FTA Negotiations with Side Payments: Asymmetric Countries and Asymmetric Information

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Abstract

Recently concluded free trade agreements (FTAs) have two outstanding features: the increase in FTAs among various market-sized countries and the existence of a small country's implicit side payments (i.e., concessions about non-trade aspects). This paper examines FTA negotiations between two asymmetric countries when informational asymmetry exists about the small country's market size. We show that the large country sometimes chooses the smaller market-sized country as its FTA partner for acquiring a larger amount of side payments. In addition, the small country can lead the large one to accept the FTA offer by suggesting side payments in advance.

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1 Introduction

Recently, there has been a dominant trend toward trade liberalization, and, especially since the 1990s, the pace of trade liberalization has accelerated worldwide within the General Agreement on Tariffs and Trade (GATT)/World Trade Organization (WTO) framework. Why do countries seek bilateral trade liberalization such as through free trade agreements (FTAs) regardless of the potential for concluding multilateral treaties based on the basic principles of GATT/WTO (i.e., most-favored-nation treatment)? The following six objectives can be considered as the answer to this question: traditional trade gains, strengthening domestic policy reform, increased multilateral bargaining power, guarantees of access, strategic linkage, and multilateral and regional interplay (Whalley 1998, 70–74). Here, we focus on the fourth objective of FTAs: "An objective present in recent large-small country trade negotiations, beginning with the Canada-U.S. agreement, is to use a regional trade agreement to make access to the larger country market in the region more secure for the smaller country" (Whalley 1998, 72).

As pointed out by Ray (1998), most regional FTAs have traditionally taken place among countries similar in aspects such as market size and economic development level. This fact is theoretically supported by Das and Ghosh (2006), who show that the formation of FTAs among similar countries

has two economic effects: the relative market access effect and the relative competition effect. However, in fact, "Such agreements (i.e., regional integration) have taken place among high-income countries, among low-income countries, and, more recently, starting with the North American Free Trade Area (NAFTA) – between high-income and developing countries" (World Bank 2000, ix). There are some notable examples of FTAs among countries of asymmetric economic size. In NAFTA, Mexico and Canada are economically small relative to the United States. Since 2004, almost all the countries in Central, Eastern, and Southeastern Europe have been accepted as new members of the European Union. Singapore and South Korea, whose markets are relatively small, have played important roles in wide-spreading regional trade agreements in East Asia. Representative analyses of FTAs among asymmetric countries are presented by Kowalczyk (2000), Park (2000), and Kose and Riezman (2002), among others.

Recent FTAs among countries with asymmetric market size have sometimes been concluded because small countries offered concessions in non-trade areas: protecting intellectual property rights, relaxing regulations regarding foreign investment, and adopting other policies not related to international trade. Ethier (1998) states that regional trade agreements created in recent years have some outstanding features that he describes as the "new regionalism": asymmetries between countries, deep integration including economic

policy reform in non-trade areas, and concessions by small countries. Whalley (1998, 73) presents the Canada–U.S. agreement as a notable example of one-sided agreements among asymmetric countries: "These arrangements were secured by implicit side payments in the form of domestic policy disciplines undertaken by Canada and favorable to the United States." Existing studies that highlight the non-trade aspects of an FTA are by Perroni and Whalley (2000), Bond and Park (2002), and Limão (2007). They emphasize that a large part of countries' motivation to conclude FTAs is not only eliminating trade barriers reciprocally but also accomplishing cooperation on non-trade issues. For example, the numerical simulations in Perroni and Whalley (2000) show that regional trade agreements between asymmetric market-sized countries can be supported by certain side payments that are transferred from the small country to the large one. Further, Bond and Park (2002) and Limão (2007) investigate whether an increase of FTAs with small countries' concessions in non-trade aspects can lead to further trade liberalization.

This paper considers FTA negotiations by two asymmetric (small and large market-sized) countries with side payments, modeled as lump-sum transfers from the small country to the large one in line with Bond and Park (2002). Our model is based on that of Krishna (1998), and it consists of three countries that are engaged in an oligopolistic Cournot competition;

it deals with the negotiation between small and large countries about eliminating their tariffs on each other (namely, an FTA). Here, realization of a bilateral trade regime is dependent on these countries' market size. In particular, it is essential that the large country, which may have to bear certain losses owing to trade liberalization, have an exact piece of information about the partner country's market size. In this paper, we introduce informational asymmetry about the small country's market size: the size is either "too small" or "less small," and the type that is actually realized is only known by the small country.[1] Our objective is to find answers to the following three questions: How does the existence of side payments affect the FTA negotiations among asymmetric countries under incomplete information? Is the less small market-sized type a more preferable economic partner for the large country? Is the too small market-sized type more eager to enter into an FTA with the large country?

This paper deals with the following two bargaining games about FTA negotiations under incomplete information, which are played by the two asymmetric countries non-cooperatively. In the first, the large country offers an

[1]Representative studies about the implication of informational asymmetry in the context of strategic trade policy are Qiu (1994), Brainard and Martimort (1996), Maggi (1999), and Creane and Miyagiwa (2008). They deal with uncertainty about market size or production costs between firms and governments. We consider the existence of informational asymmetry between two governments making a trade regime decision; that is, one country's government has private information about its own market size, which the other does not know.

FTA, stating the required side payments, and then, the small country decides to accept or reject the FTA offer. In the second, the small country offers an FTA, suggesting certain side payments, and then, the large country decides to accept or reject the FTA offer. These two bargaining games follow an ultimatum game; in both cases, the FTA offer is a take-it-or-leave-it offer and bargaining comes to a standstill once one country's offer is rejected by the other. The former case represents a screening game, where the large country intends to clarify the small country's private information about its actual market size by requiring side payments. In the latter case, the small country can take advantage of its private information; it sometimes intends to hide its actual market size, and at other times, sends a certain signal to the large country.

