Free Trade Areas and International Rivalry

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(Preliminary. Comments most welcome.)

Abstract

This paper analyzes and compares the effects of two policy options of regional economic integration for two countries that have firms producing similar products and selling them to a third country. One option is to form an FTA with the third country and the other one is to form an FTA with each other. Because of the rivalry between the firms, the countries generally find it more beneficial to have an FTA with the third country in order to capture a bigger market share.

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1 Introduction

Regional trade agreements (RTA) have recently become a popular trade policy for many governments. In the 46 years since its establishment, the GATT received 124 notifications of RTAs related to trade in goods. In the eight years after its establishment, WTO was notified 130 times about the formation of a new RTA. Asia is a late comer in terms of establishing free trade areas (FTA), but recently there has been a fever among many Asian countries in forming FTAs.[1] Bhagwati (1993) distinguishes between the First Regionalism in the 1960s and the Second Regionalism in the 1980s, and argues that the second one is more successful than the first one because of the immense interest of the United States. Krugman (1991) attributes the erosion of the multilateral process and the rise of regionalism in the 1980s to the decline of the U.S. leadership role. The current wave of regionalism in Asia, which began with the decision of the Association of Southeast Asian Nations (ASEAN) to convert itself to an FTA in 1992, has some distinct features. For example, nearly all the FTAs formed in Asia do not have the United States involved or playing any obvious role.[2]

Traditionally, the welfare effects of FTAs are analyzed in terms of the relation between volumes of trade and costs of production in the source countries. As Viner argued (Viner, 1950), if an FTA leads to trade diversion, the FTA will tend to be detrimental but if trade creation exists, a member country will tend to benefit. This view, which has been shared extensively in the literature, focuses on whether the increase in import caused by trade liberalization comes from a place with a lower cost of production.

The import side and the costs of production in non-member countries and member countries may not be sufficient to explain the current FTA fever in Asia. For example, Singapore has been very aggressive in forming FTAs with other countries. However, Singapore is already having practically no

[1] The Thai trade representative, Dr. Kantathi Suphamongkhonm, said in a speech in January 2004 that "FTAs are spreading like the flu. They are very contagious, indeed much more contagious than SARs or the Bird Flu."

[2] For example, the following recently formed FTAs do not involve the United States and seem to be progressing very well: between ASEAN and China, between Japan and Singapore, between Korea and Chile and Singapore, Furthermore, Japan and Korea showed great interest in establishing an FTA with the ASEAN, and China, Korea, and Japan are discussing/negotiating about economic integration in Northeast Asia. One exception is the FTA between Singapore and the United States. Korea is also thinking of forming a similar one with the United States.

restrictions on the import of foreign goods. Thus, for Singapore, its import side must not be crucial in its FTA policy determination. Another example is that Japan is negotiating with Mexico to form an FTA. Mexico is not a significant supplier of products to Japan. It is argued that the main reason for Japan's interest in having an FTA with Mexico is that Mexico is an important market for many of its products such as cars, computers, and cellular phones. Having the trade barriers on its products to Mexico removed is a way to level the playing field with the rivals of the Japanese firms.[3]

The objective of this paper is to provide an alternative approach to analyzing FTAs.[4] This approach, which is more consistent with the Singapore and Japan examples cited above, is related to the international rivalry between firms in two countries. Such a setting, which is common in the world, is not new to trade theorists. As the work of Brander and Spencer (1985) shows, under certain conditions a government has a very good incentive to use export subsidies to encourage its own firms to increase their outputs.[5] However, the use of export subsidies to promote the trade performance of local firms is not allowed by the World Trade Organization (WTO). Despite the prohibition of the use of export subsidies for promoting trade, governments still have incentives to help local firms to get a bigger share of the markets in which the local firms and foreign rivals are competing. The present paper argues that forming an FTA with the country in which the local firms and their rivals have sales is one way of helping local firms at the expense of their foreign rivals.[6]

To examine how the international rivalry approach works, this paper uses the case of Korea, Japan, and China, which are currently examining the possibilities of economic integration in the form of FTAs in East Asia.[7] This paper focuses on the rivalry between Korea and Japan, as they both have

[3] Japanese firms such as Honda, Toyota, Toshiba, and Sony are competing with some U.S. firms such as Ford, GM, Motorola, and Dell. Currently products from the U.S. exported to Mexico are not subject to any tariffs but those from Japan generally are.

[4] The international rivalry approach to analyzing free trade area was first proposed in Wong (2004) and Wong et. al. (2004).

[5] The argument for export subsidy in the Brander-Spencer framework is sensitive to the features of the framework. See, for example, Wong (1995, Chapter 10) for more discussion.

[6] There are many "domestic" policies that produce profit-shifting effects similar to what export subsidies would produce. See Liao and Wong (2005) for a model in which the policy of minimum quality standard can be used to yield a profit-shifting effect.

[7] For more details about the policies of the governments and the progress of the negotiation, see Wong et. al. (2004).

firms that sell similar products to the China market. This paper argues that forming an FTA with China is a way for Korea to help its local firms to get a big share of the market in China at the expense of the Japanese firms. Thus Korea should have an incentive to form an FTA with China. However, because Japan will likely be hurt by a Korea-China FTA, it will also have an incentive to form a similar FTA with China. The same argument can be applied to explain Japan's interest in forming an FTA with countries like Mexico.

This paper also considers another option for Korea, namely, to form an FTA with Japan. When the Korean and Japanese firms are producing similar products, both of them would offer sales to their own markets and each other's markets.[8] Under certain conditions, intra-industry trade exists. Thus trade liberalization by both countries will affect their firms' profits, consumer surplus, and the government's tariff revenue. How would the welfare of both countries be affected by an FTA? This will be analyzed in detail in this paper. This paper will try to rank all different FTAs in terms of the welfare of Korea.

The rest of this paper is organized as follows. In Section 2, we introduce the main features of the model used in the present analysis. Section 3 examines the formation of an FTA between Korea and China, with Japan keeping the initial trade policies. How such an FTA may affect the welfare of the relevant countries will be investigated. Section 4 turns to the case of a Korea-Japan FTA. The effects of such an FTA will be carefully analyzed. Section 5 looks at the case in which Japan responds to a Korea-China FTA with another FTA with China. How would that affect all the three countries will be discussed. Section 6 tries to rank all the FTA options from the viewpoint of Korea. The last section concludes.

2 The Model

Consider a homogeneous product with demand in three countries. Label the countries China (C), Japan (J), and Korea (K), and represent the demand q_i in market i, $i = c$, j, and k, by $p_i = p_i(q_i)$, where p_i is the market price. It is assumed that $p_i' < 0$ and p_i'' is sufficiently small in magnitude, where a prime stands for a derivative. All markets are segmented.

