Voluntary Formation of Free Trade Area in a Three-Country Model

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Abstract

This paper investigates whether both an importing country and one of exporting countries form a free trade area (FTA) voluntarily in a "three-country" model where one importing country and two non-identical exporting countries exist. Two exporting countries are different with respect to the number of firms. An export subsidy (An import tariff) is available for each of exporting governments (an importing government). We construct a following three-stage game: In the first stage, each government of importing and exporting countries determines whether it forms an FTA independently. In the second stage, if the FTA is formed, then member countries set its subsidy and its tariff level to null for the "intra-member trade," whereas the government intervention prevails for the trade between importing country and non-member one. Otherwise, then each of exporting governments (importing government) implements an export subsidy (an import tariff). In the third stage, given the level of trade policies, the firms in the exporting countries export a homogenous commodity and compete *à la* Cournot in the importing country. The main conclusions are as follows: [i] Suppose that an FTA is formed. The importing government reduces the external tariff irrespective of with which exporting country it forms the FTA. Non-member exporting country reduces the export subsidy (tax) if it has the lesser (larger) number of firms. [ii] The FTA can be formed between the importing country and the exporting country with the larger number of firms under some conditions, although the FTA between the importing country and the exporting country with the lesser number of firms cannot be formed. [iii] The FTA between the importing country and the exporting country with the larger number of firms benefits member countries as well as entire world, but hurts non-member country.

Keyword: Free Trade Area, Import Tariff, Export Subsidy, Number of Firms, Cournot Competition
JEL Classifications: F12, F13, L13

1. Introduction

Recently, many countries and regions have been tried to form free trade areas (FTAs). For example, Japan has been formed or negotiating FTAs with Singapore, Mexico, Thai, Chili, Korea, as well as other countries and regions. Although many attempts have been made to form FTAs in various areas, these attempts do not seem to necessarily succeed. This drives us to the question under what kind of conditions FTAs are successfully formed.

There are several previous literatures examine some aspects of FTAs and customs unions (CU). For example, Yi (1996) examined the endogenous stability properties of CU using the coalition formation game. Freund (2000) examined the interaction between preferential trade agreements (PTAs) and multilateral tariff reduction in a repeated game framework. Mukunoki (2004) investigated how the move from segmented market to integrated market accompanied with PTAs affects optimal tariffs against the non-member country using an oligopoly model with product differentiation. One of common features of these papers is that they assumed that all countries have a local market and local firms, and trade each other, and that all governments impose an import tariff only as trade policies. These papers focused mainly on the effects of FTAs/CU on the level of tariffs and welfare, not on the voluntary formation of FTAs.

In reality, the governments can take some kind of policies which have similar effects with an export subsidy, although the export subsidy is ruled out by WTO. However, it seems that introducing an export subsidy policy into the above-mentioned model makes the analysis complex to examine the voluntary formation of FTAs. From this perspective, Nomura (2005) examined the voluntary formation of an FTA in a standard three-country model for simplicity, and showed that, in an international *symmetric duopoly case* under endogenous timing of trade policies, the FTA is *not* formed unless the prohibition of export subsidy by WTO is rigorously effective as well as some kind of income transfer between member countries is available. Therefore, one of the questions that we must consider next is how affect an *asymmetry* of some kind on the voluntary formation of the FTA.

To examine this question, we investigate the voluntary formation of the FTA in a three-country model where one importing country and two non-identical exporting countries exist, and where each of government may implement an import tariff and an export subsidy as trade policies. We assume that two exporting countries are different with respect to the number of firms. That is, we focus on the asymmetry of the number

of firms in the exporting countries to examine the voluntary formation of the FTA.

We construct a following three-stage game: In the first stage, the governments determine whether they form an FTA independently. In the second stage, if the FTA is formed, then free trade prevails between member countries, whereas the government intervention prevails between non-member countries. Otherwise, then the governments of all countries implement trade policies. In the third stage, given the level of trade policies, the firms in the exporting countries export a homogenous commodity and compete *à la* Cournot in the importing country. The main conclusions are as follows: [i] Suppose that an FTA is formed. The importing government reduces the external tariff irrespective of with which exporting country it forms the FTA. Non-member exporting country reduces the export subsidy (tax) if it has the lesser (larger) number of firms. [ii] The FTA can be formed between the importing country and the exporting country with the larger number of firms under some conditions, although the FTA between the importing country and the exporting country with the lesser number of firms cannot be formed. [iii] The FTA between the importing country and the exporting country with the larger number of firms benefits member countries as well as entire world, but hurts non-member country.