Our claim in this paper is that side payments can be a more important objective to realize an FTA between large and small countries when informational asymmetry exists. From the perspective of interests related to trade, the less small market-sized type should be a more attractive economic partner for the large country. However, from our analysis, we confirm that the large country is sometimes eager to conclude an FTA with the too small market-sized type for acquiring a larger amount of side payments. In addition, the latter analysis implies that, if every market-sized type of the small country has incentives to conclude an FTA by compensating the other

country's loss from the FTA, the too small market-sized type can pretend to possess a larger market than it actually does by suggesting a smaller amount of side payments. Otherwise, only the too small market-sized type should offer a large amount of side payments to complete an FTA.

The remainder of this paper is organized as follows. In Section 2, we set out the basic model and consider the condition of realizing an FTA under complete information. In Section 3, we analyze the two incomplete information games about FTA negotiations between two asymmetric market-sized countries. In section 4, we present our conclusions and indicate future research directions.

2 The Model

Our model is based on that of Krishna (1998). We consider three countries: A (small), B (large), and C (rest of the world). There exists one firm in each country, and these firms produce a homogeneous product Q, compete in quantities, and choose its quantities simultaneously (i.e., Cournot competition). Here, the marginal cost c is assumed to be identical for firms in all countries. Good Q produced by these firms is supplied in all countries, whose markets are segmented from one another. We postulate that good Q's

inverse demand function in country i takes the following linear form:

$$P^i = \alpha_i - Q^i \quad \text{for } i \in \{A,\ B,\ C\}, \tag{1}$$

where P^i is the price of good Q in market i and Q^i is the total demand of good Q in market i. Here, $a_i \equiv \alpha_i - c > 0$ can be interpreted as country i's market size.

Under the unilateral trade regime, country i applies a specific tariff t^i to its imports from all other countries without discriminating between countries. In this situation, we can represent each firm's profit maximization problem in market i as follows:

$$\max_{q_i^i} \pi_i^i = (P^i - c)q_i^i \quad \text{for all } i \in \{A, B, C\}, \tag{2}$$

$$\max_{q_j^i} \pi_j^i = (P^i - c - t^i)q_j^i \quad \text{for all } i, j \in \{A, B, C\} \text{ and } i \neq j, \tag{3}$$

where q_j^i is country j-firm's supply in market i and π_j^i is country j-firm's profits in market i. For the given country i's tariff level t^i, the Cournot–Nash equilibrium output level under the unilateral regime can be solved as

follows:

$$q_i^i = \frac{1}{4}(a_i + 2t^i) \quad \text{for all } i \in \{A, B, C\}, \tag{4}$$

$$q_j^i = \frac{1}{4}(a_i - 2t^i) \quad \text{for all } i, j \in \{A, B, C\} \text{ and } i \neq j. \tag{5}$$

Then, each firm's profits are $\pi_i^i = (q_i^i)^2$ and $\pi_j^i = (q_j^i)^2$. We assume that all tariff revenues are equally distributed to domestic consumers; thus, each country's social welfare is composed of its consumer surplus, its firm's profits, and its tariff revenue. Hence, country i's welfare is defined as follows:

$$W^i \equiv CS^i + \pi_i^i + \sum_{j \neq i} \pi_i^j + t^i \cdot \sum_{j \neq i} q_j^i \quad \text{for all } i, j \in \{A, B, C\}, \tag{6}$$

where CS^i is country i's consumer surplus. By the above definition, country i's welfare under the unilateral regime can be represented as follows:

$$W^i(t^i, t^j) = \frac{11{a_i}^2 + 12t^i \cdot a_i - 20(t^i)^2}{32} + \sum_{j \neq i} \pi_i^j(t^j) \quad \text{for all } i, j \in \{A, B, C\}. \tag{7}$$

Here, the last term, which represents country i-firm's profits earned in foreign markets, is independent of t^i. Therefore, country i's optimal tariff level can be solved as $t^{i*} = 3a_i/10$. By substituting each country's optimal tariff level,

we can calculate country i's social welfare under the unilateral regime as follows:

$$W^{i*} \equiv W^i(t^{i*}, t^{j*}) = \frac{2}{5}{a_i}^2 + \frac{1}{100}\sum_{j \neq i}{a_j}^2 \quad \text{for all } i, j \in \{A, B, C\}. \tag{8}$$

If countries A and B conclude the FTA (the so-called bilateral trade regime), these countries impose a specific tariff t^{Fi}, eliminating tariffs on imports from the FTA partner.[2] In this situation, each firm's profit maximization problem in market i can be rewritten as follows:

$$\max_{q_j^i} \pi_j^i = (P^i - c)q_j^i \quad \text{for all } i, j \in \{A, B\}, \tag{9}$$

$$\max_{q_C^i} \pi_C^i = (P^i - c - t^{Fi})q_C^i \quad \text{for all } i \in \{A, B\}. \tag{10}$$

For the given country i's tariff level t^{Fi}, we can solve the Cournot–Nash equilibrium output level under the bilateral regime as follows:

$$q_j^i = \frac{1}{4}(a_i + t^{Fi}) \quad \text{for all } i, j \in \{A, B\}, \tag{11}$$

$$q_C^i = \frac{1}{4}(a_i - 3t^{Fi}) \quad \text{for all } i \in \{A, B\}. \tag{12}$$

[2]Even if countries A and B conclude an FTA with each other, the equilibrium production quantities supplied in market C are the same as those under unilateralism. Hence, country C's optimal tariff under the bilateral trade regime is also the same as that under the unilateral one.