[8] Markets are assumed to be segmented.

The industry consists of a firm in Japan (called firm J) and another firm in Korea (called firm K) but not any firm in China. Firm K produces the product with a marginal cost of c and a fixed cost of f, while the marginal cost and fixed cost of firm J are c^* and f^*, respectively. The product of each firm can be supplied to its own market, to its rival's market, and to China. Denote the supply by firm K to market i by x_i and the supply by firm J to market i by x_i^*, $i = c$, j, and k.[9] The firms compete in a Cournot fashion.

International and domestic transport costs are negligible, but initially all countries have positive tariffs on the product imported from other countries. Denote the specific tariff imposed by Korea (on the good from firm J) by t, the specific tariff imposed by Japan (on the good from firm K) by t^*, and the specific tariff imposed by China on the good from firm K (J) by τ_k (τ_j). If a free trade area is formed, the corresponding tariffs will drop down to zero.

The equilibrium condition for market i, $i = c$, j, and k, is

$$q_i = x_i + x_i^*. \tag{1}$$

The profit of each firm comes from the three markets (zero from a market if there is no supply). The profit of firm K is

$$\begin{aligned} \pi &= \pi(x_k, x_k^*, x_j, x_j^*, x_c, x_c^*, t^*, \tau_k) \\ &= p_k(q_k)x_k + p_j(q_j)x_j + p_c(q_c)x_c \\ &\quad - c(x_k + x_j + x_c) - t^*x_j - \tau_k x_c - f. \end{aligned} \tag{2}$$

The profit of firm J can be stated in the same way:

$$\begin{aligned} \pi^* &= \pi^*(x_k, x_k^*, x_j, x_j^*, x_c, x_c^*, t, \tau_j) \\ &= p_k(q_k)x_k^* + p_j(q_j)x_j^* + p_c(q_c)x_c^* \\ &\quad - c^*(x_k^* + x_j^* + x_c^*) - tx_k^* - \tau_j x_c^* - f^*. \end{aligned} \tag{3}$$

Firms K and J choose the optimal outputs to maximize its own profit function, taking each other's output and the policy parameters as given. Making

[9] A firm does not necessarily supply a positive output to each of the markets.

use of the equilibrium condition (1), the first-order conditions are:

$$\frac{\partial \pi}{\partial x_k} = p_k + p_k' x_k - c \leq 0 \tag{4a}$$

$$\frac{\partial \pi}{\partial x_j} = p_j + p_j' x_j - c - t^* \leq 0 \tag{4b}$$

$$\frac{\partial \pi}{\partial x_c} = p_c + p_c' x_c - c - \tau_k \leq 0. \tag{4c}$$

Similarly, firm J maximizes its profit by choosing optimal sales to the three markets, taking the sales of firm K and the policy parameters as given. The first-order conditions are

$$\frac{\partial \pi^*}{\partial x_k^*} = p_k + p_k' x_k^* - c^* - t \leq 0 \tag{5a}$$

$$\frac{\partial \pi^*}{\partial x_j^*} = p_j + p_j' x_j^* - c^* \leq 0 \tag{5b}$$

$$\frac{\partial \pi^*}{\partial x_c^*} = p_c + p_c' x_c^* - c^* - \tau_j \leq 0. \tag{5c}$$

Note that when taking the policy and cost parameters as given, the following pairs of equations contains two unknowns, the sales by the two firms in the corresponding markets: (4a) and (5a), (4b) and (5b), and (4c) and (5c). This means that each market can be solved separately. Furthermore, the sales of the firms to each market depend on the corresponding tariffs only. Thus, we can define the following Nash equilibrium sales: $x_k = \tilde{x}_k(t)$, $x_k^* = \tilde{x}_k^*(t)$, $x_j = \tilde{x}_j(t^*)$, $x_j^* = \tilde{x}_j^*(t^*)$, $x_c = \tilde{x}_c(\tau_k, \tau_j)$, $x_c^* = \tilde{x}_c^*(\tau_k, \tau_j)$. The corresponding market prices can also be defined: $p_k = p_k(\tilde{x}_k(t) + \tilde{x}_k^*(t)) \equiv \tilde{p}_k(t)$, $p_j = p_j(x_j(t^*) + x_j^*(t^*)) \equiv \tilde{p}_j(t^*)$, and $p_c = p_c(x_c(\tau_k, \tau_j) + x_c^*(\tau_k, \tau_j)) \equiv \tilde{p}_c(\tau_k, \tau_j)$. Using these output and price functions, the profits of the firms can be similarly defined: $\tilde{\pi}(t, t^*, \tau_k, \tau_j)$ and $\tilde{\pi}^*(t, t^*, \tau_k, \tau_j)$. Properties of these functions will be derived later.

3 A Korea-China FTA

Suppose now that Korea forms an FTA with China. This will represent a drop in the tariff imposed by China on the product from Korea, τ_k. To

analyze the effects, let us differentiate first-order conditions (4c) and (5c), with equality sign. Rearranging the terms, we have

$$\begin{bmatrix} 2p_c' + p_c''x_c & p_c' + p_c''x_c \\ p_c' + p_c''x_c^* & 2p_c' + p_c''x_c^* \end{bmatrix} \begin{bmatrix} \mathrm{d}x_c \\ \mathrm{d}x_c^* \end{bmatrix} = \begin{bmatrix} \mathrm{d}\tau_k \\ \mathrm{d}\tau_j \end{bmatrix}. \tag{6}$$

Define $D_c \equiv 3(p_c')^2 + p_c'p_c''X_c > 0$ as the determinant of the matrix in (6), where $q_c \equiv x_c + x_c^*$ is the total supply to the market in China. Solving equation (6), we get

$$\mathrm{d}x_c = \frac{(2p_c' + p_c''x_c^*)\mathrm{d}\tau_k - (p_c' + p_c''x_c)\mathrm{d}\tau_j}{D_c} \tag{7a}$$

$$\mathrm{d}x_c^* = -\frac{(p_c' + p_c''x_c^*)\mathrm{d}\tau_k - (2p_c' + p_c''x_c)\mathrm{d}\tau_j}{D_c}. \tag{7b}$$

If China establishes an FTA with Korea but not with Japan, let us keep τ_j constant at its initial value but let τ_k drop. Assuming $\mathrm{d}\tau_j = 0$, equations (7) give

$$\frac{\partial \tilde{x}_c}{\partial \tau_k} = \frac{2p_c' + p_c''x_c^*}{D_c} < 0 \tag{8a}$$

$$\frac{\partial \tilde{x}_c^*}{\partial \tau_k} = -\frac{p_c' + p_c''x_c^*}{D_c} > 0, \tag{8b}$$

