

Voluntary Formation of a Free Trade Area under Endogenous Policy Timing in a Three-Country Model*

Ryoichi Nomura

Abstract

We analyze whether a free trade area (FTA) between the importing country and one of exporting countries is voluntarily formed in a three-country model where one importing country and two exporting countries exist, and where each government can use import tariff and export subsidies. We also investigate the voluntary formation of an FTA when the use of export subsidies is prohibited. The main conclusions are as follows: (i) Suppose that a timing of export subsidies and import tariff are endogenously determined. The FTA is not formed even if an income transfer is available between its member countries. (ii) Suppose that the use of export subsidies is prohibited. The FTA is formed if the income transfer is implemented. (iii) The FTA benefits non-member country as well as entire world regardless of the prohibition of the use of export subsidies.

1. Introduction

Recently, many countries and regions try to form free trade areas (FTAs). For example, Japan forms or negotiates FTAs with Singapore, Mexico, Philippine, Thai, Korea, Chili, and others. Other typical examples are European Union (EU) and North American Free Trade Agreement (NAFTA). Under what kind of conditions are FTAs voluntarily formed?

To answer the question, we consider the voluntary formation of an FTA in a *so-called* three-country model. Few researchers, to our knowledge, try to tackle the analysis of this issue in a three-country model, except for Wong (2005).¹⁾ Keeping in mind the prohibition of the use of export subsidies by World Trade Organization (WTO), Wong (2005) considers that effects of FTAs on each country's welfare in the framework where there is a market in each country and each government can use only tariff policy and does not determine the policy timing.²⁾ He shows that an FTA between the importing country and one exporting country benefits member countries but hurts non-member country.

*I acknowledge Takao Ohkawa (Ritsumeikan University) for a lot of valuable comments. Of course, I am responsible for any remaining errors.

We should note that Wong (2005) assumes that policy parameters are given, and that he fails to account for the timing of policy decision between governments, although several³⁾ researches have been made on the endogenous timing in the analysis of strategic trade policy. Furthermore, there are other domestic policies, which have similar effects to export subsidies even though WTO prohibits the use of export subsidies.⁴⁾

In this paper, therefore, we modify Wong's (2005) model to examine the voluntary formation of an FTA between the importing country and one of exporting countries as follows: (i) there is a market in the third country, (ii) government of each country can choose not only the rate of policy tool (subsidy and tariff) but also timing of policy implementation. We also examine the voluntary formation of an FTA in the framework where the use of export subsidies is prohibited.

The main conclusions derived in this paper are as follows: (i) Suppose that a timing of export subsidies and import tariff are endogenously determined. The FTA is not formed even if an income transfer is available between its member countries. (ii) Suppose that the use of export subsidies is prohibited. The FTA is formed if the income transfer is implemented. (iii) The FTA benefits non-member country as well as entire world regardless of the prohibition of the use of export subsidies.

The rest of this paper is organized as follows. Section 2 formulates the model. Section 3 presents preliminary results. Main results are presented in Section 4. Section 5 concludes this paper.

2. The Model

2.1 Set-up

Consider a world economy where three countries (named by first, second, and third) exist and a single commodity is traded. The commodity is produced in the first and second countries and exported to the third country. No consumption occurs and one firm operates in the each exporting country. Both firms have identical production technology with constant marginal cost c .

In the third country, there is no production and consumers purchase the commodity imported from the first and second countries. Let an inverse demand function of the third country be $p=P(Q)\equiv A-Q$, where Q shows the demand for the commodity, p is the commodity price and A indicates market scale and is assumed to be greater than c . Each firm competes *à la* Cournot in the third country market.

The government of each exporting country may give an export subsidy of s_i ($i=1,2$) per output so as to maximize the country's national welfare, whilst the government of the third country may impose a specific import tariff of t_i on output supplied by the firm in the i th country ($i=1,2$). Each government then decides not only upon the level of the subsidy or tariff, but also on the timing of policy implementation if possible.

