac{p_2 (1 + \tau)}{1 - g}$$

where g is the iceberg transport cost[17], $0 \leq g < 1$, τ is the tariff[18], $0 \leq \tau$, and p_2 is a producer's price in Country 2.[19] However, I assume that there are no trading costs for the numeraire and that countries always produce it. This makes the producers' prices of the differentiated goods the same across countries.

Because of the symmetry of the three countries, it is sufficient to consider just Country 1. A representative consumer in Country 1 maximizes her

[15] There exist other choices of how firms serve foreign markets. Firms could lisence their products to foreign firms or could merge or acquire foreign firms. However, for simplicity, I do not consider these other ways of serving foreign markets.

[16] In short, Article I of the GATT describes the MFN rule such that signatory governments should treat their trading partners equally and uniformly. On the other hand, Article XXIV of the GATT requires that members of a trade agreement do not raise tariffs against non-members post the agreement (WTO, 1995).

[17] If 1 unit of good is sent to a foreign country, $1 - g$ units arrive where $0 \leq g < 1$, so g units are lost in transit.

[18] It is assumed that the tariff is levied on the c.i.f. price.

[19] When $g = 0.1$ and $\tau = 0.1$, the home consumer's price for foreign goods is 22 percent higher than the home producer's price. When $g = 0.1$ and $\tau = 0.3$, the home consumer's price for foreign goods is 44 percent higher.

utility subject to the budget constraint:

$$\max_{D_{i\omega}, D_0} U = \frac{1}{\rho} \ln \left(\sum_{i=1}^{3} \sum_{\omega=1}^{n_i} D_{i\omega}^{\rho} \right) + D_0 \tag{2}$$

s.t.

$$\sum_{i} \sum_{\omega} p_{i\omega} D_{i\omega} + D_0 = Y + TR_1, \text{ that is,} \tag{3}$$

$$\sum_{\omega=1}^{n_1} p_1 D_{11} + \sum_{\omega=n_1+1}^{n_2} p_{21} D_{21} + \sum_{\omega=n_2+1}^{n_3} p_{31} D_{31} + D_0 = Y + TR_1 \tag{4}$$

where i is an index for the three countries. D_{ij} is the quantity consumed by the consumer in Country j of goods produced in Country i, for $i, j = 1, 2, 3$. $p_{ij} = \frac{p_i(1+\tau)}{1-g}$ for $i \neq j$, and p_i is a producer's price in Country i. n_i represents the number of firms in Country i. TR_1 is a tariff revenue in Country 1 which is redistributed to the consumer in lump-sum fashion.

The maximization problem yields the equilibrium consumptions of the differentiated products per variety and the numeraire as follows:

$$\begin{aligned}
D_{11} &= \frac{p_1^{-\lambda-1}}{n_1 p_1^{-\lambda} + n_2 p_{21}^{-\lambda} + n_3 p_{31}^{-\lambda}} = \frac{p_1^{-1}}{n_1 + n_2\sigma + n_3\sigma}, \\
D_{21} &= \frac{p_{21}^{-\lambda-1}}{n_1 p_1^{-\lambda} + n_2 p_{21}^{-\lambda} + n_3 p_{31}^{-\lambda}} = \frac{p_1^{-1} \left(\frac{1-g}{1+\tau}\right)^{\lambda+1}}{n_1 + n_2\sigma + n_3\sigma}, \\
D_{31} &= \frac{p_{31}^{-\lambda-1}}{n_1 p_1^{-\lambda} + n_2 p_{21}^{-\lambda} + n_3 p_{31}^{-\lambda}} = \frac{p_1^{-1} \left(\frac{1-g}{1+\tau}\right)^{\lambda+1}}{n_1 + n_2\sigma + n_3\sigma}, \quad \text{and} \\
D_0 &= Y + TR_1 - 1
\end{aligned} \tag{5}$$

where $\sigma \equiv \left(\frac{1-g}{1+\tau}\right)^{\lambda}$, and $0 < \sigma \leq 1$. Note that the lower the σ the higher the overall trading costs.

Consider a producer's problem in Country 1. Its operating profit[20] is

$$o\pi_1 = (p_1 - c) D_{11} + (p_1 - c) \frac{D_{12}}{1-g} + (p_1 - c) \frac{D_{13}}{1-g}$$

where D_{11} is given in equation (5), and D_{12} and D_{13} can be similarly derived. After substituting the equilibrium consumptions and $p = c/\rho$ and using the symmetry in the number of firms[21], I have

$$o\pi_1 = (1-\rho) \frac{1}{n} \frac{1+2\phi}{1+2\sigma}$$

[20] The expression of the operating profit is the *net* of tariffs.

[21] Due to the symmetry of the model, $n_1 = n_2 = n_3 \equiv n$.

where $\phi \equiv \frac{1}{1-g}\left(\frac{1-g}{1+\tau}\right)^{\lambda+1} = \frac{1}{1+\tau}\sigma$.[22] Note that $0 < \phi \leq \sigma \leq 1$, and thus $\frac{1+2\phi}{1+2\sigma} \leq 1$. The operating profit here is smaller than that in the closed economy. Indeed, this sounds intuitive because, in this trading economy with positive tariffs, some of the total revenue for a firm in the differentiated sector is lost to the tariff revenues of governments.

The zero-profit condition determines the number of varieties or, equivalently, the number of firms per country:

$$n = \frac{1-\rho}{F+G}\frac{1+2\phi}{1+2\sigma}. \tag{6}$$

Observe that the number of firms here is less than its counterpart ($n^* = \frac{1-\rho}{F+G}$) in the closed economy. This is because with smaller operating profits the economy can accommodate fewer number of firms.

I now find out under what conditions the single-plant equilibrium is possible. For this, I examine whether a national firm has an incentive to change its strategy of serving foreign markets from exporting to setting up plants in the local markets. An exporting firm in the single-plant equilibrium does not want to deviate to become an MNC if its total profit when exporting is no less than the total profit when setting up plants overseas. That is, an exporting firm would *not defect* to become an MNC if $\pi_i \geqq \pi_i'$ for $i = 1, 2, 3$, where π_i is the total profit of the exporting firm in Country i, and π_i' is the total profit of an MNC headquartered in Country i.[23] I call this a *no-defection* condition.