Result (8) is intuitive: An increase in the tariff on the import from Korea discourages Korea's export to China but encourages that of Japan to China. The effects on the total sale and market price are

$$\frac{\partial \tilde{q}_c}{\partial \tau_k} = \frac{\partial \tilde{x}_c}{\partial \tau_k} + \frac{\partial \tilde{x}_c^*}{\partial \tau_k} = \frac{p_c'}{D_c} < 0 \tag{9a}$$

$$\frac{\partial \tilde{p}_c}{\partial \tau_k} = \frac{(p_c')^2}{D_c} > 0. \tag{9b}$$

Using equations (8), the effect of the FTA on the profit of firm K is

$$\frac{\partial \tilde{\pi}}{\partial \tau_k} = \frac{\partial \pi}{\partial x_c^*}\frac{\partial \tilde{x}_c^*}{\partial \tau_k} - x_c, \tag{10}$$

where the Envelope Theorem has been used. The first term on the right-hand side of (10) can be termed the profit-shifting effect while the second term is

the tariff effect. For a decrease in τ_k, the profit-shifting effect comes from a decrease in the market share of firm J in the China market, and the tariff effect is due to a drop in the tariff payment by firm K to China. Substitute equation (8b) into (10) and rearrange terms to give

$$\frac{\partial \tilde{\pi}}{\partial \tau_k} = -\frac{4p_c' + p_c''(q_c + x_c^*)}{D_c} p_c' x_c < 0. \tag{11}$$

The sign of the effect in (11) means that a reduction in τ_k is beneficial to firm K.

The welfare of Korea, W, can be defined as

$$W(t, t^*, \tau_k, \tau_j) = \tilde{\pi}(t, t^*, \tau_k, \tau_j) + \left[\int_0^{q_k} p_k(v)\mathrm{d}v - p_k q_k\right] + t x_k^*. \tag{12}$$

In equation (12), the term within the square brackets represents the consumer surplus, and the last term is the government revenue generated by the tariff on the import from Japan. Since a change in τ_k will not affect the market in Korea or the revenue of the Korea government, the change in firm K's profit is the same as the change in Korea's welfare:

$$\frac{\partial W}{\partial \tau_k} = \frac{\partial \tilde{\pi}}{\partial \tau_k} = -\frac{4p_c' + p_c''(q_c + x_c^*)}{D_c} p_c' x_c < 0. \tag{13}$$

The effects of the Korea-China FTA on the profit of firm J can be determined in the same way:

$$\begin{aligned} \frac{\partial \tilde{\pi}^*}{\partial \tau_k} &= \frac{\partial \pi}{\partial x_c}\frac{\partial \tilde{x}_c}{\partial \tau_k} \\ &= \frac{2p_c' + p_c'' x_c^*}{D_c} p_c' x_c^* > 0. \end{aligned} \tag{14}$$

The welfare of Japan can be defined as

$$W^*(t, t^*, \tau_k, \tau_j) = \tilde{\pi}^*(t, t^*, \tau_k, \tau_j) + \left[\int_0^{q_j} p_j(v)\mathrm{d}v - p_j q_j\right] + t^* x_j. \tag{15}$$

A change in China's tariff on the goods from Korea will not affect the market conditions in Japan. Thus the effects of a change in τ_k on Japan's welfare is equal to

$$\frac{\partial W^*}{\partial \tau_k} = \frac{\partial \tilde{\pi}^*}{\partial \tau_k} = \frac{2p_c' + p_c'' x_c^*}{D_c} p_c' x_c^* > 0. \tag{16}$$

On the other hand, equations (9) imply that the consumers in China will benefit from the FTA because of an increase in the total sale and a drop in the market price, as equations (9) show. These results are summarized by the following proposition:

Proposition 1 *A free trade area between Korea and China benefits Korea and China but hurts Japan.*

The proposition shows that a Korea-China FTA will be a voluntary one since it benefits both countries. Japan, as a non-member country, could be hurt. This shows that Japan, as an international rival of Korea, could lose out when Korea is able to capture a bigger share of the China market through the establishment of an FTA.

Since the FTA hurts Japan but benefits Korea, we want to see how their welfare as whole may be affected. Combining (11), (13), (14), and (16), we have

$$\frac{\partial W}{\partial \tau_k} + \frac{\partial W^*}{\partial \tau_k} = \frac{2(p_c')^2(x_c^* - 2x_c) + p_c' p_c''[(x_c^*)^2 - (q_c + x_c^*)x_c]}{D_c}. \qquad (17)$$

In general, the sign of the expression in (17) is ambiguous. It depends on, among other things, the sale of the two firms in the China market.

Condition A: $x_c > x_c^*/2$.

Given condition A, equation (17) implies that a drop in τ_k will improve the total welfare levels of Korea and Japan. This means that the gain of Korea will more than cover the loss of Japan. If condition A is satisfied initially, then a drop in τ_k will raise x_k but lower x_k^*. This means that any further drop in τ_k will guarantee condition A. Therefore the aggregate welfare level of Korea and Japan will be higher when a Korea-China FTA is formed. If, however, condition A is not satisfied at the initial tariff rate τ_k, it may still be satisfied after a certain reduction in τ_k. In this case, how the aggregate welfare level of Korea and Japan may change when a Korea-China FTA is formed is unclear.

In the special case in which Korea and Japan have identical economies, with the same technology and with the same initial tariff rates imposed by China, $x_c = x_c^*$. Then condition A is satisfied, and thus a Korea-China will improve the aggregate Korea-Japan welfare.

Proposition 2 *(a) A small reduction in τ_k will benefit Korea and Japan as a whole if condition A is satisfied. (b) A Korea-China FTA will benefit Korea and Japan as a whole if condition A is satisfied initially.*