Here, each firm's profits are $\pi_j^i = (q_j^i)^2$ and $\pi_C^i = (q_C^i)^2$. Likewise, we can represent country i's welfare under the bilateral regime as follows:

$$W^{Fi}(t^{Fi}, t^{Fj}, t^C) = \frac{11{a_i}^2 + 6t^{Fi} \cdot a_i - 21(t^{Fi})^2}{32} + \pi_i^j(t^{Fj}) + \pi_i^C(t^C)$$
$$\text{for all } i, j \in \{A, B\} \text{ and } i \neq j. \quad (13)$$

Noticing that the last two terms are independent of t^{Fi}, we can solve country i's optimal tariff level as $t^{Fi*} = a_i/7$.[3] By substituting each country's optimal tariff level, we can calculate country i's social welfare under the bilateral regime as follows:

$$W^{Fi*} \equiv W^{Fi}(t^{Fi*}, t^{Fj*}, t^{C*}) = \frac{5}{14}{a_i}^2 + \frac{4}{49}{a_j}^2 + \frac{1}{100}{a_C}^2$$
$$\text{for all } i, j \in \{A, B\} \text{ and } i \neq j. \quad (14)$$

By comparing country i's welfare under each trade regime, we consider which regime is better for country i. Here, we add the following two assumptions. First, country B's market size is larger than that of country A; that is, $a_A < a_B$. Second, if country i is indifferent between concluding the FTA and unilateralism, then it prefers the FTA to the unilateral trade regime. We can

[3]To avoid the conclusion of discriminatory bilateral trade liberalization that would harm external countries, Article XXIV of the GATT prohibits FTA members from raising import tariff levels on non-members. In this paper, the FTA members' optimal tariffs are consistent with this constraint.

derive the following proposition about the suitable market size in concluding an FTA from (8) and (14).

Proposition 1 *If* ${a_i}^2 \leq 117{a_j}^2/70$*, then country* i *can earn profits by concluding an FTA with country* j*.*

This proposition implies that if the other country's market size is large enough, the offering country prefers an FTA with it; that is, the FTA operates to give the market access effect especially for the small country. Therefore, the small country has incentives to conclude the FTA even if it is required to give concessions to achieve the FTA. In this paper, these concessions are modeled as lump-sum transfers (i.e., side payments) from the small country to the large one, which is similar to the dealing in Bond and Park (2002). Thus, when countries A and B agree on an FTA, country A may pay side payments $s \geq 0$ to country B. We define that $\Delta W^{i*} \equiv W^{Fi*} - W^{i*}$; that is, ΔW^{i*} means country A's benefits of concluding the FTA. Then, the following proposition can be confirmed.

Proposition 2 *If* ${a_A}^2 \geq 70{a_B}^2/117$*, then an FTA can be realized when* $s = 0$*. Otherwise, the FTA can be realized when* $s = -\Delta W^{B*} = -351{a_A}^2/4900 + 3{a_B}^2/70$*.*

As shown in Das and Ghosh (2006), an FTA among countries whose

market sizes are similar can be realized without any side payments. However, even if the difference between participating members' market size is too large, an FTA can be realized by appropriate lump-sum transfers from the small country to the large one as implicit side payments (e.g., Perroni and Whalley 2000).

3 FTA Negotiations under Incomplete Information

To the model mentioned in the previous section, we introduce informational asymmetry about the small country's market size. In reality, country A's market size is its own private information; that is, the small country correctly grasps its own market size but this information is not known to the large one.[4] For simplicity, we postulate that country A's market size takes one of the following two types: $a = a_A^H$ s.t. $(a_A^H)^2 \geq 70{a_B}^2/117$ with probability θ and $a = a_A^L$ s.t. $(a_A^L)^2 < 70{a_B}^2/117$ with probability $1-\theta$. In this section, the former ("less small" market-sized) type is denoted by $\overline{A}$. Likewise, the latter ("too small" market-sized) type is denoted by $\underline{A}$.

Country i's welfare depends on both country A's market size and the

[4]It is assumed that such informational asymmetry exists only between each country's government. That is, all firms can engage in their manufacturing in the same way under the complete information case.

trade regime, and hence, we can define country i's welfare as follows:

- $\overline{W}^{Fi*}$ is country i's welfare under bilateralism if $A = \overline{A}$.
- $\overline{W}^{i*}$ is country i's welfare under unilateralism if $A = \overline{A}$.
- $\underline{W}^{Fi*}$ is country i's welfare under bilateralism if $A = \underline{A}$.
- $\underline{W}^{i*}$ is country i's welfare under unilateralism if $A = \underline{A}$.

We consider the following two incomplete information games about FTA negotiations between large and small countries.

Game 1 The large country offers an FTA, stating the required side payments, and then, the small country decides to accept or reject the FTA offer.

Game 2 The small country offers an FTA, suggesting certain side payments, and then, the large country decides to accept or reject the FTA offer.

After these games, the small country's actual market size is completely revealed and the firm in each country produces good Q according to its Cournot–Nash equilibrium output level, which depends on both the size of the specific market to which good Q is supplied and a realized trade regime. We analyze these two cases separately and clarify the role of side payments in FTA negotiations under incomplete information.

Game 1: Requiring Side Payments

The first game deals with the case that country B requires an FTA with side payments s_B, and then, country A decides to accept or reject the FTA offer. The timing of this game is composed of the following three stages. First, Nature decides country A's type. Second, country B requires an FTA with side payments s_B. Third, each type of country A decides to accept ($\rho_A = a$) or reject ($\rho_A = r$). Figure 1 illustrates the related game tree. The equilibrium concept of this game is a Bayesian Nash equilibrium, defined as follows.