Consider an exporting firm in Country 1. Then, its no-defection condition reduces to

$$G \geqq o\pi_{12}' - o\pi_{12}$$

where $o\pi_{12}$ is the variable profit earned in Country 2 by the exporting firm based in Country 1, and $o\pi_{12}'$ is the variable profit from Country 2 for the MNC headquartered in Country 1:

$$\begin{aligned} o\pi_{12} &= \frac{\phi}{n_1\sigma + n_2 + n_3\sigma}, \\ o\pi_{12}' &= \frac{1}{n_1\sigma + n_2 + n_3\sigma}. \end{aligned}$$

[22] The "total" relative demand of the foreign goods to the domestic goods is $\frac{C_{ij}/(1-g)}{C_{ii}} = \frac{1}{1-g}\left(\frac{1-g}{1+\tau}\right)^{\lambda+1}$ for $i \neq j$, which is the exact same term as ϕ. The relative demand is "total" in the sense that it takes account of the "indirect" demand of the foreign goods lost in transit as well as the direct demand. In fact, ϕ in my paper resembles Krugman's "σ" (1980, p.953).

[23] Because of the symmetry of countries, when a firm chooses to become an MNC, it builds two more plants in two foreign markets (one in each market) in addition to the plant in its domestic market.

After replacing the symmetric equilibrium number of firms in equation (6), the condition is given by[24]

$$G \geq \frac{1-\phi}{3\phi} F \tag{7}$$

where $\phi \equiv \frac{1}{1-g}\left(\frac{1-g}{1+\tau}\right)^{\lambda+1}$. This establishes the parameter space for the single-plant equilibrium.

2.2.2 The Multiple-Plant Equilibrium

In the multiple-plant equilibrium there exist only MNCs in the economy. Consider a consumer's problem in Country 1 which is similar to the one in the single-plant equilibrium, equation (2). One thing to note is that the consumer price for imported goods is the same as the producer price because this economy does not involve any trading between countries. The FOCs of the consumer's problem yield the equilibrium quantity consumed of the differentiated products:

$$D_{11}^m = D_{21}^m = D_{31}^m = \frac{p^{-1}}{3n^m} \tag{8}$$

where n^m is the number of the multinational firms headquartered in each country.

The operating profit for an MNC headquartered in Country1 is

$$o\pi_1 = (1-\rho)\frac{1}{n^m}.$$

Again, the zero-profit condition pins down the number of the firms

$$n^m = \frac{1-\rho}{F+3G}. \tag{9}$$

Hence, the total number of firms operating in Country 1 is $3n^m$. It is most likely that there are fewer varieties in the multiple-plant equilibrium than in the single-plant equilibrium due to the higher plant-specific sunk costs.

As in the single-plant equilibrium, I derive a no-defection condition for the multiple-plant equilibrium as follows:

$$G \leq \frac{1-\phi}{3\phi} F \tag{10}$$

where $\phi \equiv \frac{1}{1-g}\left(\frac{1-g}{1+\tau}\right)^{\lambda+1}$.

The comparison of the two no-defection conditions, inequality (7) and inequality (10), implies that the mixed equilibrium is possible only on the

[24] I assume no-integer problem in the derivation so that one firm's deviation does not affect the price index at all.

knife-edge, *i.e.*, when either inequality (7) or inequality (10) holds equally. Therefore, the economy tips from one equilibrium to the other equilibrium by crossing the border line. The relationship among the parameters in inequality (10) sounds intuitive. As either tariffs (τ), transport costs (g), firm-specific sunk costs (F), or the inverse measure for the love for variety (λ) increases, the multiple-plant equilibrium is more likely to hold. However, as plant-specific sunk costs (G) increases, the single-plant equilibrium is more likely to hold.

Finally, I can calculate the welfare in each equilibrium given with the equilibrium consumption, equations (5) and (8), and the equilibrium numbers of firms, equations (6) and (9). Notice that the welfare of a country in both equilibria is the same for the other countries due to the symmetry of the three countries.

2.3 The Post-FTA Scenario

Now suppose that Country 1 and 2 sign an FTA so that they abolish tariffs on imports from each other. Hence, trading between the member countries incurs only a transport cost. There are five possible equilibria in the post-FTA scenario: single-plant, hybrid, concentrating, and two kinds of multiple-plant (two-plant and three-plant) equilibrium.

In the post-FTA single-plant equilibrium, all firms are exporters. Note that firms in Country 3 cannot cross the border between the member countries without paying tariffs. This is basically the idea of the Rule of Origin (ROO). Only the products that are made within the member countries are subject to zero tariffs. Therefore, the ROO prevents the firms outside from exporting all of their products into one member country and then exporting to the other member country without paying tariffs.

The hybrid equilibrium is the case in which the firms inside are exporters, but the firms outside are MNCs. However, these MNCs have *two* plants in total, not three. They build only one plant in one of the member countries and then export their final goods to the other member country without incurring any tariffs. This operation does not violate the ROO.

In the two-plant equilibrium, firms in Country 1 and 2 set up their foreign subsidiaries in Country 3 but not in each other's market. Firms in Country 3 build their plants in Country 1 to serve the local market and export their products from the plant in Country 1 to Country 2. Furthermore, as in the pre-FTA, it is still possible that when trade barriers are very high, MNCs have three plants with one plant in each country. I call this situation the three-plant equilibrium. It is even feasible that all firms could operate in the integrated region (Country 1 and 2) so that no production of differentiated products is present in Country 3. This is called the concentrating equilibrium. This can happen for a relatively lower level of the trading costs. The firms in the equilibrium realize the increasing returns to scale by concen-

trating their productions at the larger and integrated market and exporting their products to Country 3 with the low trading costs. However, since the two multiple-plant and the concentrating equilibria are not directly relevant to the main theme of the paper, I will omit discussion of them.[25]

2.3.1 The Single-Plant Equilibrium

In this equilibrium, all firms are exporters.[26] Recalling that there are no tariffs between Country 1 and 2, a firm's operating profit in Country 1 is

$$o\pi_1^s = (1-\rho)\left(\frac{1}{n_1^s + n_2^s\gamma + n_3^s\sigma} + \frac{\gamma}{n_1^s\gamma + n_2^s + n_3^s\sigma} + \frac{\phi}{n_1^s\sigma + n_2^s\sigma + n_3^s}\right)$$

where $\gamma \equiv (1-g)^\lambda$, $\sigma \equiv \left(\frac{1-g}{1+\tau}\right)^\lambda$, and $\phi \equiv \frac{1}{1-g}\left(\frac{1-g}{1+\tau}\right)^{\lambda+1}$. Notice that $0 < \phi \leq \sigma \leq \gamma \leq 1$.