In the case where an FTA is formed between one of exporting countries and the importing

country, we deal with an FTA between the first and third countries. In this case, the government of the first (third) country sets its level of subsidy (tariff on output from the first country) to null, whereas the government of the second (third) country can choose not only its level of subsidy (tariff on output from the second country), but also both of them can determine the timing of policy implementation.

2.2 FTA formation game

We consider the following multi-stage game: In the first stage, the first and third countries determine whether they form an FTA or not. If both of them choose to *form* an FTA, then an FTA is formed; otherwise, then it is not formed.

When the FTA is rejected, all countries face to the following stages: In the second stage, the government of each country decides the timing of its export subsidy and import tariff. In the third stage, each government chooses the level of its export subsidy and import tariff according to the predetermined timing. In the fourth stage, the firms behave in Cournot fashion, given the export subsidies and import tariffs set by each government.⁵⁾ We refer this case as the case *without* FTA.

We solve this game backwardly. Let us begin with the fourth stage subgame. The firms simultaneously and independently choose their outputs so as to maximize profits given the export subsidy and import tariff set by each government. Profit of a firm in the *i* th country is given by $\pi_i = P(Q)q_i - (c - s_i + t_i)q_i$ where q_i is output of a firm in the *i* th country. The equilibrium output level of each firm, q_i , is given by

$$q_i = \frac{1 + 2(s_i - t_i) - (s_j - t_j)}{3}, \quad i, j = 1, 2, \quad i \neq j. \tag{1}$$

From equation (1), total output level in equilibrium is given by

$$Q = \frac{2 + (s_1 - t_1) + (s_2 - t_2)}{3}. \tag{2}$$

Note that we normalize $A - c = 1$ for the purpose of simplicity.

In the third stage, each government of the exporting countries sets the level of subsidy s_i in order to maximize national welfare, W_i , defined as profit of a domestic firm net of export subsidies:

$$W_i = \pi_i - s_i q_i, \quad i = 1, 2. \tag{3}$$

The government of the importing country determines the level of tariff t_i in order to maximize national welfare, W_3 , defined as the sum of consumer surplus and the tariff revenue:

$$W_3 = \frac{1}{2} Q^2 + t_1 q_1 + t_2 q_2. \tag{4}$$

We define world welfare as the sum of all countries' welfare:

$$W = W_1 + W_2 + W_3 = \frac{1}{2} Q(2 - Q). \tag{5}$$

Because the two exporting countries are identical, there are eight possible timing decisions with trade policy. Table 1 presents these timings. Note that the *i* th country does not move later than the *j* th country.

Table 1: Possible timing of decisions for trade policy

A	All countries act simultaneously.
B	Both exporting countries choose own subsidy level simultaneously, and then the importing country chooses its tariff level.
C	The importing country chooses its tariff level first, and then both exporting countries choose own subsidy level simultaneously.
D	The i th country and the third country act simultaneously before the j th country choose its subsidy level.
E	The j th country and the third country act simultaneously after the i th country chooses its subsidy level.
F	The i th country is the first mover, the j th country is the second, and the third country is the last.
G	The third country is the first mover, the i th country is the second, and the j th country is the last.
H	The i th country is the first mover, the third country is the second, and the j th country is the last.

From equations (1) through (5), we calculate the level of subsidies, s_i^h , and tariff, t_i^h , the each country's welfare, W_i^h , and world welfare, W^h , in the case of timings $h (=A, \dots, H)$. Tables 2 and 3 summarize the results.

When the FTA is accepted, the first (the third) country sets its subsidy (tariff) level to null as a commitment. All countries face to the following stages: In the second stage, the governments of the second and third countries decide the timing of its export subsidy and import tariff. In the third stage, these governments choose the level of its export subsidy and import tariff according to the predetermined timing. In the fourth stage, the firms behave in Cournot fashion, given the export subsidies and import tariffs set by each government. In this case, the government of member exporting country does not intervene (that is, $s_1=0$) and the importing government imposes tariff against only the firm in the non-member exporting country (that is, $t_1=0$). We refer this case as the case *with* FTA.