4 A Korea-Japan FTA

Suppose now that Korea establishes an FTA with Japan, not with China. The FTA will remove both the tariffs imposed by Korea and Japan on the good imported from each other. Since the markets can be analyzed separately, let us focus on the market in Korea first. Totally differentiate (4a) and (5a) (with equalities) and rearrange terms to give

$$\begin{bmatrix} 2p_k' + p_k''x_k & p_k' + p_k''x_k \\ p_k' + p_k''x_k^* & 2p_k' + p_k''x_k^* \end{bmatrix} \begin{bmatrix} \mathrm{d}x_k \\ \mathrm{d}x_k^* \end{bmatrix} = \begin{bmatrix} 0 \\ \mathrm{d}t \end{bmatrix}, \tag{18}$$

which can be solved for

$$\frac{\mathrm{d}\tilde{x}_k}{\mathrm{d}t} = -\frac{p_k' + p_k''x_k}{D_k} > 0 \tag{19a}$$

$$\frac{\mathrm{d}\tilde{x}_k^*}{\mathrm{d}t} = \frac{2p_k' + p_k''x_k}{D_k} < 0, \tag{19b}$$

where $D_k \equiv 3(p_k')^2 + p_k'p_k''q_k > 0$. Equation (19) imply the following effects on the aggregate sale and market price in Korea:

$$\frac{\mathrm{d}\tilde{q}_k}{\mathrm{d}t} = \frac{\partial x_k}{\partial t} + \frac{\partial x_k^*}{\partial t} = \frac{p_k'}{D_k} < 0 \tag{20a}$$

$$\frac{\mathrm{d}\tilde{p}_k}{\mathrm{d}t} = \frac{(p_k')^2}{D_k} > 0. \tag{20b}$$

The effect on the profit of firm K is

$$\frac{\partial\tilde{\pi}}{\partial t} = \frac{\partial\pi}{\partial x_k^*}\frac{\mathrm{d}\tilde{x}_k^*}{\mathrm{d}t} = \frac{p_k'x_k(2p_k' + p_k''x_k)}{D_k} > 0. \tag{21}$$

Equation (21) represents a profit-shifting effect, as a decrease in t will encourage firm J to lower its sale to the Korea market. To find out how the welfare

of Korea may be affected by the tariff, differentiate the welfare function in (12) with respect to t to give

$$\begin{aligned}\frac{\partial W}{\partial t} &= \frac{\partial \tilde{\pi}}{\partial t} - p_k' q_k \frac{\mathrm{d}\tilde{q}_k}{\mathrm{d}t} + x_k^* + \frac{\mathrm{d}\tilde{x}_k^*}{\mathrm{d}t} t \\ &= \frac{(p_k')^2(x_k + 2x_k^*) + p_k' p_k''(x_k^2 + q_k x_k^*)}{D_k} + \frac{2p_k' + p_k'' x_k}{D_k} t. \end{aligned} \tag{22}$$

The sign of the expression in (22) is in general ambiguous and is dependent on the magnitude of the tariff, t, among other things. If t is sufficiently small, as in the case of free trade, a small increase in t is beneficial.

$$\left.\frac{\partial W}{\partial t}\right|_{t=0} = \frac{(p_k')^2(x_k + 2x_k^*) + p_k' p_k''(x_k^2 + q_k x_k^*)}{D_k} > 0. \tag{23}$$

Equation (22) also leads to the optimal tariff. Setting the expression in (22) to zero, $\partial W/\partial t = 0$, which is a necessary condition for the maximum welfare, gives the optimal tariff:

$$\tilde{t} = -\frac{(p_k')^2(x_k + 2x_k^*) + p_k' p_k''(x_k^2 + q_k x_k^*)}{2p_k' + p_k'' x_k}. \tag{24}$$

Note that equation (24) gives an implicit function of the optimal tariff, since the outputs and the price depend on the tariff rate. If the Korea welfare function is strictly concave, then $\partial W/\partial t < 0$ if and only if $t > \tilde{t}$. Note further that because the Korean market is determined independent of the other markets, the optimal tariff is independent of what tariff Japan chooses.

A drop in t, however, benefits firm J:

$$\begin{aligned}\frac{\partial \tilde{\pi}^*}{\partial t} &= \frac{\partial \pi^*}{\partial x_k} \frac{\mathrm{d}\tilde{x}_k}{\mathrm{d}t} - x_k^* \\ &= -\frac{p_k' x_k^* [4p_k' + p_k''(x_k + q_k)]}{D_k} < 0. \end{aligned} \tag{25}$$

The effect on firm J is the same as the effect on Japan's welfare:

$$\frac{\partial W^*}{\partial t} = \frac{\partial \tilde{\pi}^*}{\partial t} < 0. \tag{26}$$

Let us now turn to the effects of a change in t^*. Since Korea and Japan are symmetric in the present model, the results for a change in t are similar

to those for a change in t^*. For example,

$$\frac{\mathrm{d}\tilde{x}_j}{\mathrm{d}t^*} = \frac{2p'_j + p''_j x^*_j}{D_j} \tag{27a}$$

$$\frac{\mathrm{d}\tilde{x}^*_j}{\mathrm{d}t^*} = -\frac{p'_j + p''_j x^*_j}{D_j}, \tag{27b}$$

where $D_j = 3(p'_j)^2 + p'_j p''_j q_j > 0$. The effects of a change in t^* on the firms' profits are

$$\frac{\partial\tilde{\pi}}{\partial t^*} = -\frac{p'_j x_j[4p'_j + p''_j(x^*_j + q_j)]}{D_j} < 0 \tag{28a}$$

$$\frac{\partial\tilde{\pi}^*}{\partial t^*} = \frac{p'_j x^*_j(2p'_j + p''_j x^*_j)}{D_j} > 0. \tag{28b}$$

Using the welfare functions of Korea and Japan defined in (12) and (15), the welfare effects of a change in t^* are found to be:

$$\frac{\partial W}{\partial t^*} = \frac{\partial\tilde{\pi}}{\partial t^*} < 0 \tag{29a}$$

$$\begin{aligned}\frac{\partial W^*}{\partial t^*} &= \frac{\partial\tilde{\pi}^*}{\partial t^*} - \frac{(p'_j)^2 q_j}{D_j} + x_j + \frac{\mathrm{d}\tilde{x}_j}{\mathrm{d}t^*}t^* \\ &= \frac{(p'_j)^2(x^*_j + 2x_j) + p'_j p''_j[(x^*_j)^2 + q_j x_j]}{D_j} + \frac{2p'_j + p''_j x^*_j}{D_j}t^*. \end{aligned} \tag{29b}$$

Equation (29) show that a decrease in t^*, as in a free trade agreement between Korea and Japan, will benefit Korea, but its effect on Japan's welfare is ambiguous. If $\partial W^*/\partial t^*$ is set to zero, equation (29b) gives a necessary condition for a maximum welfare (when taking Korea's tariff rate as given).