The operating profit for a firm in Country 2 is parallel to that in Country 1 due to the symmetry of the member countries. However, a firm in Country 3 incurs not only the transport cost but also the tariffs when it exports to the free trade area. Hence, its operating profit is

$$o\pi_3^s = (1-\rho)\left(\frac{\phi}{n_1^s + n_2^s\gamma + n_3^s\sigma} + \frac{\phi}{n_1^s\gamma + n_2^s + n_3^s\sigma} + \frac{1}{n_1^s\sigma + n_2^s\sigma + n_3^s}\right).$$

The three zero-profit conditions determine the number of firms in each country: $o\pi_i = F + G$, $i = 1, 2, 3$. After a tedious derivation, I obtain the equilibrium numbers of firms as follows:

$$\begin{aligned} n_1^s = n_2^s &= \frac{1-\rho}{F+G}\frac{1+\gamma-2\phi^2}{1+\gamma-2\sigma^2}\frac{(1+\gamma-2\phi)-\sigma(1-\phi)}{(1+\gamma-2\phi)(1-\phi)}, \qquad (11) \\ \text{and } n_3^s &= \frac{1-\rho}{F+G}\frac{1+\gamma-2\phi^2}{1+\gamma-2\sigma^2}\frac{(1-\phi)(1+\gamma)-2\sigma(1+\gamma-2\phi)}{(1+\gamma-2\phi)(1-\phi)}. \end{aligned}$$

In order to ensure a positive number of firms operating in each country, I restrict the trading costs as follows:

$$\sigma(1-\phi) < (1+\gamma-2\phi) < \frac{(1-\phi)(1+\gamma)}{2\phi}. \qquad (12)$$

Although the comparison between n_1^s and n_3^s is analytically ambiguous, simulations suggest that $n_1^s > n_3^s$. It is also ambiguous whether the total number of firms in this equilibrium is bigger than the total number in the pre-FTA equilibrium and whether the integrated region gains more firms

[25] Discussion on the two multiple-plant and the concentrating equilibria are available upon request.

[26] When I analyze the post-FTA equilibria, I treat each block member separately rather than as one entity because of non-zero transport costs.

after integration. However, simulations show that the total number of firms increases after the FTA, and there exist more firms in the integrated region but fewer firms outside.[27] Thus, the simulation results suggest that the integrated market can facilitate more firms than each individual market can in total.

Intuitive explanation on the simulation results is as follows: Formation of a bloc expands a market size not only for existing firms but also for potential firms in the bloc. The expanded market promotes the potential firms to enter the bloc market, because the market size is now big enough for them to recoup the firm-specific sunk costs. Furthermore, the new entrants replace firms outside the bloc as firms outside are not so competitive as firms inside due to the non-zero external tariffs. Hence, the number of firms in the non-member country drops to a small number after integration.

Examination of no-defection conditions additionally restricts the parameter space for the post-FTA single-plant equilibrium. An exporting firm may contemplate to switch to setting up multiple plants as its mode of serving foreign markets. If the firm switches, it could choose either two plants (one in the integrated region and the other in the non-member country) or three plants (one plant in each country). However, since building more plants incurs more plant-specific sunk costs, it is easier for an exporting firm to switch to setting up two plants than to setting up three plants. This implies that if an exporting firm does not deviate to become a two-plant MNC, defecting to become a three-plant MNC is out of the question.[28] Therefore, I only need to examine the former, which is that an exporting firm in any country would not defect to become an MNC with two plants unless profitable. This condition is summarized by

$$\phi\left(3+\gamma-4\phi\right)G \geq \left(1+\gamma-2\phi\right)\left(1-\phi\right)F \quad \text{for } 2\sigma^2 < 1+\gamma. \tag{13}$$

Overall, the parameter restrictions from positive numbers of firms (inequality (12)) and from the above no-defection condition (inequality (13)) determine the parameter space for the post-FTA single-plant equilibrium.

2.3.2 The Hybrid Equilibrium

I move on to examine another equilibrium in which "the firms outside a bloc" are MNCs, but the firms inside are exporters. The MNCs have two plants: one in Country 3 and the other in either bloc member countries.[29]

[27] Refer to Columns 3, 4, and 6 in Table 1 for the simulation results.

[28] I explicitly consider the no-defection condition to a three-plant MNC and confirm that it is not binding whenever the no-defection to a two-plant MNC holds.

[29] It is true that the MNCs here are not domiciled, because where they incur the firm-specific sunk costs does not matter in the model. However, I assume that they are all headquartered in a non-member country so that I can treat setting up plants in member countries as inward FDI from a non-member. This assumption, however, does not affect welfare results and thus main conclusions of the paper.

In addition, it must be true that, in equilibrium, a 50 percent of the MNCs have their foreign subsidiaries in one member country, and another 50 percent of the MNCs have their foreign subsidiaries in the other member. I name this equilibrium the hybrid. Such an equilibrium can be also found in an oligopolistic model. Motta and Norman (1996) point out in a three-country and three-firm model that the improved market accessibility due to a regional bloc can induce an outside firm to switch its strategy of serving the regional market from exporting to investing. I show a similar result in this general-equilibrium setting.

I derive the operating profit for an exporting firm in Country 1 as follows:

$$o\pi_1^h = (1-\rho)\left(\frac{1}{n_1^h + n_2^h\gamma + \frac{1}{2}n_3^h(1+\gamma)} + \frac{\gamma}{n_1^h\gamma + n_2^h + \frac{1}{2}n_3^h(1+\gamma)} + \frac{\phi}{n_1^h\sigma + n_2^h\sigma + n_3^h}\right)$$

where $\gamma \equiv (1-g)^\lambda$, $\sigma \equiv \left(\frac{1-g}{1+\tau}\right)^\lambda$, and $\phi \equiv \frac{1}{1-g}\left(\frac{1-g}{1+\tau}\right)^{\lambda+1}$. The operating profit for a firm in Country 2 is analogous to that in Country 1 because of the symmetry of the member countries.