We begin with the fourth stage subgame. Rearranging equation (1), we obtain the equilibrium output level of each firm:

$$q_1 = \frac{1 - (s_2 - t_2)}{3}, \text{ and} \quad (6)$$

$$q_2 = \frac{1 + 2(s_2 - t_2)}{3}. \quad (7)$$

Similarly, rearranging equation (2), we obtain the equilibrium total output level:

$$Q = \frac{2 + s_2 - t_2}{3}. \quad (8)$$

In the third stage, the governments of the second and third countries choose the level of export subsidy and import tariff so as to maximize its welfare. Welfare of each country in the case with FTA is defined:

$$W_1 = \pi_1, \quad (9)$$

Table 2: The level of subsidies and tariffs in the case without FTA

Timing	Subsidy		Tariff
	s_i^h	s_j^h	t_i^h
A	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{2}{7}$
B	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{5}{18}$
C	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
D	$\frac{6}{23}$	$\frac{3}{23}$	$\frac{5}{23}$
E	$\frac{5}{24}$	$\frac{1}{8}$	$\frac{7}{24}$
F	$\frac{4}{21}$	$\frac{2}{21}$	$\frac{2}{7}$
G	$\frac{2}{7}$	$\frac{1}{7}$	$\frac{1}{7}$
H	$\frac{21}{88}$	$\frac{3}{22}$	$\frac{19}{88}$

Note: Superscript h ($= A, \dots, H$) indicates the timing of policy decisions.

Table 3: Welfare of each country and world in the case without FTA

Country Timing	W_i^h	W_j^h	W_3^h	World welfare
A	$\frac{2}{49}$	$\frac{2}{49}$	$\frac{16}{49}$	$\frac{20}{49}$
B	$\frac{5}{108}$	$\frac{5}{108}$	$\frac{25}{81}$	$\frac{65}{162}$
C	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{3}$	$\frac{4}{9}$
D	$\frac{27}{529}$	$\frac{18}{529}$	$\frac{375}{1058}$	$\frac{465}{1058}$
E	$\frac{1}{24}$	$\frac{1}{32}$	$\frac{49}{144}$	$\frac{119}{288}$
F	$\frac{1}{21}$	$\frac{5}{147}$	$\frac{16}{49}$	$\frac{20}{49}$
G	$\frac{3}{49}$	$\frac{2}{49}$	$\frac{5}{14}$	$\frac{45}{98}$
H	$\frac{9}{176}$	$\frac{9}{242}$	$\frac{5415}{15488}$	$\frac{6783}{15488}$

$$W_2 = \pi_2 - s_2 q_2, \tag{10}$$

$$W_3 = \frac{1}{2} Q^2 + t_2 q_2. \tag{11}$$

We assume that the member countries can transfer a part of its income, I , to the other member country. Note that world welfare in the case with FTA is the same as that in the case without FTA.

Table 4: Possible timing of decisions in the case with FTA

A*	The second country and the importing country act simultaneously.
B*	The second country chooses own subsidy level, and then the importing country chooses its tariff level.
C*	The importing country chooses its tariff level first, and then the second country chooses own subsidy level.

Table 5: Subsidies, Tariffs, and Welfare in the case with FTA

Country Timing	s_2^h	t_2^h	W_2^h	W_2^h	W_3^h	World welfare
A*	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{18}$	$\frac{5}{18}$	$\frac{4}{9}$
B*	$\frac{9}{56}$	$\frac{1}{56}$	$\frac{121}{784}$	$\frac{9}{112}$	$\frac{295}{1568}$	$\frac{663}{1568}$
C*	$\frac{3}{14}$	$\frac{1}{14}$	$\frac{4}{49}$	$\frac{9}{98}$	$\frac{2}{7}$	$\frac{45}{98}$

In this setting, there are three possible timings as shown in Table 4. From equations (5) through (11), we calculate the level of subsidy and tariff, and welfare of each country and world in each possible timing. These results are summarized in Table 5.