When Korea and Japan form an FTA, both t and t^* will drop. Suppose now that t and t^* drop marginally at the same time and by the same amount. The effect on the profits of the firms are

$$\frac{\partial\tilde{\pi}}{\partial t} + \frac{\partial\tilde{\pi}}{\partial t^*} = \frac{p'_k x_k(2p'_k + p''_k x_k)}{D_k} - \frac{p'_j x_j[4p'_j + p''_j(x^*_j + q_j)]}{D_j} \tag{30a}$$

$$\frac{\partial\tilde{\pi}^*}{\partial t} + \frac{\partial\tilde{\pi}^*}{\partial t^*} = -\frac{p'_k x^*_k[4p'_k + p''_k(x_k + q_k)]}{D_k} + \frac{p'_j x^*_j(2p'_j + p''_j x^*_j)}{D_j}. \tag{30b}$$

Equations (21) and (28a) show that firm K is hurt by a decrease in t but benefits from a decrease in t^*. Equation (30a) shows how an equal drop in t and t^* will affect firm K's profit. Similarly, equation (30b) gives the effect of a drop in t and t^* by the same amount on firm J's profit. In general, all these effects have ambiguous signs.

We now turn to the effects on the welfare of the two economies. When t and t^* change at the same time and by the same amount, the welfare effects are:

$$\begin{aligned}\frac{\partial W}{\partial t}+\frac{\partial W}{\partial t^*} &= \frac{(p_k')^2(x_k+2x_k^*)+p_k'p_k''(x_k^2+q_kx_k^*)}{D_k}+\frac{2p_k'+p_k''x_k}{D_k}t \\ &\quad -\frac{p_j'x_j[4p_j'+p_j''(x_j^*+q_j)]}{D_j} \qquad (31a)\\ \frac{\partial W^*}{\partial t}+\frac{\partial W^*}{\partial t^*} &= \frac{(p_j')^2(x_j^*+2x_j)+p_j'p_j''[(x_j^*)^2+q_jx_j]}{D_j}+\frac{2p_j'+p_j''x_j^*}{D_j}t^* \\ &\quad -\frac{p_k'x_k^*[4p_k'+p_k''(x_k+q_k)]}{D_k}. \qquad (31b)\end{aligned}$$

Again in general the signs of the expressions in equations (31) are ambiguous. The effect of a simultaneous change in t and t^* on the sum of the countries' welfare is

$$\begin{aligned}\frac{\partial W}{\partial t}+\frac{\partial W}{\partial t^*}+\frac{\partial W^*}{\partial t}+\frac{\partial W^*}{\partial t^*} &= \frac{p_k'\,[p_k'(x_k-2x_k^*)+p_k''x_k(x_k-x_k^*)]}{D_k} \\ &\quad +\frac{p_j'[p_j'(x_j^*-2x_j)+p_j''x_j^*(x_j^*-x_j)]}{D_j} \\ &\quad +\frac{2p_k'+p_k''x_k}{D_k}t+\frac{2p_j'+p_j''x_j^*}{D_j}t^*. \qquad (32)\end{aligned}$$

In general, the expression in equation (32) has an ambiguous sign.

Condition B: (i) $x_k < 2x_k^*$; (ii) $x_j^* < 2x_j$.

Note that parts (i) and (ii) of condition B refer to the Korea and the Japan markets, respectively. In equation (32), if condition B is satisfied, and if both t and t^* are sufficiently small, then the expression is negative. This result is summarized as follows:

Proposition 3 *If both t and t^* are sufficiently small, and if in each of the Korean and Japanese markets the sale of the local firm is less than twice the sale of the foreign firm, then a simultaneous drop in t and t^* by the same amount will benefit the total welfare of Korea and Japan.*

To get more information about international rivalry and trade policies, let us consider some special cases:

(a) The Nash-Equilibrium Case

Suppose that initially both Korea and Japan have chosen a tariff to maximize their own welfare, when taking the tariff rate chosen by the other country as given. In other words, both Korea and Japan initially are at the Nash equilibrium point. This means that

$$\frac{\partial W}{\partial t} = \frac{\partial W^*}{\partial t^*} = 0. \tag{33}$$

Using equation (33), equations (31) reduce to

$$\frac{\partial W}{\partial t} + \frac{\partial W}{\partial t^*} = -\frac{p'_j x_j [4p'_j + p''_j (x^*_j + q_j)]}{D_j} < 0 \tag{34a}$$

$$\frac{\partial W^*}{\partial t} + \frac{\partial W^*}{\partial t^*} = -\frac{p'_k x^*_k [4p'_k + p''_k (x_k + q_k)]}{D_k} < 0. \tag{34b}$$

Equations (34) show that if initially both countries are at the Nash equilibrium, a simultaneously small drop in t and t^* by the same amount will benefit both countries. The reason is that at the Nash equilibrium, each country will not be affected by a marginal change in its own tariff, but both of them will benefit from a drop in the other country's tariff.

Proposition 4 *At the Nash Equilibrium, a small drop in t and t^* by the same amount will raise the welfare of Korea and Japan.*

The limitation of the above proposition is that it refers to a marginal change in the tariff rates at the initial Nash equilibrium point only.

(b) The Identical (Korea-Japan) Case

In this case, the Korean and Japanese economies are identical, and their firms have identical technology. Therefore initially firms K and J have the

same sale to their own market or to each other's market, $x_k = x_j^*$ and $x_j = x_k^*$. Furthermore, $D_k = D_j$. Equation (30a) reduces to

$$\frac{\partial \tilde{\pi}}{\partial t} + \frac{\partial \tilde{\pi}}{\partial t^*} = \frac{2(p_k')^2(x_k - 2x_k^*) + p_k' p_k''[x_k^2 - 2(x_k^*)^2 - x_k^* x_k]}{D_k}. \tag{35}$$

By equation (35), a drop in t and t^* will cause a rise in firm K's profit if condition B is satisfied. In the present case with Korea and Japan having identical economies, condition B is satisfied if t and t^* are small so that $x_k \approx x_k^*$. By symmetry, equation (35) applies to firm J as well.

Let us now turn to the welfare effects. Equation (31a) reduces to

$$\frac{\partial W}{\partial t} + \frac{\partial W}{\partial t^*} = \frac{(p_k')^2(x_k - 2x_k^*) + p_k' p_k''\,(x_k - x_k^*)\,x_k}{D_k} + \frac{2p_k' + p_k'' x_k}{D_k} t. \tag{36}$$

If the tariffs are sufficiently low, $x_k \approx x_k^*$, and condition B is satisfied. So the expression in (36) is negative. Thus we have

Proposition 5 *If Korea and Japan have identical economies, and if the initial tariff rates are equal and low, a simultaneous drop in t and t^* by the same amount or the formation of a Korea-Japan FTA will raise the profits of firms K and J and will improve both countries' welfare.*

(c) The Linear Demand (Korea-Japan) Case

If the demand of the Korean and Japanese economies are linear, let $p_k' = -b_k$ and $p_j' = -b_j$, where b_k and b_j are positive constants. The countries may not be identical. Equations (30) reduce to

$$\frac{\partial \tilde{\pi}}{\partial t} + \frac{\partial \tilde{\pi}}{\partial t^*} = \frac{2(x_k - 2x_j)}{3} \tag{37a}$$

$$\frac{\partial \tilde{\pi}^*}{\partial t} + \frac{\partial \tilde{\pi}^*}{\partial t^*} = \frac{2(x_j^* - 2x_k^*)}{3}. \tag{37b}$$

Condition C: (i) $x_k < 2x_j$; (ii) $x_j^* < 2x_k^*$.