Firms in Country 3 are MNCs with two plants. Now suppose that a firm has one plant in Country 3, builds a plant in Country 1 to serve the local market, and export its goods from the subsidiary in Country 1 to Country 2. However, it still incurs the transport costs in exporting to Country 2. Overall, compared to the case for a national firm, the MNC saves the transport costs and tariffs in "trading" to Country 1 and avoids tariffs in exporting to Country 2, whereas the MNC spends a plant-specific sunk cost in setting up a plant in Country 1. Having noted this, the operating profit for a firm in Country 3 is given by

$$o\pi_3^h = (1-\rho)\left(\frac{1}{n_1^h + n_2^h\gamma + \frac{1}{2}n_3^h(1+\gamma)} + \frac{\gamma}{n_1^h\gamma + n_2^h + \frac{1}{2}n_3^h(1+\gamma)} + \frac{1}{n_1^h\sigma + n_2^h\sigma + n_3^h}\right).$$

Again, the three zero-profit conditions determine the number of firms in each country. They are $o\pi_i^h = F + G$, $i = 1, 2$, but $o\pi_3^h = F + 2G$. The equilibrium numbers of firms are

$$\begin{aligned} n_1^h &= n_2^h = \frac{(1-\rho)(1-\phi)}{1-\sigma}\left(\frac{1}{(1-\phi)F + (1-2\phi)G} - \frac{1}{2G}\right), \text{ and} \\ n_3^h &= \frac{(1-\rho)(1-\phi)}{1-\sigma}\left(\frac{1}{G} - \frac{2\sigma}{(1-\phi)F + (1-2\phi)G}\right). \end{aligned}$$

Although it is analytically hard to determine the relationship among the numbers of firms, simulation sheds some lights on the relationship.[30] The total number of firms in the hybrid equilibrium turns out to be less than that

[30] See columns 5 and 7 in Table 1 which correspond to the hybrid equilibrium.

in the pre-FTA equilibrium. In particular, the number of firms in Country 1 (2) sharply drops while the numbers in Country 3 increase compared to the numbers in the pre-FTA single-plant equilibrium. I can deduce a similar result from the oligopolistic model in Motta and Norman (1996). They argue that when a reduction of intra-regional tariff induces a firm outside to switch from exporting to investing, both prices and the firms' profits in the regional market fall. However, the indigenous firm in the host country for FDI experiences a greater falling profit. In my monopolistic competition setting, a greater falling profit can be interpreted as a sharp drop in the number of active firms in the host countries, which is exactly the case in the simulation.

I impose some restrictions on the parameters in order to warrant the positive number of firms in each country. The restrictions are listed in the order for $n_1^h, n_2^h > 0$, and $n_3^h > 0$:

$$\frac{1}{(1-\phi)F + (1-2\phi)G} \geq \frac{1}{2G} \text{ and } [2(\sigma+\phi)-1]G \leq (1-\phi)F. \quad (14)$$

These restrictions constrain the parameter space for the hybrid equilibrium combined with the following no-defection conditions. One condition states that no firm in Country 3 deviates to become an exporter unless it is profitable, which is given by

$$[\phi(3+\gamma-4\phi)]G \leq (1+\gamma-2\phi)(1-\phi)F. \quad (15)$$

Another no-defection condition is that no firm in Country 1 defects to be an MNC with two plants if

$$G \geq o\pi_1^{h'} - o\pi_1^h$$

where $o\pi_1^h$ is the operating profit of the exporting firm Country 1, and $o\pi_1^{h'}$ is the profit when the firm defects to become an MNC with two plants. However, the right hand side of the above condition is simply equal to G, which means this inequality weakly holds. That is, the firm in Country 1 is indifferent between being an exporter and being an MNC. The intuition about indifference is that, in the perspective of the firms in the integrated region, Country 3 is a smaller but less crowded market. The smaller market suggests that firms export, whereas the less crowded market encourages them to set up plants.

The final no-defection condition is that no firm in both the integrated region and the non-member country deviates to become an MNC with *three* plants, which is given by

$$(\phi+2\gamma-3\gamma\phi)G \geqq (1-\gamma)(1-\phi)F. \quad (16)$$

Overall, the parameter space for the hybrid equilibrium comes from the combination of three restrictions: the parameter restriction from positive

numbers of firms (inequality (14)), and the two no-defection conditions (inequalities (15) and (16)).

As in the pre-FTA scenario, I can calculate the welfare in the post-FTA scenario. Various welfare in the pre- and post-FTA scenario become the payoffs of the three countries under different trading regimes in the coalition formation game, which is the next topic.

3 The Coalition Formation Game

This section endogenizes a country's decision on coalition formation. The coalition formation game considers the unanimity rule as a coalition-structuring rule, which reconciles each country's partnership plan into a coalition structure. According to the unanimity rule, players can form a bloc if and only if *all* of its members agree upon the coalition. However, under the unanimity rule, bilateralism is always trivially a Nash equilibrium, even when all three countries strictly prefer the free trade regime. This is because a unilateral deviation results in the dissolution of a coalition. Further, Nash equilibrium acknowledges only the possibility of a *unilaterally* profitable deviation, but does not take into account a *mutually* beneficial deviation. Hence, I will use one of the refinements of Nash equilibrium, namely, a Coalition Proof Nash equilibrium (CPNE) originally suggested by Bernheim, Peleg, and Whinston (1987). CPNE is a desirable equilibrium concept in the environment where the players can freely communicate and make non-binding but mutually beneficial agreements. (Bernheim et al., 1987).

In the following subsection, I define a game structure and CPNE. Then, I provide sufficient and necessary conditions under which bilateralism can be an equilibrium outcome. These conditions are instrumental to numerically plot the parameter space for equilibrium coalition structure later.

3.1 Definitions

The set of the three countries is given by $N = \{1, 2, 3\}$. Denote B as the set of all possible coalition structures, b:

$$B = \{\{\{1\}, \{2\}, \{3\}\}, \{\{1, 2\}, \{3\}\}, \{\{1, 3\}, \{2\}\}, \{\{2, 3\}, \{1\}\}, \{\{1, 2, 3\}\}\}.$$

The first element represents the MFN regime, while the last represents the grand coalition (*i.e.*, the free trade regime). The remaining three elements indicate bilateralism (*i.e.,* trading blocs).

The game is simultaneous and non-cooperative. Country i's strategy is its partnership plan which describes with whom it wants to form a coalition. Call this S_i. S_i must be a subset of N with $i \in S_i$. Then, a strategy profile, s, puts together the partnerships of the three countries so that $s = (S_1, S_2, S_3)$. Further, define the strategy space for Country i as $\hat{S}_i$ and the set of all strategy profiles as $\hat{S} = \Pi_{i \in N} \hat{S}_i$.