3. Preliminary Results

First, we consider the case without FTA. From Table 3, we obtain following results :

Lemma 1 (Proposition 1 in Nomura (2005)) :

- [i] The equilibrium timing is C, that is, the importing country sets its tariff level first, and the exporting countries set their own subsidy level simultaneously.
- [ii] The equilibrium welfare of each country and world are as follows :

$$W_1^C = W_2^C = \frac{1}{18}, \quad W_3^C = \frac{1}{3}, \quad \text{and} \quad W^C = \frac{4}{9}.$$

Let us consider the intuition of Lemma 1. Because we assume that two exporting countries are identical, each firm's market share becomes equal.⁶⁾ In this situation, the effect of strategic distortion dominates that of terms of trade distortion. Therefore, each government of exporting countries has incentives to subsidize a domestic firm and to become a first mover among exporting countries. As a result, both governments of exporting countries move simultaneously. As shown in equations (2) and (4), export subsidies of both exporting governments increase total output, and thereby consumer surplus in the third country. Subsidy in both exporting governments induces the importing government to lower its tariff rate, because the decrease in tariff rate raises subsidy one. To do so, the importing country's government chooses the

low level of tariff before exporting countries' determination of subsidy level.

In this situation, the importing government intended to increase consumer surplus rather than tariff revenue by lowering import tariff before exporting governments decide their subsidy level.

Next, we consider the case with FTA. From Table 5, we obtain following results :

Lemma 2: Suppose that an FTA is formed between the first and third countries.

[i] The equilibrium timing is C*, that is, the importing country sets its tariff first, and then the non-member exporting country sets its subsidy level.

[ii] The equilibrium welfare of each country and world are as follows :

$$W_1^{C^*} = \frac{4}{49}, \quad W_2^{C^*} = \frac{9}{98}, \quad W_3^{C^*} = \frac{2}{7}, \quad \text{and} \quad W^{C^*} = \frac{45}{98}.$$

Lemma 2 shows that the importing government set its tariff level before the second government sets the level of export subsidies if an FTA between the first and third countries is formed. Therefore, the importing government becomes the first mover whichever an FTA is formed or not.

The intuition of Lemma 2 is as follows: Because the government of the first country does not subsidize a domestic firm, the government of the second country can enlarge market share of a domestic firm by the use of export subsidy, as compared with non-intervention. In this case, the net export subsidy for the firm in the second country is positive whereas that for the firm in the first country is zero. This makes market share of the firm in the non-member country relatively large. From equation (11), the government of importing country has an incentive to enlarge output and lower tariff rates as a first mover. Thus, Lemma 2 [i] is obtained.

4 . Main Results

In this section, we compare the outcome at timing C with that at timing C*, and consider followings : (i) the voluntary formation of an FTA, and (ii) the prohibition of the use of export subsidies by WTO.

4 . 1 Voluntary formation of an FTA

First, we examine whether an FTA between the importing country and one of exporting countries is formed voluntarily or not. The governments of the first and third countries face to the first stage game depicted in Table 6.

From Lemmas 1 and 2, following inequalities hold :

$$W_1^C < W_1^{C^*}, \tag{12}$$

$$W_3^C > W_3^{C^*}, \tag{13}$$

$$\left| W_1^{C^*} - W_1^C \right| < \left| W_3^{C^*} - W_3^C \right|. \tag{14}$$

Table 6: Payoff matrix in the first stage game.

Country 3 Country 1	A	R
A	$W_1^{C^*}, W_3^{C^*}$	W_1^C, W_3^C
R	W_1^C, W_3^C	W_1^C, W_3^C

Note 1: Strategy A (R) represents to accept (reject) an FTA.

Note 2: The FTA is formed only when both government accept it.

From inequalities (12) and (13), there are two Nash equilibria in this stage game, which are (A, R) , and (R, R) . In either equilibrium, at least one country chooses the strategy R , therefore an FTA is not formed.

Now, we allow the income transfer between member countries. Suppose that the first country transfers a part of its income I , to the third country. Equation (14) indicates that the first country cannot improve the third country's welfare as compared with the case without FTA by transferring its income I , unless it loses gains from an FTA. Thus, we obtain following results :

Proposition 1: [i] An FTA is not formed between the importing country and one of exporting countries when each government is interested in own welfare only. [ii] An FTA is not formed even if member countries can transfer a part of its income to other member country.