[Figure 1: The game tree of requiring side payments]

Definition 1 $(\rho^*_{\overline{A}}, \rho^*_{\underline{A}}, s^*_B)$ *is a Bayesian Nash equilibrium if*

$$E_{\overline{A}}(\rho^*_{\overline{A}}, \rho^*_{\underline{A}}, s^*_B) \geq E_A(\rho_{\overline{A}}, \rho^*_{\underline{A}}, s^*_B) \quad \textit{for any } \rho_{\overline{A}} \in \{a, r\},$$

$$E_{\underline{A}}(\rho^*_{\overline{A}}, \rho^*_{\underline{A}}, s^*_B) \geq E_A(\rho^*_{\overline{A}}, \rho_{\underline{A}}, s^*_B) \quad \textit{for any } \rho_{\underline{A}} \in \{a, r\},$$

$$E_B(\rho^*_{\overline{A}}, \rho^*_{\underline{A}}, s^*_B) \geq E_B(\rho^*_{\overline{A}}, \rho^*_{\underline{A}}, s_B) \quad \textit{for any } s_B \in [0, \infty],$$

where E_i denotes country i's expected payoffs.

We can find the equilibria in this game by means of backward induction. We first consider country A's optimal strategy.

Lemma 1 *For any* a_A^H, a_A^L, a_B, $\Delta\underline{W}^{A*} > \Delta\overline{W}^{A*}$.

This lemma implies that country $\underline{A}$ has incentives to realize the FTA at the expense of more side payments than country $\overline{A}$. This is because the country whose market size is larger bears greater costs to provide access for its free trade partner. Country A's optimal strategy can be classified as the following three cases.

(i) If $s_B \leq \Delta\overline{W}^{A*}$, then $\rho_{\overline{A}} = \rho_{\underline{A}} = a$.

(ii) If $\Delta\overline{W}^{A*} < s_B \leq \Delta\underline{W}^{A*}$, then $\rho_{\overline{A}} = r,\ \rho_{\underline{A}} = a$.

(iii) If $\Delta\underline{W}^{A*} < s_B$, then $\rho_{\overline{A}} = \rho_{\underline{A}} = r$.

In case (i), both types of country A can accept country B's FTA offer because side payments required by country B are small enough. In case (ii) where country B requires the middle amount of side payments, only country $\underline{A}$ accepts the FTA offer. In case (iii), side payments required by country B are too large for both types of country A to accept country B's FTA offer.

Country B's optimal strategy depends on country A's strategy, and hence, country B's expected payoffs can be represented by the following three cases.

$$E_B^1(s_B) \equiv E_B(s_B, \rho_{\overline{A}} = a, \rho_{\underline{A}} = a) = \theta \cdot \overline{W}^{FB*} + (1-\theta)\underline{W}^{FB*} + s_B, \quad (15)$$

$$E_B^2(s_B) \equiv E_B(s_B, \rho_{\overline{A}} = r, \rho_{\underline{A}} = a) = \theta \cdot \overline{W}^{B*} + (1-\theta)(\underline{W}^{FB*} + s_B), \quad (16)$$

$$E_B^3 \equiv E_B(s_B, \rho_{\overline{A}} = r, \rho_{\underline{A}} = r) = \theta \cdot \overline{W}^{B*} + (1-\theta)\underline{W}^{B*}. \quad (17)$$

By considering country A's optimal strategy in the final stage, we can confirm that the maximum of E_B^1 is $E_B^1(s_B = \Delta\overline{W}^{A*})$. Likewise, the maximum of E_B^2 is $E_B^2(s_B = \Delta\underline{W}^{A*})$. We can solve country B's optimal strategy by comparing only these two values because it always holds that $E_B^2(s_B = \Delta\underline{W}^{A*}) > E_B^3$.

Lemma 2 *We define that*

$$\overline{\Theta} \equiv \frac{70[(a_A^H)^2 - (a_A^L)^2]}{117(a_A^H)^2 - 70(a_A^L)^2 + 47{a_B}^2}. \quad (18)$$

If $\theta \geq \overline{\Theta}$*, then* $E_B^1(s_B = \Delta\overline{W}^{A*}) \geq E_B^2(s_B = \Delta\underline{W}^{A*})$*. Otherwise,* $E_B^1(s_B = \Delta\overline{W}^{A*}) < E_B^2(s_B = \Delta\underline{W}^{A*})$.

[Figure 2: The large country's expected payoffs]

As shown in Figure 2, the optimal side payments for country B are $s = \Delta\overline{W}^{A*}(s = \Delta\underline{W}^{A*})$ when $\theta \geq \overline{\Theta}$ $(\theta < \overline{\Theta})$. That is, if the value of θ is

sufficiently large, country B should require just a small enough amount of side payments for both types of country A to be able to accept country B's FTA offer. Otherwise, country B intends to require a larger amount of side payments, thus excluding type $\overline{A}$.

Proposition 3 *The equilibria in the requiring side payments game are as follows:*

- *If* $\theta \geq \overline{\Theta}$, *then* $s_B^* = \Delta \overline{W}^{A*}$, $\rho_{\overline{A}}^* = \rho_{\underline{A}}^* = a$.
- *Otherwise,* $s_B^* = \Delta \underline{W}^{A*}$, $\rho_{\overline{A}}^* = r$, $\rho_{\underline{A}}^* = a$.

[Figure 3: Each country's equilibrium strategy in Game 1]

If the probability that the other country belongs to the less small market-sized type is sufficiently high, the large country requires a smaller amount of side payments and the FTA between the large and small countries can be achieved in spite of the small country's actual market size. Otherwise, the large country can require too large an amount of side payments for the less small market-sized type to pay during FTA negotiations; that is, the large country utilizes its requirement of side payments as a screening method and can earn more non-trade profits from an FTA with the too small market-sized type. Figure 3 depicts the relation between the value of θ and the amount of side payments required by the large country.