A function ψ determines a coalition structure for a given profile of partnership, that is, $\psi : \hat{S} \to B$. In other words, a function ψ assigns a coalition structure $b = \psi(s)$ to any $s \in \hat{S}$. I call the function ψ the coalition-structure rule. There are several candidates for the coalition-structure rule, for example, open membership, exclusive membership, and unanimity rule.[31] The open membership rule requires that a player can freely join a coalition as long as the player is willing to abide by the rules of the coalition. In a sense, under this rule, the membership is open to outsiders. On the other hand, under the exclusive membership, a coalition forms only among the players who announce the same list of players in the coalition.

According to the unanimity rule, players form a bloc if and only if *all* of its members are unanimous about the coalition. Otherwise, the players remain singletons. The unanimity rule is very similar to the exclusive rule because both rules require that players in a coalition have an identical partnership plan, that is, an identical strategy. However, the unanimity rule further demands that *all* players in the partnership plan join in the coalition. For illustration, suppose a strategy profile such that $s = (\{1,2,3\}, \{1,2,3\}, \{2,3\})$. Since Country 1 and 2 announce the same "address", the resulting coalition structure is $b = \{\{1,2\},\{3\}\}$ under the open membership rule. Similarly, the exclusive membership rule results in $b = \{\{1,2\},\{3\}\}$ because both Country 1 and 2 have the identical partnership plan. However, not all countries in the partnership plan do participate in the coalition. Thus, the resultant coalition structure is $b = \{\{1\},\{2\},\{3\}\}$ under the unanimity rule.

It is important to note that what happens to a coalition when a member of a coalition leaves. The remaining members of the coalition stay together under both the open and exclusive membership rules, whereas the coalition completely breaks down for the unanimity rule. Hence, for any given strategy profile, the unanimity rule allows the "finest" coalition structure among the three rules in the sense that the unanimity rule makes it harder to achieve a coalition between two or more players. Another observation is that no matter what the coalition-structure rule is, the grand coalition is possible only when all countries agree upon it. In the following analysis, however, I concentrate only on the unanimity rule as the coalition-structure rule in order to avoid any intricacies involved with the other rules.

A payoff to Country i is its welfare under a given coalition structure. Thus, define the payoff function to be $W_i : \psi(B) \to R^+$. Therefore, for example, given that the strategies of the other countries are S_2 and S_3, the payoff to Country 1 with its strategy S_1 is $W_1(\psi(S_1, S_2, S_3))$ or, equivalently, $W_1(\psi(s)) = W_1(b)$.[32]

[31] Burbidge et al. (1997) call the exclusive membership the similarity rule and call the unanimity rule the strict unanimity rule.

[32] Throughout the game, I assume no side-payments for simplicity.

As mentioned earlier, Nash equilibrium produces too many outcomes and does not allow a mutually profitable deviation. Thus, I adopt a Coalition Proof Nash Equilibrium (CPNE) as an equilibrium concept. Coalition-proofness is recursively defined. In a heuristic manner, a strategy profile is called coalition-proof if and only if there is no Pareto-superior coalition deviation to the strategy profile which is self-enforceable, taking the strategies of its complement as fixed. The deviation is self-enforceable in the sense that it is itself *free* from further deviations by the subsets of the deviating coalition. Moreover, the self-enforceability requires that when a deviation occurs, only members of the deviating coalition can deviate further from the deviation. This implies that non-members' strategies are taken as given when the members contemplate a further deviation.[33]

For clarity, let me go through the recursive steps in the definition of CPNE, using an example. A coalition is formed according to the unanimity rule. The steps are as follows: (i) A deviation by a bloc of two countries, say Country 1 and 2, is self-enforceable if and only if (*iff*) neither member of that bloc would want to change unilaterally or, in other words, *iff*[34]

$$\begin{array}{rcl} W_1\left(\{\{1,2\},\{3\}\}\right) & \geq & W_1\left(\{\{1\},\{2\},\{3\}\}\right) \text{ and } W_1\left(\{\{1,3\},\{2\}\}\right), \\ & & \text{AND} \\ W_2\left(\{\{1,2\},\{3\}\}\right) & \geq & W_2\left(\{\{1\},\{2\},\{3\}\}\right) \text{ and } W_2\left(\{\{2,3\},\{1\}\}\right). \end{array} \tag{17}$$

(ii) A deviation by a bloc of three countries is self-enforceable *iff* there is no self-enforceable bloc of two countries or one country that would be willing

[33] The reader is invited to see Berheim et al. (1987) for a formal treatment of CPNE.

[34] Notice that the inequalities do not include $W_i\left(\{\{1,2,3\}\}\right)$ for $i = 1,2$ and $W_1\left(\{\{2,3\},\{1\}\}\right)$ and $W_2\left(\{\{1,3\},\{2\}\}\right)$. When either member of the bloc, $\{1,2\}$, unilaterally deviates, it is impossible to reach the grand coalition under the unanimity rule. Thus, neither Country 1 nor Country 2 takes $W_i\left(\{1,2,3\}\right)$ into consideration. Next, consider that one of the two countries in $\{1,2\}$ unilaterally deviates. When Country 1, say, deviates, $\{1,2\}$ breaks down. Depending on Country 3's strategy, the resultant coalition structure is either $\{\{1\},\{2\},\{3\}\}$ or $\{\{1,3\},\{2\}\}$, but not $\{\{2,3\},\{1\}\}$; she cannot force the others to form their own coalition. However, it is possible to arrive $\{\{2,3\},\{1\}\}$ if Country 2 would want to deviate from $\{1,2\}$, that is, if $W_2\left(\{\{2,3\},\{1\}\}\right) \geq W_2\left(\{\{1,2\},\{3\}\}\right)$. Here, the country that deviates and compares the welfare is Country 2, not Country 1. This is why I do not include $W_1\left(\{\{2,3\},\{1\}\}\right)$ in the welfare comparison for Country 1 but include it in the welfare comparison for Country 2. A similar argument applies when Country 2 unilaterally deviates.

to deviate or, in other words, *iff*

$$\begin{aligned} W_1(\{\{1,2,3\}\}) \quad &\geq \quad W_1(\{\{1\},\{2\},\{3\}\}), W_1(\{\{1,2\},\{3\}\}), \\ &\quad\ \text{and } W_1(\{\{1,3\},\{2\}\}), \\ &\quad\ \text{OR} \qquad (18) \\ W_1(\{\{1,2,3\}\}) \quad &\leq \quad W_1(\{\{1,2\},\{3\}\}), \\ &\quad\ \text{but the bilateral deviation, } \{1,2\}, \text{ is not self-enforceable,} \\ &\quad\ \text{OR} \\ W_1(\{\{1,2,3\}\}) \quad &\leq \quad W_1(\{\{1,3\},\{2\}\}), \\ &\quad\ \text{but the bilateral deviation, } \{1,3\}, \text{ is not self-enforceable,} \\ &\quad\ \text{AND similarly for Country 2.} \end{aligned}$$

(iii) A strategy profile is a CPNE *iff* there is no further self-enforceable bloc of *any* size that would want to deviate from the strategy profile.