Proposition 1 states that an FTA between the importing country and one of exporting countries is not formed even though income transfer between member countries is possible. This is simply because that an FTA benefits the first country but hurts the third country and gain of the first country is smaller than loss of the third country.

Next, we consider effects of an FTA on non-member country's welfare and world welfare. From Lemmas 1 and 2, we have following inequalities :

$$W_2^C < W_2^{C^*}, \quad (15)$$

$$W^C < W^{C^*}. \quad (16)$$

From inequalities (15) and (16), we obtain following results :

Proposition 2: Suppose that the first and third countries form an FTA. An FTA benefits non-member exporting countries as well as entire world.

Propositions 1 and 2 state that if an FTA between the first and third countries, it would benefit (hurt) both exporting countries (the importing country), and would improve world welfare.⁷⁾

We consider the intuition of these propositions. Because of the removal of tariff on output from the first country, tariff revenue for the importing country seems to reduce drastically, and the weight of consumer surplus in the importing country's welfare becomes larger than

that in the case without FTA. Therefore, the importing government has an incentive to induce more export subsidies by lowering tariff rates. Given lower tariff rates as compared with the case without FTA, the government of non-member country, i. e., the second country raises the level of export subsidies to enlarge its domestic firm's market share and thereby improve its national welfare.

Since the net export subsidy for the firm in the second country becomes positive, the non-member second country's firm has cost advantage under the FTA. In other words, the formation of an FTA makes the market share of the firm in the member exporting country become smaller. On the other hand, an FTA enables the first country to save on the expenditures of export subsidy and to stop rent shifting through tariff. The former negative effect is dominated by the latter positive effect. Thus, the formation of an FTA improves the first countries' welfare.

Whereas an FTA increases consumer surplus by the increase in total output, it reduces tariff revenue. The former effect is dominated by the latter effect. Therefore, the importing country worsens its welfare by forming an FTA.

4.2 Prohibition of export subsidies

Finally, we analyze the case where the prohibition of the use of export subsidies by WTO is effective in the sense that exporting countries cannot implement any domestic policies having the same effect as export subsidy policy. In this situation, we need not to deal with export subsidies as well as policy timing, because only the importing country chooses the level of tariff. Therefore, there are no actions in the second stage. To examine whether an FTA is formed voluntarily under the prohibition of the use of export subsidies, we consider two cases: (i) the importing country sets tariff on each output from both exporting countries (no-FTA case), and (ii) the importing country imposes and sets tariff on output from non-member country only (that is the second country) given tariff rate for output from member country to zero (an FTA case).⁸⁾

We begin with the fourth stage. Each firm's output and total output are given by

$$q_i = \frac{1 - 2t_i + t_j}{3}, \quad (17)$$

$$Q = \frac{2 - t_1 - t_2}{3}. \quad (18)$$

Welfare of each exporting country is defined the domestic firm's profit, and welfare of the importing country is defined the sum of consumer surplus and tariff revenue, which is the same as equation (4).

In the third stage, only the importing country determines the level of tariff in order to maximize national welfare. From equations (4), (17), and (18), we calculate the level of tariff and welfare of each country and world as follows:

Lemma 3: Suppose that the use of export subsidies is prohibited.

[i] The level of tariff in the no-FTA case and an FTA case are as follows:

Table 7: Payoff matrix in the first stage game under the prohibition of the use of export subsidies.

	Country 3	
	A	R
Country 1		
A	$\widehat{W}_1, \widehat{W}_3$	\bar{W}_1, \bar{W}_3
R	\bar{W}_1, \bar{W}_3	\bar{W}_1, \bar{W}_3

$$\bar{t}_1 = \bar{t}_2 = \frac{1}{4},$$

$$\widehat{t}_2 = \frac{1}{11}.$$

[ii] The equilibrium welfare of each country and world in each case are as follows :

$$\bar{W}_1 = \bar{W}_2 = \frac{1}{16}, \quad \bar{W}_3 = \frac{1}{4}, \quad \bar{W} = \frac{3}{8},$$

$$\widehat{W}_1 = \frac{16}{121}, \quad \widehat{W}_2 = \frac{9}{121}, \quad \widehat{W}_3 = \frac{5}{22}, \quad \widehat{W} = \frac{105}{242}.$$

Note that bar (hat) represents no-FTA (an FTA) case.