As explained earlier, the large country can earn more profits related to trade issues by concluding an FTA with the less small market-sized type, and hence, the large country should have incentives to eliminate countries whose market size is too small. However, when informational asymmetry exists, occasionally, the large country prefers to choose the too small market-sized type, which can afford to pay a large amount of side payments, as its FTA partner. This paradoxical logic is supported by the fact that the benefits from side payments can be more significant for the large country than the gains from free trade.

Game 2: Suggesting Side Payments

Next, we deal with the case that country A suggests an FTA with certain side payments s_A, and then, country B decides to accept or reject the FTA offer. The timing of the game is composed of the following three stages. First, Nature decides country A's type. Second, each type of country A suggests an FTA with side payments s_A. Third, country B decides to accept ($\sigma_B = a$) or reject ($\sigma_B = r$). Figure 4 illustrates the related game tree. The equilibrium concept of this game is a perfect Bayesian equilibrium, which is defined as follows.

[Figure 4: The game tree of suggesting side payments]

Definition 2 $(s^*_{\overline{A}}, s^*_{\underline{A}}, \sigma^*_B, \mu^*, \nu^*)$ *is a perfect Bayesian equilibrium if*

$$E_{\overline{A}}(s^*_{\overline{A}}, s^*_{\underline{A}}, \sigma^*_B) \geq E_A(s_{\overline{A}}, s^*_{\underline{A}}, \sigma^*_B) \quad \textit{for any } s_{\overline{A}} \in [0, \infty],$$

$$E_{\underline{A}}(s^*_{\overline{A}}, s^*_{\underline{A}}, \sigma^*_B) \geq E_A(s^*_{\overline{A}}, s_{\underline{A}}, \sigma^*_B) \quad \textit{for any } s_{\underline{A}} \in [0, \infty],$$

$$E_B(s^*_{\overline{A}}, s^*_{\underline{A}}, \sigma^*_B) \geq E_B(s^*_{\overline{A}}, s^*_{\underline{A}}, \sigma_B) \quad \textit{for any } \sigma_B \in \{a, r\},$$

$$\mu^* = \frac{\theta \cdot Prob(s^*_{\overline{A}}|A = \overline{A})}{\theta \cdot Prob(s^*_{\overline{A}}|A = \overline{A}) + (1-\theta) \cdot Prob(s^*_{\overline{A}}|A = \underline{A})},$$

$$\nu^* = \frac{(1-\theta) \cdot Prob(s^*_{\underline{A}}|A = \underline{A})}{\theta \cdot Prob(s^*_{\underline{A}}|A = \overline{A}) + (1-\theta) \cdot Prob(s^*_{\underline{A}}|A = \underline{A})}.$$

Here, μ means country B's belief that $A = \overline{A}$ for suggested $s_{\overline{A}}$. Likewise, ν means country B's belief that $A = \underline{A}$ for suggested $s_{\underline{A}}$.

This kind of game is generally called a "signaling game" because a player who has his private information can first send a certain signal to other players. Two kinds of equilibria exist in signaling games: pooling and separating equilibria. In pooling equilibria, country A proposes the same amount of side payments in spite of its market size and country B chooses the same strategy. In separating equilibria, country A proposes different amounts of contributions and country B chooses a different answer according to country A's type. In order to narrow down the equilibria in this game, we require certain lemmas.

Lemma 3 *For any a^L_A, a_B, $\Delta\underline{W}^{A*} > -\Delta\underline{W}^{B*}$.*

Lemma 4 *If* ${a_B}^2 \geq [70(a_A^H)^2 - 117(a_A^L)^2]/47$, *then* $\Delta\overline{W}^{A*} \geq -\Delta\underline{W}^{B*}$. *Otherwise,* $\Delta\overline{W}^{A*} < -\Delta\underline{W}^{B*}$.

These lemmas compare the profits that each type of country A can earn in bilateralism with country B's losses from concluding an FTA with the too small market-sized type. Country $\underline{A}$ always prefers to realize an FTA with country B, compensating country B's losses by side payments. In contrast, if country B's relative market size is not sufficiently large, country $\overline{A}$ should not go so far as to compensate it in order to realize the FTA.

By the former assumption, if country B is indifferent between concluding an FTA and unilateralism, the FTA can be achieved. Therefore, solving the condition that such an indifference relation holds, we can derive the minimum amount of side payments Ω required for concluding the FTA, which depends on country B's belief μ.

Lemma 5 *If*

$$s_A = \Omega(\mu) \equiv -\frac{351}{4900}\mu[(a_A^H)^2 - (a_A^L)^2] - \frac{351}{4900}(a_A^L)^2 + \frac{3}{70}{a_B}^2, \qquad (19)$$

then $E_B(\sigma_B = a|s_A) = E_B(\sigma_B = r|s_A)$.

We can easily confirm that $\Omega(\mu)$ increases as μ decreases. If the value of μ is large enough, then $\Omega(\mu) \leq 0$; that is, country A can realize the FTA

without paying any side payments. In contrast, if the value of μ is too small, then $\Omega(\mu) > \Delta\overline{W}^{A*}$; that is, the required amount of side payments $\Omega(\mu)$ is larger than country $\overline{A}$'s benefits of concluding an FTA. Hence, country $\overline{A}$ loses the incentive to conclude the FTA with country B in this case. We can solve these critical values of μ as the following lemma.