I adopt a CPNE as an equilibrium concept. Then, for a CPNE strategy profile s^*, a coalition structure b^* is an equilibrium outcome under the unanimity rule, that is, $b^* = \psi(s^*)$.

3.2 Equilibrium Coalition Structure

Given the elements of the game laid out, I am now ready to derive conditions where bilateralism rather than multilateralism is the equilibrium outcome. The conditions involve comparisons of welfare under different coalition structures (*i.e.*, trading regimes). However, the welfare depends on the parameter values in the model. Therefore, whether the conditions hold, rendering bilateralism an equilibrium coalition structure, really depends on the parameters. Once I know the conditions, I can determine numerically under what parameter values bilateralism can be an equilibrium outcome. Proposition 1 states the conditions.

Proposition 1 $b^* = \{\{1,2\},\{3\}\}$ is an equilibrium coalition structure under the unanimity rule iff

$$\begin{aligned} W_1(\{\{1,2\},\{3\}\}) \quad &\geq \quad W_1(\{\{1\},\{2\},\{3\}\}),\ W_1(\{\{1,3\},\{2\}\}),\ \text{and} \\ &\quad\ W_1(\{\{1,2,3\}\}),\ \text{AND} \\ W_2(\{\{1,2\},\{3\}\}) \quad &\geq \quad W_2(\{\{1\},\{2\},\{3\}\}),\ W_2(\{\{2,3\},\{1\}\}),\ \text{and} \\ &\quad\ W_2(\{\{1,2,3\}\}). \qquad (19) \end{aligned}$$

The proof is omitted to conserve a space and is available upon request. Let me sketch here what the proof involves. First, for the "if" statement, I show that if inequalities (19) hold, $\{1,2\}$ is a self-enforceable bilateral deviation, and there is no further self-enforceable bloc deviation of any size from it. Thus, $\{1,2\}$ constitutes a CPNE. Next, for the "only if" direction, I prove that the necessary and sufficient conditions for $\{1,2\}$ to be a CPNE

are the exact same inequalities as inequalities (19). One remark is that if a bloc formed from any country pair is a CPNE outcome, then the bloc formed by any other pair is as well. That is, $b^* = \{\{1,2\},\{3\}\}$, $\{\{1,3\},\{2\}\}$, or $\{\{2,3\},\{1\}\}$. In the following section, inequalities (19) are instrumental to numerically plot the parameter space for equilibrium coalition structure.

4 Bilateralism vs. Multilateralism

In this section, I present numerical results, discuss their implications, and draw conclusions. In simulations, I fix the degree of love for variety ($\rho = 0.75$), the two sunk costs ($F = G = 10$), while varying the transport costs (g), and tariffs (τ). Figure 1 shows the parameter space for various equilibria in the pre- and post-FTA scenario. The figure is in the two dimensions of g and τ. There exist four distinct regions depending on the parameters. Finally, I use the welfare comparison, inequalities (19), in Proposition 1 to find out the parameter region for equilibrium coalition structure. That is, Figure 2 presents a region for bilateralism and a region for multilateralism.

Comparing Figure 1 and 2 reveals that the parameter region for bilateralism is a subset of the parameter space of the single-plant and the concentrating equilibrium in the post-FTA.[35] Hence, bilateralism is possible for some parameter values where *only* exporting firms exist in the pre and post-FTA. Therefore, we can conclude that bilateralism, instead of multilateralism, can be an equilibrium outcome with the possibility of FDI, but that it does *not* coincide with FDI. Some authors have found a similar result, while they do not allow FDI into their analyses.[36] However, what is *new* here is that the result has been arrived at through a general-equilibrium model with monopolistic competition.

Let me expound the intuition for the result. The welfare of a country in a bloc can be superior to that in the MFN regime and, importantly, superior to that under multilateralism. Signing an FTA is a so-called "beggar-thy-neighbor" policy. Countries forming a bloc can extract tariff rents from non-members, which should make the members better-off but worsen the non-members. Furthermore, there is a variety effect. Elimination of tariffs between the members creates a larger and integrated market. The extended market, then, can facilitate more firms than each individual market can in total under multilateralism. More firms mean more varieties, which should improve the welfare of the bloc members. On the other hand, the firms outside are less competitive in the bloc market due to non-zero external tariffs, and thus suffer losses. Then, under the assumption of free entry and

[35] Observe that the combined trading costs of the parameter space for bilateralism are relatively small.

[36] Bond and Syropoulos (1996) demonstrate a similar result in a pure exchange model, and Yi (1996) in a partial-equilibrium model of oligopoly.

exit, fewer firms remain, which should worsen the non-member's welfare. In a nutshell, when countries form a bloc, they can be much better-off at the expense of the non-members so that their welfare can be even higher than the welfare under multilateralism, that is, forming a bloc can be the beggar-thy-neighbor policy.[37]

Remarkably, however, Figure 2 shows that bilateralism cannot be an equilibrium outcome for the parameter space of the hybrid equilibrium. Instead, multilateralism (*i.e.*, the grand coalition) is the equilibrium outcome. In other words, when countries are in the environment where the formation of a bloc could cause FDI from the non-members, multilateralism is the equilibrium outcome. This result implies that the formation of an FDI-attracting bloc is not an equilibrium outcome when multilateral free trade is an option for the countries.

When a trading bloc causes firms outside to become MNCs, member countries in the bloc can be better off than in the MFN regime; the overall price level in bloc members is lower than in the MFN regime and the free trade regime, because the MNCs from a non-member do not pay tariffs *and* transport costs. However, this welfare improvement is not enough to compensate for the adverse welfare effects of the tariff-jumping FDI.

Since the firms outside jump over the tariff barrier, there is no chance that the member countries will extract tariff rents from the non-member country in the hybrid equilibrium. Furthermore, there is economic inefficiency associated with FDI. When countries form a bloc, there is too much tendency for firms outside the bloc to jump over the trade barriers, tariffs and transport costs, and to invest into the bloc markets. Although setting up plants is the best strategy for firms outside in response to the bloc formation, it is not necessarily optimal from the point of views of member countries. Hence, setting up plants results in the waste of resources, which otherwise could be used for producing more varieties. In the model, the relatively small number of varieties available in the world economy give evidence of this waste of resources and inefficiency.