Note that if Korea and Japan are identical, condition C is equivalent to condition B. By equations (37), if condition C(i) is satisfied, a simultaneous decrease in t and t^* by the same amount will increase firm K's profit. Similarly, condition C(ii) is a sufficient condition for an increase in firm J's profit.

In the present case, equations (31) reduce to

$$\frac{\partial W}{\partial t}+\frac{\partial W}{\partial t^*} = \frac{x_k+2x_k^*-4x_j}{3}-\frac{2}{3\beta_k}t \tag{38a}$$

$$\frac{\partial W^*}{\partial t}+\frac{\partial W^*}{\partial t^*} = \frac{x_j^*+2x_j-4x_k^*}{3}-\frac{2}{3\beta_j}t^*. \tag{38b}$$

Condition D: (i) $t > b_k[x_k+2x_k^*-4x_j]/2$; (ii) $t^* > b_j[x_j^*+2x_j-4x_k^*]/2$.

Equation (38a) indicates that a drop in t and t^* by the same amount will improve Korea's welfare if and only if condition D(i) is satisfied, or will improve Japan's welfare if and only if condition D(ii) is satisfied.

If it is further given that the Korean and Japanese economies are identical with $t = t^*$,

$$\frac{\partial W}{\partial t}+\frac{\partial W}{\partial t^*}=\frac{\partial W^*}{\partial t}+\frac{\partial W^*}{\partial t^*}=\frac{x_k-2x_k^*}{3}-\frac{2}{3b_k}t. \tag{39}$$

Thus condition D reduces to $t > b_k[x_k-2x_k^*]/2$ (the same for part (i) and part (ii)). At low tariff rates, $x_k \approx x_k^*$, and $x_k-2x_k^*<0$. This means that condition D is necessarily satisfied, and a small drop in t and t^* will be benefit both countries. To see this point further, evaluate (39) at $t=t^*=0$, which implies $x_k=x_k^*$ and

$$\frac{\partial W}{\partial t}+\frac{\partial W}{\partial t^*}=\frac{\partial W^*}{\partial t}+\frac{\partial W^*}{\partial t^*}=-\frac{x_k^*}{3}<0. \tag{40}$$

Equation (40) confirms the previous proposition that with identical Korean and Japanese economies, simultaneous trade liberalization between Korea and Japan at low tariffs is beneficial to both economies.

Proposition 6 *Suppose that the demand of Korea and Japan can be represented by linear functions. Simultaneous trade liberalization is beneficial to firm K if condition C(i) (C(ii)) is satisfied. Furthermore, Korea (Japan) gains if and only if condition D(i) (D(ii)) is satisfied.*

5 Korea-China and Japan-China FTAs

In the previous analysis, we showed that a Korea-China FTA will benefit Korea but hurt Japan. This provides an incentive to Japan to establish a

similar FTA with China. In this section, we examine how a Korea-China FTA and a Japan-China FTA may affect the two countries.

We first consider the effects of a reduction in τ_j. The analysis is similar to the one on the effects of a change in τ_k analyzed before. From equations (7), we have

$$\frac{\partial \tilde{x}_c}{\partial \tau_j} = -\frac{p_c' + p_c'' x_c}{D_c} > 0 \tag{41a}$$

$$\frac{\partial \tilde{x}_c^*}{\partial \tau_j} = \frac{2p_c' + p_c'' x_c}{D_c} < 0. \tag{41b}$$

The effects on the aggregate supply and market prices are similar to those due to a change in τ_k:

$$\frac{\partial \tilde{q}_c}{\partial \tau_j} = \frac{p_c'}{D_c} < 0 \tag{42a}$$

$$\frac{\partial \tilde{p}_c}{\partial \tau_j} = \frac{(p_c')^2}{D_c} > 0. \tag{42b}$$

The effects on the profits of the firm are

$$\frac{\partial \tilde{\pi}}{\partial \tau_j} = \frac{\partial \pi}{\partial x_c^*}\frac{\partial \tilde{x}_c^*}{\partial \tau_j} = \frac{2p_c' + p_c'' x_c}{D_c} p_c' x_c > 0 \tag{43a}$$

$$\frac{\partial \tilde{\pi}^*}{\partial \tau_j} = \frac{\partial \pi^*}{\partial x_c}\frac{\partial \tilde{x}_c}{\partial \tau_j} - x_c^* = -\frac{4p_c' + p_c''(q_c + x_c)}{D_c} p_c' x_c^* < 0. \tag{43b}$$

The effects of the change in τ_j on the welfare of Korea and Japan are the same as those on their firms' profits:

$$\frac{\partial W}{\partial \tau_j} = \frac{\partial \tilde{\pi}}{\partial \tau_j} > 0 \tag{44a}$$

$$\frac{\partial W^*}{\partial \tau_j} = \frac{\partial \tilde{\pi}^*}{\partial \tau_j} < 0. \tag{44b}$$

Equations (44) show that a reduction in τ_j benefits Japan but hurts Korea. Since the signs of the expressions do not depend on the firms' sales to the market, equations (44) further imply that a Japan-China FTA will benefit Japan but hurt Korea.

We now turn to the simultaneous formation of a Korea-China FTA and a Japan-China FTA. Suppose that China simultaneously lowers τ_k and τ_j by the same amount. The effects on the sales are

$$\frac{\partial \tilde{x}_c}{\partial \tau_k} + \frac{\partial \tilde{x}_c}{\partial \tau_j} = \frac{p'_c + p''_c(x^*_c - x_c)}{D_c} < 0 \tag{45a}$$

$$\frac{\partial \tilde{x}^*_c}{\partial \tau_k} + \frac{\partial \tilde{x}^*_c}{\partial \tau_j} = \frac{p'_c + p''_c(x_c - x^*_c)}{D_c} < 0. \tag{45b}$$

The effects on the total sale and the market price are

$$\frac{\partial \tilde{q}_c}{\partial \tau_k} + \frac{\partial \tilde{q}_c}{\partial \tau_j} = \frac{2p'_c}{D_c} < 0 \tag{46a}$$

$$\frac{\partial \tilde{p}_c}{\partial \tau_k} + \frac{\partial \tilde{p}_c}{\partial \tau_j} = \frac{2(p'_c)}{D_c} < 0. \tag{46b}$$

The output and price effects as given by equations (45) and (46) are not surprising. As China liberalizes trade, more import will be expected.