2. The Model

Consider a world economy where three countries (one importing country and two exporting countries) exist and a single commodity is traded. The commodity is produced in the exporting countries and exported to the importing country. Firms in both exporting countries have an identical production cost function with constant marginal cost c. No firms exist in the importing country. We assume that two exporting countries are different with respect to the number of firms, and we call the exporting country with the larger number of firms as *country L* and that with the lesser number of firms as *country S*. Country *L* (*S*) has n_L (n_S) firms, that is $n_L > n_S$.

Let an inverse demand function of the importing 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 importing country market.

The each exporting government give an export subsidy of s_i $(i = L, S)$ per output so as to maximize the country's national welfare, while the importing government may impose a specific import tariff of t_i on output exported by the firms in country *i*.

We construct the following three-stage game: In the first stage, the governments of three countries determine whether they form an FTA or not independently and simultaneously. If two of them choose to form an FTA each other, then an FTA is formed; otherwise, then it is not formed. Note that we focus on the FTA between two countries. In the second stage, when any FTA is not formed, each government chooses the level of its export subsidy and import tariff simultaneously; on the other hand, when the FTA is formed, the governments of member countries set its level of subsidy and tariff on output from the member country to null, whereas the governments of the non-member exporting country and the importing country take trade policies each other. In the third stage, the firms compete *à la* Cournot, given the export subsidies and import tariffs set by each government.

3. Preliminary Results

We solve this game by backward induction[1]. In the third stage, 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 each firm in country i is given by $\pi_i = P(Q)q_i - (c - s_i + t_i)q_i$ where q_i is each firm's output in country i. The equilibrium output level of each firm in country i is given by

$$q_i = \frac{1-(t_j - s_j)(n_j + 1) + (t_i - s_i)n_j}{n_i + n_j + 1}, \quad i, j = L, S, \quad i \neq j. \tag{1}$$

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

$$Q = \frac{(1 - t_L + s_L)n_L + (1 - t_S + s_S)n_S}{n_L + n_S + 1}. \tag{2}$$

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

In the second stage, each government of the exporting country sets the level of export subsidy s_i in order to maximize national welfare, W_i, defined as the sum of profits of domestic firms net of export subsidies:

$$W_i = n_i(\pi_i - s_i q_i). \tag{3}$$

The importing government determines the level of tariff t_i in order to maximize national welfare, W_I, defined as consumer surplus plus the tariff revenue:

$$W_I = \frac{1}{2}Q^2 + t_L n_L q_L + t_S n_S q_S. \tag{4}$$

Subscript I stands for the importing country. All governments determine its trade

[1] This type of the timing game is called the extended game with observable delay. See Hamilton and Slutsky (1990).

policies simultaneously. Let us consider the second stage outcome about the following two cases respectively: FTA case and No FTA case.

3.1 No FTA Case

First, we consider the case where FTA is not formed. In this case, each of exporting governments (importing government) implements an export subsidy (an import tariff). For simplicity, we assume that the importing government imposes uniform tariffs on outputs from both exporting countries, that is $t_L = t_S = t$. From equations (1) through (4), we calculate the equilibrium level of subsidies and tariff as follows:

$$s_i = \left(n_j + 1 - n_i\right)\left(n_i + n_j\right)/n_i\Omega, \text{ and} \tag{5}$$

$$t = \left(n_i + n_j + 2\right)/\Omega. \tag{6}$$

Note that $\Omega = \left(n_i + n_j\right)^2 + 2\left(2n_i + 2n_j + 1\right)$. From equations (5) and (6), we have

Lemma 1: (i) Suppose that $n_L \geq n_S + 2$. Then, the government of country *L* (*S*) imposes (gives) the export tax (the export subsidy). (ii) The importing country imposes the positive tariff[2].