Let us consider the voluntary formation of an FTA under the prohibition of the use of export subsidies. The first and third countries face to the first stage game depicted in Table 7. From Lemma 3 [ii], following inequalities are satisfied :

$$\bar{W}_1 < \widehat{W}_1, \tag{19}$$

$$\bar{W}_3 > \widehat{W}_3, \tag{20}$$

$$|\widehat{W}_1 - \bar{W}_1| > |\widehat{W}_3 - \bar{W}_3|. \tag{21}$$

From inequalities (19) and (20), there are two Nash equilibria in this stage game, which are (A, R), and (R, R). Thus, an FTA is not formed under the prohibition of the use of export subsidies and no availability of income transfer.

Now, we allow the income transfer between member countries. Equation (21) implies that the first and third countries can form an FTA by transferring a part of income I from the first country to the third country although an FTA decreases the importing country's welfare itself. From Lemma 3 [ii], if the level of I is in the following interval :

$$\frac{135}{1936} > I \geq \frac{91}{1936},$$

then an income transfer enable them to form an FTA. Thus, we obtain following results :

Proposition 3: Suppose that the use of export subsidies is prohibited. [i] An FTA is not formed between the importing country and one of exporting countries when an income transfer is not available. [ii] An FTA may be formed if member countries can transfer a part of its income to other member country.

Proposition 3 states that without any income transfer, an FTA is not formed even if the rigorous prohibition of the use of export subsidies is implemented by WTO, and that the proper income transfer enables an FTA to be formed under the rigorous prohibition of export subsidies.

Next, we consider how an FTA affects non-member country's welfare and world welfare. From Lemma 3 [ii], following inequalities are satisfied:

$$\bar{W}_2 < \widehat{W}_2, \tag{22}$$

$$\bar{W} < \widehat{W}. \tag{23}$$

From inequalities (22) and (23), we obtain following results:

Proposition 4: Suppose that the first and third countries form an FTA and the prohibition of the use of export subsidies is effective. An FTA benefits non-member exporting country as well as entire world.

Propositions 3 and 4 indicate that, under the prohibition of the use of export subsidies, member countries can gain from an FTA by transferring its income to other member country, and that an FTA benefits non-member country. In other words, WTO may improve not only world welfare but also every country's welfare by prohibiting the use of export subsidies.

Suppose that an FTA is formed between the first and third countries. When the use of export subsidies is not prohibited, the second country can improve its welfare by the use of export subsidies, which enlarge a local firm's market share. However, Proposition 4 states that the second country gains from an FTA even when the use of export subsidies is prohibited.

Let us consider intuition of these results. The removal of tariff on output from the first country increases (decreases) market share of the first (second) country. Therefore, welfare of the first country increases. Drastic reduction of tariff revenue increases the weight of consumer surplus in the third country's welfare. Then the importing country reduces tariff rates on output from the second country so as to induce more output. As a result, profit of the firm in the second country increases although its market share decreases.

5. Concluding Remarks

This paper considers the voluntary formation of an FTA in a three-country model, where one importing country and two exporting countries exist and each government can use import tariff and export subsidies. We deal with an FTA between the importing country and one of exporting countries. The main conclusions we derive are as follows: (i) Suppose that a timing of export subsidies and import tariff are endogenously determined. The FTA is not formed even if an income transfer is available between its member countries. (ii) Suppose that the use of export subsidies is prohibited. The FTA is formed if the income transfer is implemented.

(iii) The FTA benefits non-member country as well as entire world regardless of the prohibition of the use of export subsidies.