Overall, the FDI can improve the welfare of members due to the lower prices, but the welfare improvement is not sufficient to compensate for the adverse welfare effects resulting from the elimination of tariff-rent extraction and the inefficiency with the FDI. Thus, the welfare of a member country with FDI cannot exceed the welfare under multilateral free trade. Therefore, when a trading bloc can cause FDI from a non-member country, countries choose multilateralism rather than bilateralism.

[37] A similar argument can be also found in Yi (1996) at the context of a Customs Union.

5 Concluding Remarks

To summarize the main points, I show that, with the possibility of FDI, countries may choose bilateralism instead of multilateralism, but it does not coincide with FDI. Further, when the bloc can cause FDI from the non-member countries, countries will choose multilateralism to avoid the FDI.

Some directions for future research are worth mentioning. The literature of economic growth often finds that both capital accumulation from FDI, as well as any technology spillover effects of FDI, lead to economic growth in host countries (Barro and Sala-i-Martin, 1999; Borensztein et al., 1998). Hence, if I introduce these elements of FDI into the model so that they can improve considerably the welfare of host countries, bilateralism might reappear in equilibrium.

In reality there is more than one reason why countries form trading blocs. Suppose that bloc-seeking countries have both a political motive as well as an economic motive to attract FDI. We know from the discussion in this paper that the tariff-jumping FDI would not improve significantly the welfare of member countries. However, if the political reason dominates the welfare effect of FDI, the countries would want to form a bloc. Incorporating other motives of blocs would enrich the current analysis, though at the price of complication in modelling them.

Other worthwhile direction could be to endogenize tariffs in the model. In fact, endogenous tariffs seem appropriate in this situation where a government chooses a trade policy on its own. One way to endogenize the tariff is to use a tariff which maximizes a country's welfare given the tariffs of other countries, which is an optimal tariff. However, endogenizing tariffs might make this model intractable.

Finally, one might want to avoid the knife-edge condition so that the model could generate a mixed equilibrium where both national and multinational firms coexist. The knife-edge condition is primarily due to the symmetry of the model. In order to avoid the knife-edge condition, asymmetric factors could be used in the model. A quick fix would be to assume that each firm, which is specialized at a particular variety, has a different plant sunk cost. This would generate a mixed equilibrium such that exporting firms, which have a higher plant sunk cost, and MNCs, which have a lower cost, coexist.

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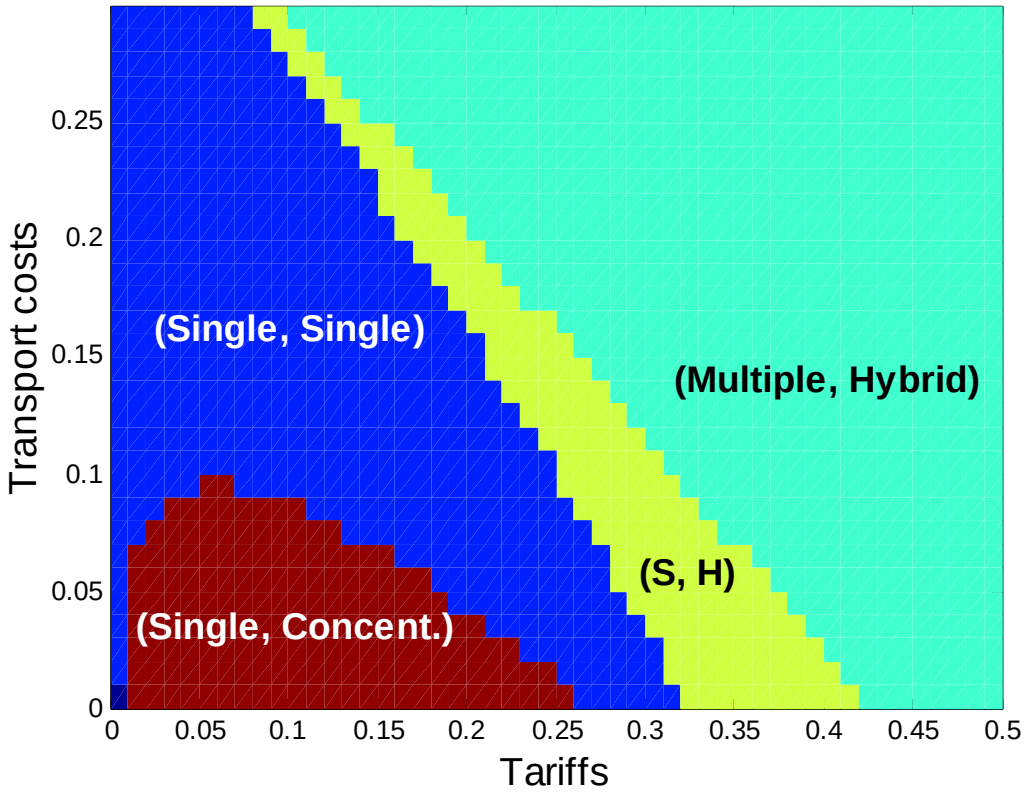
Table 1: Simulations