Substituting equations (5) and (6) into equations (3) and (4), we calculate each exporting country's welfare and the importing country's one respectively as follows:

$$W_i = \left(n_i + 1\right)\left(n_i + n_j\right)^2/\Omega^2, \tag{7}$$

$$W_I = \left(n_i + 1\right)\left(n_i + n_j + 2\right)^3/2\Omega^2. \tag{8}$$

From equations (4), (7), and (8), world welfare is given by

$$W = \left(n_i + n_j\right)\left(n_i + n_j + 2\right)\left(\left(n_i + n_j\right)^2 + 2\left(3n_i + 3n_j + 2\right)\right)/2\Omega^2. \tag{9}$$

3.2 FTA Case

Next, we consider the case where an FTA is formed. Suppose that the importing country and the country *i* form the FTA, that is $t_i = 0$ and $s_i = 0$. From

[2] Calculations and Proofs are available from authors upon request.

equations (1) through (4), the equilibrium subsidy and tariff level are

$$s_j^F = \frac{(2n_i+1)(n_i-n_j+1)}{(n_i+1)\Phi}, \text{ and} \tag{10}$$

$$t_j^F = \frac{(n_i+1)^2 - n_i n_j}{(n_i+1)\Phi}. \tag{11}$$

Note that superscript F means FTA case, and that $\Phi = (n_i+1)^2 + (3n_i+2)n_j$. From equations (10) and (11), we have

Lemma 2: Suppose that the FTA is formed. (i) Non-member exporting government gives the export subsidy if it is country *S*; otherwise, it then imposes the export tax. (ii) The importing government imposes the positive external tariff.

Substituting equations (10) and (11) into equations (3) and (4), each country's welfare in this case is derived as follows:

$$W_i^F = \frac{n_i(n_i+n_j+1)^2}{\Phi^2}, \tag{12}$$

$$W_j^F = \frac{(2n_i+1)^2 n_j^2}{(n_i+1)\Phi^2}, \text{ and} \tag{13}$$

$$W_I^F = \frac{n_i^5 + 3n_i^4(2n_j+1) + 3n_i^3(3n_j^2+6n_j+1) + n_i^2(11n_j^2+20n_j+1) + (5n_i+1)(n_j+2)n_j}{(n_i+1)\Phi^2}. \tag{14}$$

From equations (12) through (14), world welfare is given by

$$W^F = \frac{(n_i+1)(n_i^3 + 3n_i^2(2n_j+1) + n_i(9n_j^2+10n_j+2) + (3n_j+2)n_j)}{2(n_i+1)\Phi^2}. \tag{15}$$

Before considering whether the FTA is formed voluntarily, we examine how affects the FTA on the level of export subsidy and import tariff if it is formed. Using equations (5), (6), (10), and (11), we obtain the following results:

Proposition 1: Suppose that the FTA is formed. (i) The importing government always reduces the tariff level. (ii) Non-member exporting government reduces (increases) the export subsidy (tax) level if it is country *S* (*L*).

4. Analysis

In this section, we consider the first stage, that is, whether the FTA is formed voluntarily by comparing the level of each country's welfare between No FTA case and FTA case. Note that the FTA is formed only when both countries have an incentive to form the FTA each other.

First, we consider whether the importing government has an incentive to form the FTA with one of exporting countries. Subtracting equation (8) from equation (14), we have $W_I^F - W_I > 0$ if the inequality $n_i \geq n_j + 2$ holds[3]. From here, we obtain the following result:

Lemma 3: Suppose that $n_i \geq n_j + 2$. The importing government has an incentive to form the FTA with country *L*, although it has no incentive to form the FTA with country *S*.

Lemma 3 states that the importing government may have an incentive to form the FTA with the exporting country with the larger number of firms only. In other words, the importing government *never* forms the FTA with the exporting country with the lesser number of firms. Thus, hereafter, we focus on the FTA with the country *L*.

Next, we consider whether the exporting government of country *L* has an incentive to form the FTA. Subtracting equation (7) from equation (12), we have $W_L^F - W_L > 0$. From this inequality, we obtain

Lemma 4: The government of country *L* has always an incentive to form the FTA.

From Lemmas 3 and 4, we obtain

Proposition 2: Suppose that $n_L \geq n_S + 2$. The FTA with country *L* is formed, although the FTA with country *S* is never formed.

Intuition behind Proposition 2 is as follows: First, we consider about the exporting countries. In No FTA case, the firms in country *L* face export tax and import

[3] For simplicity, we assume that the small country has at least three firms.

tariff, although the firms in country *S* face export subsidy and import tariff (net tariff is positive). As a result, the firms in country *S* have a substantial cost advantage against the firms in country *L*, and the market share of the firms in country *L* (*S*) becomes small (large).