In this paper, an FTA is not formed voluntarily, except when the prohibition of export subsidy is effective and income transfer is available between member countries. However, as mentioned in Section 1, FTAs have become a popular trade policy more than ever in the real world. Therefore, some factors, which not regarded in our model, play a key role to make FTAs beneficial. Therefore, one possible direction for future research is to specify the factors, which make FTAs beneficial for member countries, and the situation where FTAs are formed voluntarily.

Notes

- 1) One of the seminal researches about strategic trade policies in a three-country model is Brander and Spencer (1985). They construct a model in which two exporting countries and one importing country exist and firms in the exporting countries compete *à la* Cournot in the importing country's market, and show that the exporting country has incentive to subsidize a local firm to increase their market share under some conditions.
- 2) Wong (2005) considers not only an FTA between the importing country and one of exporting countries but also between two exporting countries.
- 3) There are many studies about the endogenous timing of policy game. Ohkawa, Okamura, and Tawada (2005) investigates the endogenous policy timing of the exporting countries in the absence of the importing country's policy intervention modifying Brander and Spencer's (1985) model. Introducing the tariff policy of the importing country to Ohkawa, Okamura, and Tawada's (2002) model, Nomura (2005) examines the endogenous policy timing of the exporting countries and the importing country. In addition to a three-country model, there are several studies using a two-country model, e. g. Collie (1994), Toshimitsu (1997), and Hayashibara (2002).
- 4) Of course, Wong (2005) points out these domestic policies.
- 5) This type of the timing game is called the extended game with observable delay. See Hamilton and Slutsky (1990).
- 6) See Krishna and Thursby (1986) for strategic distortion and terms of trade distortion.
- 7) We compare results derived in this paper with those in previous researches. At equilibrium timing C^* , the importing country move first and the exporting country move second. This is contrast to the equilibrium timing in a two-country model (e. g. Hayashibara (2002)) but the same as a three-country model without an FTA (e. g. Nomura (2005)). In addition to this, the exporting country sets the export subsidy in our model although it sets to the export tax in a two-country model. This is because the strategic distortion arises from the existence of the rival firm in the other exporting country and dominates the terms of trade distortion. Note that we assume that there are no firms in the importing country in a two-country model in order to compare it with our results with ease.
- 8) This is not the same as Wong (2005) because he assumes that policy parameters are given. If we analyze this issue in Wong's (2005) framework, we need to assume that the importing country sets tariff on output from member country to null, given tariff rate for output from non-member country as the level in the absence of an FTA.

References

- Brander, J. A. and B, J. Spencer (1985), "Export Subsidies and International Market Share Rivalry", *Journal of International Economics* 18, 83-100.
- Collie, D.R. (1994), "Endogenous Timing in Trade Policy Games: Should Governments Use Countervailing Duties?", *Weltwirtschaftliches Archiv* 130, 191-209.
- Hamilton, J. H. and S. M. Slutsky (1990), "Endogenous Timing in Duopoly Games: Stackelberg or Cournot Equilibria", *Games and Economic Behavior* 2, 29-46.
- Hayashibara, M. (2002), "Industrial Concentration Reverses the Timing in a Trade Policy Game", *Open Economies Review* 13, 73-86.
- Krishna, K. and M. Thursby (1991), "Optimal Policies with Strategic Distortion", *Journal of International Economics* 31, 291-308.
- Nomura, R. (2005), "Endogenous Timing of Subsidies and Tariff in an Export Rivalry Model", *Ritsumeikan University Discussion Paper* No. 05004.
- Ohkawa, T., M. Okamura, and M. Tawada (2002), "Endogenous Timing and Welfare in the Game of Trade Policies under International Oligopoly", in A. D. Woodland (eds.) *Economic Theory and International Trade: essays in honour of Murray C. Kemp*, Northampton: Edward Elgar, 218-231.
- Toshimitsu, T. (1997), "On the Endogenous Timing in Trade Policy Game: a General Case", *Kwansei Gakuin University Discussion Paper Series* 1997-6.
- Wong, K. (2005), "Free Trade Areas and International Rivalry", *mimeo*.