Lemma 6 *We define that*

$$\tilde{\Theta} \equiv \frac{1}{(a_A^H)^2 - (a_H^L)^2}\left[-(a_A^L)^2 + \frac{70}{117}{a_B}^2\right], \tag{20}$$

and

$$\hat{\Theta} \equiv \left[\frac{4900}{351[(a_A^H)^2 - (a_H^L)^2]}\right]\left[\frac{3}{70}(a_A^H)^2 - \frac{351}{4900}(a_A^L)^2 - \frac{141}{4900}{a_B}^2\right]. \tag{21}$$

If $\mu \geq \tilde{\Theta}$*, then* $\Omega(\mu) \leq 0$*. And if* $\mu < \hat{\Theta}$*, then* $\Omega(\mu) > \Delta\overline{W}^{A*}$*.*

We can derive the equilibria in this game from the series of aforementioned lemmas.

Proposition 4 *The equilibria in the suggesting side payments game are as follows:*

- *If* ${a_B}^2 < [70(a_A^H)^2 - 117(a_A^L)^2]/47$ *and* $\theta < \hat{\Theta}$*, then* $s_{\overline{A}}^* = 0,\ s_{\underline{A}}^* = -\Delta\underline{W}^{B*},\ \sigma_B^* = a,\ \mu^* = 1,\ \nu^* = 0.$

- *Otherwise, if* $\theta \geq \tilde{\Theta}$*, then* $s_{\overline{A}}^* = s_{\underline{A}}^* = 0,\ \sigma_B^* = a,\ \mu^* = \theta,\ \nu^* = 1 - \theta.$

Further, if $\theta < \tilde{\Theta}$*, then* $s^*_{\overline{A}} = s^*_{\underline{A}} = \Omega(\theta),\ \sigma^*_B = a,\ \mu^* = \theta,\ \nu^* = 1 - \theta.$

[Figure 5: The amount of side payments suggested by the small country]

In the suggesting side payments game, a separating equilibrium exists in the former case and a pooling equilibrium exists in the latter case. If the large country's relative market size is small enough and the probability that the small country has the less small market-size is low enough, then the less small market-sized type loses the incentive to pay an amount of side payments that is enough to compensate the partner's loss from entering into an FTA. However, the too small market-sized type would always like to realize an FTA even if it pays that amount of side payments to realize the FTA. Hence, the amount of side payments suggested by each type differs; that is, the amount of side payments plays a role of signals about the offering country's market size. Otherwise, both types of the small country try to conclude an FTA with the large country with the smaller outlay on side payments; that is, the too small market-sized type can pretend to be the less small one and the large country cannot have an insight into the other country's actual market size.

Figure 5 depicts the amount of side payments suggested by the small country in the equilibria when the large country's relative market size is small enough. If the value of θ is too low, each type of the small country suggests a different amount of side payments; therefore, the large country

can gauge the hidden information about the small country's market size. Otherwise, each type of the small country suggests a same amount of side payments. Then, the amount of side payments suggested by both types is decreasing in θ, and an FTA can be realized without any side payments when θ is high enough. The offering country whose market size is relatively small can lead the potential partner to accept the FTA offer in any case.

4 Concluding Remarks

This paper analyzed the negotiations involved in concluding FTAs between small and large countries under the existence of informational asymmetry about the small country's market size. We considered the following two bargaining games about FTA negotiations under incomplete information between two asymmetric market-sized countries. In the first game, the large country offers an FTA, stating the required side payments, and then, the small country decides to accept or reject the FTA offer. In the second game, the small country offers an FTA, suggesting certain side payments, and then, the large country decides to accept or reject the FTA offer. As explained in the beginning, the recent trend toward regionalism by way of FTAs is characterized by an increase in FTAs among various market-sized countries and the existence of certain implicit side payments from the small country to

the large one. This paper explained these two features using the theoretical framework of bargaining games under incomplete information and showed that such implicit side payments play a more important role in FTA negotiations between asymmetric market-sized countries when informational asymmetry exists about the small country's market size.

Finally, we point out some limitations and future directions of our research. In this paper, to simplify our analysis, we ignored some important concerns regarding FTA negotiations. For example, we did not discuss the aspect of each country's strategic order of its move by comparing the two analyses in this paper: which is the country that intends to make an FTA offer in the first stage? It is also our intention to extend our analyses to consider finite or infinite dynamic games, in which two countries reciprocally offer an FTA with a certain amount of side payments. In addition, it is important to consider the following question about FTA negotiations with implicit side payments proposed by Bhagwati (1991): can such an FTA be the basis of multilateral trade liberalization ("building blocks") or additional trading blocks in the world ("stumbling blocks")? Bond and Park (2002) show that efficient trading agreements involve changes in the amount of side payments and gradual tariff reductions imposed by one country over time. In contrast, Limão (2007) finds that such agreements motivated by cooperation in non-trade issues increase the cost of multilateral tariff reductions,

and thus, become stumbling blocks to global free trade. These matters are left open for future debate.