We now turn to the effects on the firms' profits:

$$\frac{\partial \tilde{\pi}}{\partial \tau_k} + \frac{\partial \tilde{\pi}}{\partial \tau_j} = -2p'_c x_c \frac{p'_c + p''_c x^*_c}{D_c} < 0 \tag{47a}$$

$$\frac{\partial \tilde{\pi}^*}{\partial \tau_k} + \frac{\partial \tilde{\pi}^*}{\partial \tau_j} = -2p'_c x^*_c \frac{p'_c + p''_c x_c}{D_c} < 0. \tag{47b}$$

Equations (47) show that both firms benefit from a trade liberalization by China. The equations also show that the firm that has a bigger share of the market in China will benefit more.

The effects on the welfare of Korea and Japan are:

$$\frac{\partial W}{\partial \tau_k} + \frac{\partial W}{\partial \tau_j} = \frac{\partial \tilde{\pi}}{\partial \tau_k} + \frac{\partial \tilde{\pi}}{\partial \tau_j} = -2p'_c x_c \frac{p'_c + p''_c x^*_c}{D_c} < 0 \tag{48a}$$

$$\frac{\partial W^*}{\partial \tau_k} + \frac{\partial W^*}{\partial \tau_j} = \frac{\partial \tilde{\pi}^*}{\partial \tau_k} + \frac{\partial \tilde{\pi}^*}{\partial \tau_j} = -2p'_c x^*_c \frac{p'_c + p''_c x_c}{D_c} < 0. \tag{48b}$$

Since the signs of the terms in equations (45) to (48) remain unchanged as China continues to liberalize trade, we can conclude that if initially China has the same tariff rates on the products from Korea and Japan, the signs

in these equations also represent the effects of simultaneous Korea-China and Japan-China FTAs. By comparing (13) with (48a), we note that Korea benefits more from a single FTA with China than with the existence of a Korea-China FTA and a Japan-China FTA. This argument also applies to Japan: Japan benefits more from a single FTA with China than with the existence of a Korea-China FTA and a Japan-China FTA.

Proposition 7 *If initially China has the same tariff rates on the products from Korea and Japan, a Korea-China FTA and a Japan-China FTA will benefit the firms of Korea and Japan, and improve the welfare of Korea and Japan. Each of Korea and Japan will benefit more if it forms an FTA with China with the other country excluded than with the existence of a Korea-China FTA and a Japan-China FTA.*

6 Ranking the FTAs

So far we have analyzed two FTA options for Korea: forming an FTA with either China or Japan. If Korea establishes an FTA with China, Japan may or may not follow suit. How are these options compared? If the initial welfare of Korea is represented by $W(t, t^*, \tau_k, \tau_j)$, where all tariff rates are positive initially, what should Korea choose?

If Korea forms an FTA with China, the China tariff on the good from Korea will drop down to zero, $\tau_k = 0$. Assuming that all other tariffs remain unchanged, the resulting welfare of Korea is $W(t, t^*, 0, \tau_j)$. If Japan also forms an FTA with China, the resulting welfare of Korea is $W(t, t^*, 0, 0)$. If Korea forms an FTA with Japan instead, the tariffs imposed by the countries on the good from each other will be eliminated, i.e., $t = t^* = 0$. When all other tariffs do not change, the resulting welfare of Korea is $W(0, 0, \tau_k, \tau_j)$.

Based on the analysis given earlier, we have[10]

$$W(t, t^*, 0, \tau_j) > W(t, t^*, 0, 0) > W(t, t^*, \tau_k, \tau_j) > W(t, t^*, \tau_k, 0). \qquad (49)$$

Note that Korea is hurt if Japan forms an FTA with China while it is not doing anything.

If Korea forms an FTA with Japan, the effects on the welfare of the countries may or may not be positive. The conditions for a beneficial simultaneous trade liberalization by Korea and Japan have been analyzed. If it

[10] We assume that the initial values of t and t^* are approximately equal.

is known that a Korea-Japan FTA hurts Korea, then this option is inferior to the one with Korea forming an FTA with China. However, ranking the Korea-China FTA (whether Japan responds) with the Korea-Japan in general is complicated because the ranking depends on a lot of factors, including the initial tariff rates, the preferences of the countries, and the technologies of the firms.

To get more insights, we consider a special case, with the following assumptions:

1. All countries have the same preferences, with the same demand given by a linear function.

2. Firms J and K have the same technology; in particular, $c = c^*$.

3. All countries have the same tariff rate, i.e., $t = t^* = \tau_k = \tau_j$.

We showed earlier that since Korea and Japan have identical economies and linear demand functions, trade liberalizations by the countries will benefit both countries, at least when the tariff rates are low. We now examine whether and how various FTAs are ranked.

Let the common demand in each country be $p = a - bq$. Country subindices are dropped because of identical preferences. We first begin with China. It is easy to determine the outputs of firm K and firm J:

$$x_c = \frac{a - c - 2\tau_k + \tau_j}{3b} \tag{50a}$$

$$x_c^* = \frac{a - c + \tau_k - 2\tau_j}{3b}, \tag{50b}$$

where $c = c^*$ has been used. The profits of the firms from the market in China can be shown to be

$$\pi_c = \frac{(a - c - 2\tau_k + \tau_j)^2}{9b} \tag{51a}$$

$$\pi_c^* = \frac{(a - c + \tau_k - 2\tau_j)^2}{9b}, \tag{51b}$$

where the subscript "c" represents the profit of the firm derived from China. Note that the profits of the firms from this market are the same as the welfare

that the corresponding country gets from the same market. In other words, we have

$$W_c = \frac{(a-c-2\tau_k+\tau_j)^2}{9b} \tag{52a}$$

$$W_c^* = \frac{(a-c+\tau_k-2\tau_j)^2}{9b}, \tag{52b}$$

where again the subscript "c" indicates the part of the country's welfare derived from China.