Parameters							
g : transport cost	**0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.24**	**0.24**
τ: tariff	**0.3**	**0**	**0.1**	**0.2**	**0.3**	**0.05**	**0.15**
Type of Equilibrium in Pre, Post-FTA	**(S,S)**	**(S,S)**	**(S,S)**	**(S,S)**	**(S,H)**	**(S,S)**	**(S,H)**
Consumptions per variety							
Pre-FTA equilibrium							
home cons'n of home gds	35.2888	24.4101	30.0626	35.2294	39.7223	34.8373	39.9475
home cons'n of foreign gds	12.3556	16.0155	13.4718	11.1468	9.125	9.5618	7.62
Free Trade							
home cons'n of home gds	20	24.4101	24.4101	24.4101	24.4101	31.9497	31.9497
home cons'n of foreign gds	20	16.0155	16.0155	16.0155	16.0155	10.6591	10.6591
Post-FTA equilibrium							
a member's cons'n of own gds	22.2201	24.4101	24.4291	26.2559	28.7556	32.5358	34.7103
a member's cons'n of partner's gds	22.2201	16.0155	16.028	17.2265	18.8665	10.8547	11.5801
member 1's cons'n of outsider gds	7.7799	16.0155	10.9473	8.3075	28.7556	8.9302	34.7103
member 2's cons'n of outsider gds	7.7799	16.0155	10.9473	8.3075	28.7556	8.9302	34.7103
outsider's cons'n of a member's gds	15.5598	16.0155	15.9858	13.1431	9.2534	10.0181	7.64
outsider's cons'n of own gds	44.4402	24.4101	35.6726	41.5388	40.2816	36.4996	40.0527
The Number of Firms							
Pre-FTA	0.0111	0.0125	0.0119	0.0115	0.0113	0.0122	0.0119
Free Trade	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Post-FTA							
member 1	0.0164	0.0125	0.017	0.0153	0.0086	0.0133	0.0079
member 2	0.0164	0.0125	0.017	0.0153	0.0086	0.0133	0.0079
non-member	0.0019	0.0125	0.0024	0.0052	0.0129	0.0105	0.0141
total number of firms	0.0347	0.0375	0.0364	0.0358	0.0301	0.0371	0.0299
Welfare							
Pre-FTA equilibrium	997.5385	997.5514	997.5295	997.5054	997.4812	997.4534	997.435
Free Trade	997.6178	997.5514	997.5514	997.5514	997.5514	997.4617	997.4617
Post-FTA equilibrium							
member's welfare	997.5887	**997.5514**	**997.5551**	997.5399	997.4968	**997.4639**	*997.4341*
non-member's welfare	997.5564	997.5514	997.5055	997.493	997.4556	997.4406	997.4183
Tariff Revenues							
Pre-FTA equilibrium	0.11	0	0.0475	0.0763	0.0921	0.0205	0.0477
Post-FTA equilibrium							
Tariff revenues of a member	0.0059	0	0.0039	0.0128	0	0.0082	0
Tariff revenues of non-member	0.2047	0	0.0805	0.1188	0.0711	0.0233	0.032

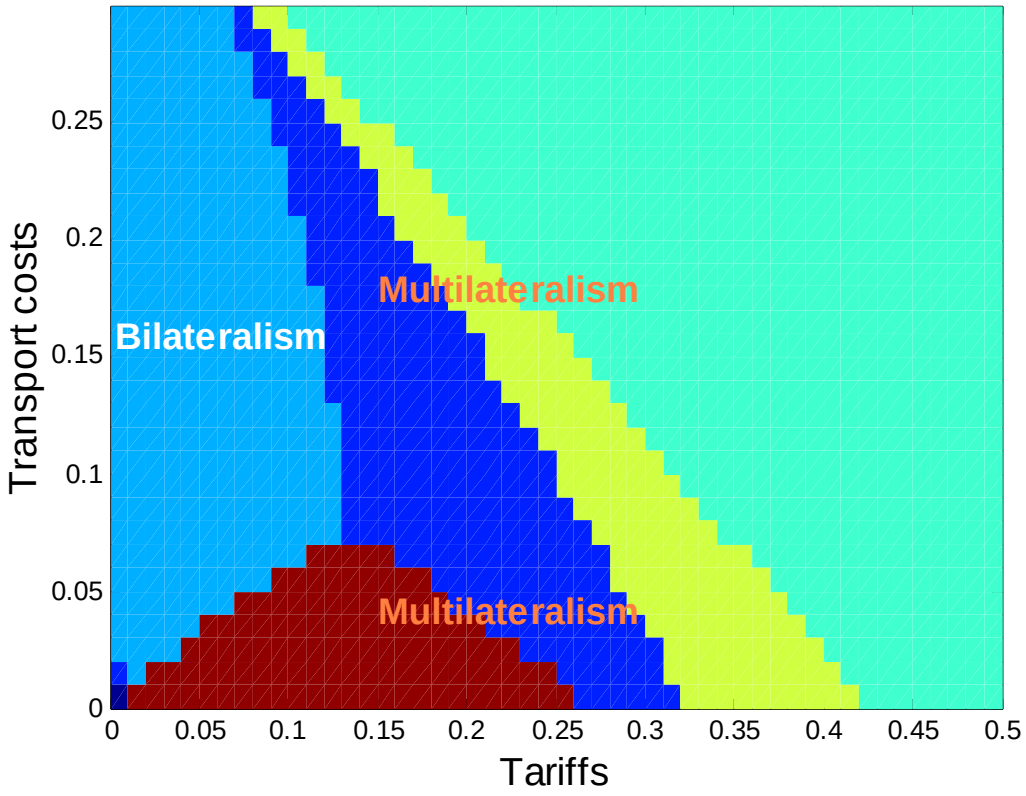
Notes: Other parameters are set as follows for the simulations: Y=1000, c=1, ρ=0.75, and F=G=10. In the simulations, I consider only the single-plant equilibrium for the pre-FTA scenario and either the single-plant or the hybrid equilibrium for the post-FTA. As in the text, I assume that the countries signing an FTA are Country 1 (member 1) and Country 2 (member 2), and thus Country 3 is the outsider. (S, S) represents the single-plant equilibrium for both periods. (S, H) is the single-plant equilibrium in the pre-FTA and the hybrid in the post-FTA.

Figure 1: The Parameter Space for Various Equilibria



Notes: Other parameters are set as follows for the simulations: Y=1000, c=1, ρ=0.75, and F=G=10. In this figure, I plot the parameter space for the various equilibria in the pre- and post-FTA scenario. The first item in parentheses indicates the pre-FTA equilibrium, and the second the post-FTA equilibrium. (Single, Single) represents the single-plant equilibrium for both periods. (Single, Concent.) is the single-plant equilibrium and the concentrating equilibrium. (S, H) is the single-plant and the hybrid equilibrium. (Multiple, Hybrid) is the multiple-plant (with three plants) and the hybrid equilibrium.

Figure 2: The Parameter Space for Equilibrium Coalition Structure



Notes: For the parameter values, refer to the notes in Figure 1. Bilateralism represents an FTA between two countries, while multilateralism is multilateral free trade among all three countries. It is important to note that the parameter region for bilateralism is a subset of the parameter space of (Single, Single) and (Single, Concent.) in Figure 1. Thus, bilateralism is possible for some parameter values where only exporting firms exist in the pre- and post-FTA. On the other hand, notice that bilateralism is not an equilibrium outcome for the parameter space of the hybrid equilibrium. This means that under the parameter space where the formation of a bloc can cause firms outside the bloc to become MNCs, bilateralism cannot be an equilibrium outcome. Instead, multilateralism is the equilibrium outcome.