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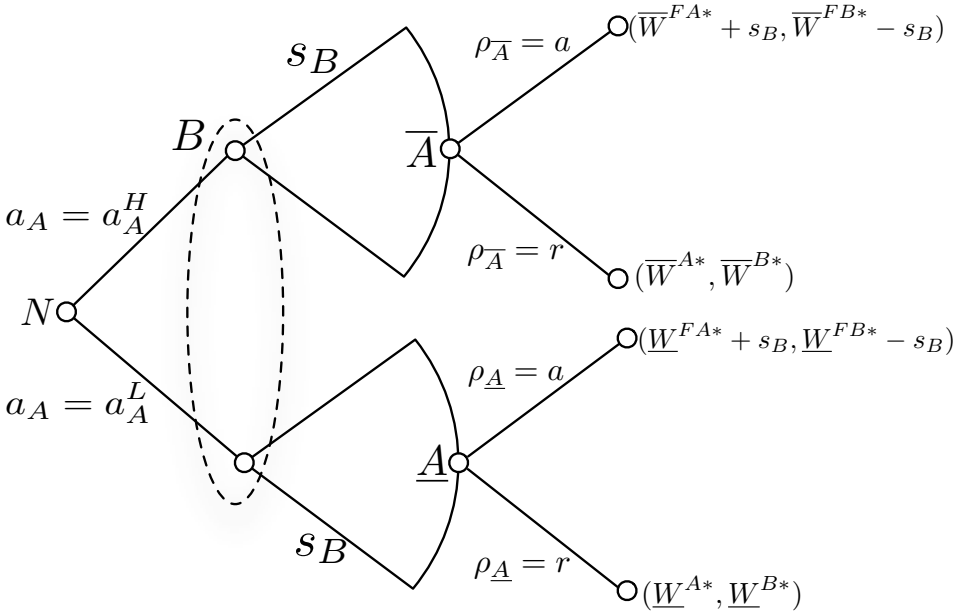
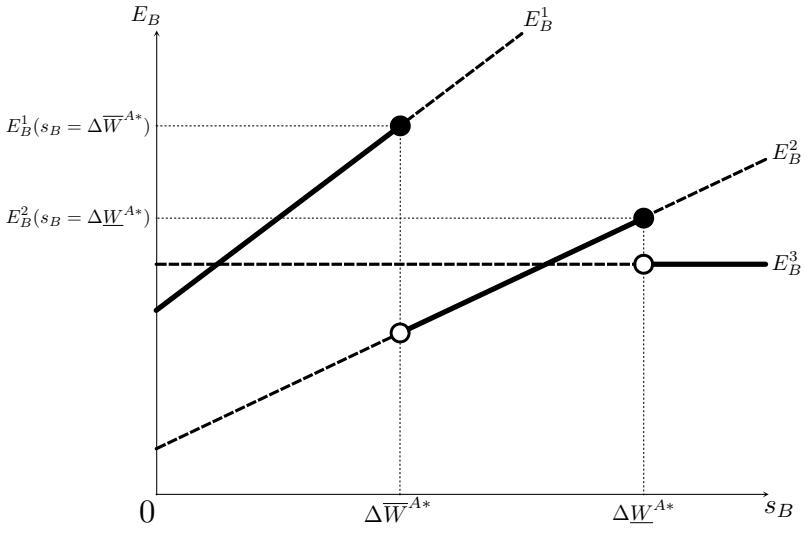
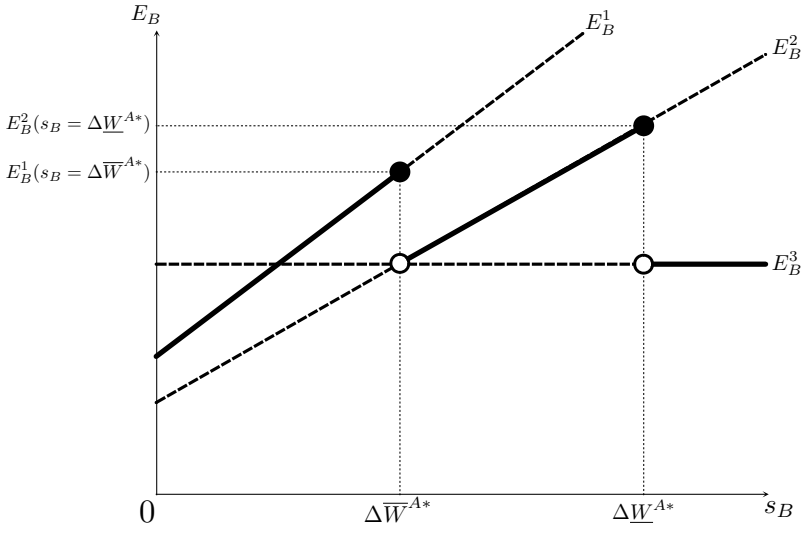