Let us consider FTA case. Suppose that the FTA with country *L* (which has more firms) is formed. Then, the firms in country *L* face no trade policies although the firms in country *S* face export subsidy and import tariff (net tariff is positive). Although the firms in country *S* have a substantial cost advantage against the firms in country *L* as before, the substantial cost difference becomes small and the market share of the firms in country *L* (*S*) becomes large (small). This is because the number of firms in country *L* iks greater than that in country *S*. In addition, the reduction in price is not drastic compared with the substantial cost improvement effect of the firms in country *L* because the firms in country *S* decrease their outputs accompanied with the loss of substantial cost advantage. Therefore, the firms in country *L* can increase their profits largely and the exporting government of country *L* has an incentive to form the FTA. To put another way, the FTA is profitable to country *L*, because the outputs of firms in country *L* are lessened by the export tax as well as the import tariff at first, and those are increased drastically by the formation of the FTA.

On the other hand, when the FTA with country *S* (which has less firms) is formed, the firm in member country *S* loses the substantial cost advantage and decrease their outputs, and besides price goes down. Because the reduction in profits of the firms in country *S* dominates the saving of the expenditure of export subsidy, then the FTA is not profitable to the country *S*.

Second, we consider about the importing country. The formation of FTA has two effects on the importing country's welfare: the effect on consumer surplus and tariff revenue. The FTA with the exporting country *L* makes the substantial cost of the firms in country *L* lower, but the effect on the substantial cost of the firms in country *S* is ambiguous. However, in any cases, the cost difference becomes small, total output increases and price of the commodity goes down. Therefore, consumer surplus increases apparently. In contrast, tariff revenue goes down, because the importing government does not impose a tariff on the commodities imported from the member country in addition to the reduction in the tariff rate. When the increase in consumer surplus is greater than the decrease in tariff revenue, the importing government has an incentive to form the FTA.

Now, let us consider under what condition the incentive for the importing government to form the FTA arises. When the FTA is not formed, higher the difference

in the number of firms between two exporting countries, larger the substantial cost differences. Thus, the market share of the firms in country *L* becomes smaller in No FTA case. In the circumstances where the difference in the number of firms is large, if the FTA with country *L* is formed, then the market share of the firms in country *L* becomes large drastically. On the other hand, although it is sure that tariff revenue goes down, the loss of tariff revenue by forming the FTA is not so high. Therefore, the increase in consumer surplus dominates the decrease in tariff revenue. Thus, the importing country has an incentive to form the FTA with the exporting country with the larger number of firms if $n_L \geq n_S + 2$.

Finally, we consider how affects this FTA on world welfare as well as non-member country's welfare, that is country *S*. Subtracting equations (9) from equation (15), we have $W^F - W > 0$. Using equations (7) and (13), we have $W_S^F - W_S < 0$ under $n_L \geq n_S + 2$. We summarize these results as follows:

Proposition 2: Suppose that $n_L \geq n_S + 2$. The FTA with country *L* benefits entire world but hurts non-member country.

When the FTA with country *L* is formed, total outputs increase and the price of commodities goes down because the firms in country *L* become efficiently and increase their outputs compared with the decrease in outputs of firms in country *S*. Then world welfare improves. Whereas, the firms in county *S* decrease the market share drastically in addition to declines of the price, and, therefore, the welfare of country *S* goes down.

5. Concluding Remarks

This paper examines whether or not the FTA is formed endogenously in a three-country model where one importing country and two exporting countries exist, and where each government may implement an import tariff and an export subsidy as trade policies. We assume that two exporting countries are different with respect to the number of firms. Main conclusions in this paper are as follows: [i] Suppose that an FTA is formed. The importing government reduces the external tariff irrespective of with which exporting country it forms the FTA. Non-member exporting country reduces the export subsidy (tax) if it has the lesser (larger) number of firms. [ii] The FTA can be formed between the importing country and the exporting country with the larger number of firms if $n_L \geq n_S + 2$, although the FTA between the importing country and the exporting country with the lesser number of firms cannot be formed. [iii] The FTA

between the importing country and the exporting country with the larger number of firms benefits member countries as well as entire world, but hurts non-member country.

We have several suggestions for further researches. First, we examine the voluntary formation of FTAs under endogenous timing of trade policies as Nomura (2005). Second, we introduce cost difference between the firms in both exporting country explicitly. Third, we modify the model in which all countries have a local market and local firms, and trade each other under strategic trade policies.

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