Figure 1: The game tree of requiring side payments



(a) if $\theta \geq \Theta$



(b) if $\theta < \Theta$

Figure 2: The large country's expected payoffs

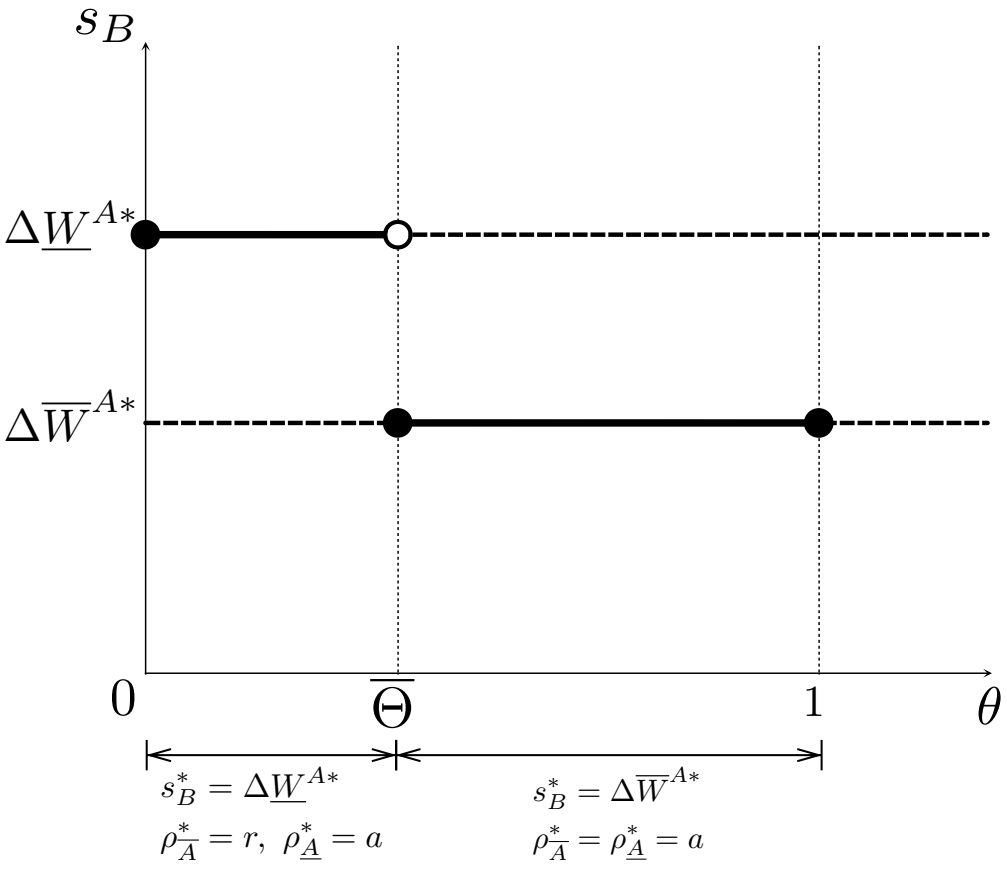


Figure 3: Each country's equilibrium strategy in Game 1

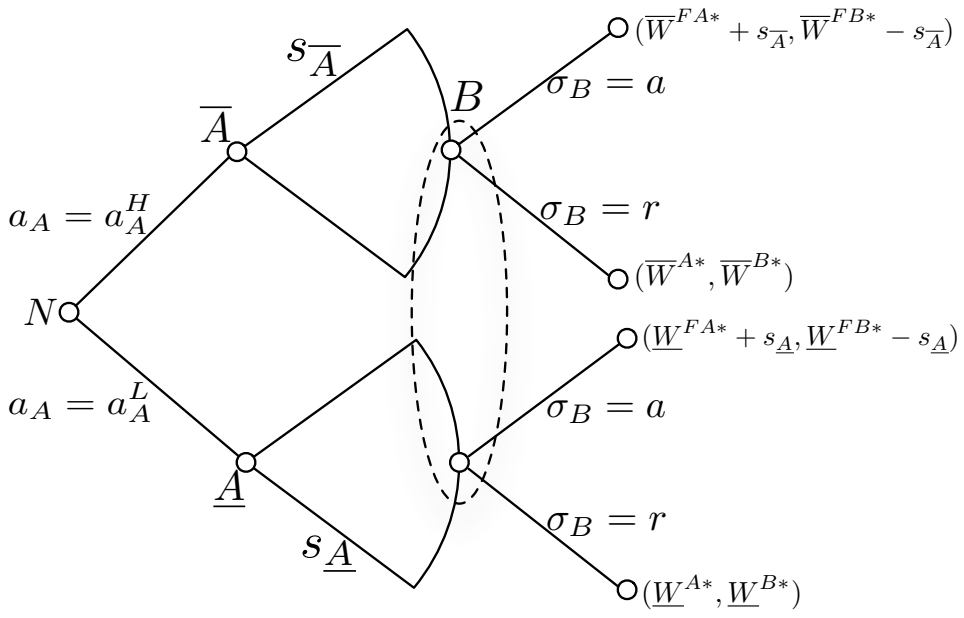


Figure 4: The game tree of suggesting side payments

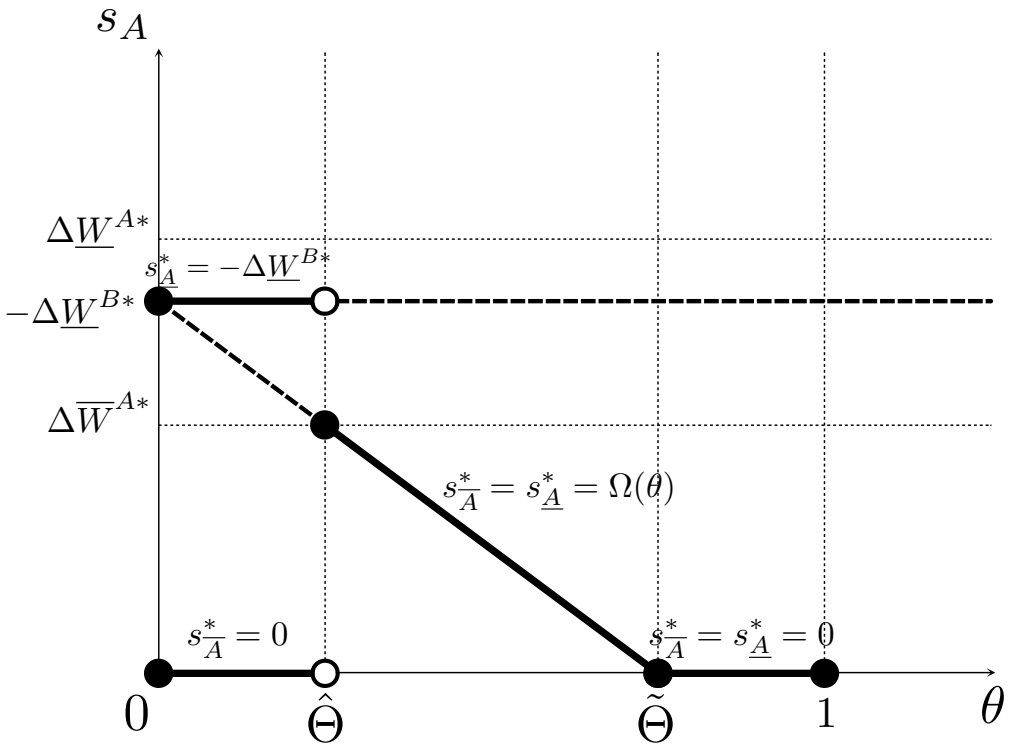


Figure 5: The amount of side payments suggested by the small country