We now turn to the market in Korea. The equilibrium is the same as the one in China, except that τ_j is replaced by t and τ_k is set to be zero. Thus the outputs of the firms are:

$$x_k = \frac{a-c+t}{3b} \tag{53a}$$

$$x_k^* = \frac{a-c-2t}{3b}. \tag{53b}$$

The profits of the firms from the Korean market are

$$\pi_k = \frac{(a-c+t)^2}{9b} \tag{54a}$$

$$\pi_k^* = \frac{(a-c-2t)^2}{9b}. \tag{54b}$$

The welfare of Korea from this market consists of three components: firm K's profit, consumer surplus, and tariff revenue. So we have

$$W_k = \pi_k + \frac{b(q_k)^2}{2} + tx_k^*. \tag{55}$$

Substituting the relevant outputs and profit into (55), the equation reduces to

$$W_k = \frac{2a^2+4c^2-4ac+2(a-c)t-3t^2}{6b}. \tag{56}$$

Differentiate both sides of (56) to give

$$\frac{\mathrm{d}W_k}{\mathrm{d}t} = \frac{a-c-3t}{3b}. \tag{57}$$

By (57), W_k increases with t at lower tariff rates. The optimal tariff is given by

$$\tilde{t} = \frac{a-c}{3}. \tag{58}$$

The same analysis can be extended to the Japanese market. The sales of the firms to the market are

$$x_j = \frac{a-c-2t^*}{3b} \tag{59a}$$

$$x_j^* = \frac{a-c+t^*}{3b}. \tag{59b}$$

The profits of the firms from this market are

$$\pi_j = \frac{(a-c-2t^*)^2}{3b} \tag{60a}$$

$$\pi_j^* = \frac{(a-c+t^*)^2}{3b}. \tag{60b}$$

Note that the welfare of Korea derived from the Japanese market is the same as what its firm gets:

$$W_j = \frac{(a-c-2t^*)^2}{3b}. \tag{61}$$

The initial welfare of Korea is equal to what it gets from the three markets:

$$\begin{aligned} W_0 &\equiv W(t,t^*,\tau_k,\tau_j) = W_c + W_k + W_j \\ &= \frac{(a-c-2\tau_k+\tau_j)^2}{9b} + \frac{2a^2+4c^2-4ac+2(a-c)t-3t^2}{6b} \\ &\quad + \frac{(a-c-2t^*)^2}{9b}. \end{aligned} \tag{62}$$

The initial welfare level of Korea depends on what the initial tariff rates are. Setting $t = t^* = \tau_k = \tau_j$ and defining $\alpha \equiv (a-c)$, differentiate W_0 with respect to t (with all tariff rates changing at the same time) to yield

$$\frac{\mathrm{d}W_0}{\mathrm{d}t} = \frac{-3\alpha+t}{9b}. \tag{63}$$

Equation (63) shows that W_0 decreases with a rise in t when the tariff rates are small, but it reaches a minimum at $t = 3\alpha$. Note that in the present

paper, only the region $t \in (0, \alpha/2)$ is relevant because for $t > \alpha/2$, x_j and x_k^* are negative. The dependence of W_0 on the tariff rates within this region is illustrated by the schedule labeled W_0 in Figure 1.

Suppose now that Korea and China form an FTA, assuming that Japan takes no action. The resulting welfare of Korea is equal to

$$W^{kc} \equiv W(t, t^*, 0, \tau_j) = \frac{(a - c + \tau_j)^2}{9b} + W_k + W_j. \tag{64}$$

Differentiate W^{kc} with respect to t to give

$$\frac{\mathrm{d}W^{kc}}{\mathrm{d}t} = \frac{2\alpha + 2t}{18b} > 0. \tag{65}$$

Equation (65) shows that W^{kc} increases monotonically with t. The dependence of W^{kc} on t is shown by the schedule labeled W^{kc} in Figure 1.

If Japan also forms an FTA with China, the welfare of Korea is

$$W^{kcj} \equiv W(t, t^*, 0, 0) = \frac{(a - c)^2}{9b} + W_k + W_j. \tag{66}$$

Differentiate W^{kcj} with respect to t to give

$$\frac{\mathrm{d}W^{kcj}}{\mathrm{d}t} = -\frac{2\alpha + 2t}{18b} < 0. \tag{67}$$

Equation (67) shows that within the range $t \in (0, \alpha/2)$ W^{kcj} is a negative function of t, and is illustrated by the negatively sloped schedule labeled W^{kcj} in Figure 1. It is clear from (66) and (64) that for $\tau_k = \tau_j$, $W^{kc} > W^{kcj} > W_0$ within the range $t \in (0, \alpha/2)$.

If Korea and Japan forms an FTA instead, the resulting welfare of Korea is

$$W^{kj} \equiv W(0, 0, \tau_k, \tau_j) = W_c + \frac{2a^2 + 4c^2 - 4ac}{6b} + \frac{(a - c)^2}{9b}. \tag{68}$$

Note that in the present case, a Korea-Japan FTA is always beneficial to Korea:

$$W^{kj} - W_0 = \frac{2(a - c)t + t^2}{18b} > 0. \tag{69}$$

Differentiate W^{kj} with respect with t to give:

$$\frac{\mathrm{d}W^{kj}}{\mathrm{d}t} = \frac{-2\alpha + 2t}{9b} < 0. \tag{70}$$

Note that W^{kj} is a convex function of t, with a minimum at $t = \alpha$. Within the relevant range $t \in (0, \alpha/2)$, W^{kj} is a negative function of t, and is illustrated by the schedule labeled W^{kj} in Figure 1.

We now compare the three welfare levels given by (64) to (68). First, let us compare the Korea welfare level after forming an FTA with China, with Japan forming a similar FTA with China, with its welfare level after forming an FTA with Japan:

$$W^{kcj} - W^{kj} = \frac{2\alpha t - 3t^2}{18b}, \tag{71}$$

which is positive if and only if

$$t < \frac{2\alpha}{3}. \tag{72}$$

Within the relevant range $t \in (0, \alpha/2)$, $W^{kcj} > W^{kj}$. Now suppose that Japan does not respond to a Korea-China FTA. The difference in welfare level is

$$W^{kc} - W^{kj} = \frac{6(a-c)t - t^2}{18b}, \tag{73}$$

which is positive if and only if

$$t < 6(a-c). \tag{74}$$

Again, within the relevant range, $W^{kc} > W^{kj}$, and the dependence of W^{kc} is illustrated by the positively sloped schedule labeled W^{kc} in Figure 1.[11]

The rankings of the FTA options are summarized by the following proposition:

Proposition 8 *In the present case as described above, a Korea-Japan FTA is always beneficial to Korea. Within the relevant range $t \in (0, \alpha/2)$, the following ranking has been established:*

$$W^{kc} > W^{kcj} > W^{kj} > W_0. \tag{75}$$

[11] Note that the schedules in Figure 1 show the welfare levels of Korea under each of the FTA options when given the initial tariff rates. For example, if the initial tariff rates are equal to t' in Figure 1. Then the initial welfare of Korea is equal AB. If it forms an FTA with China, and if Japan remains passive, Korea welfare is equal to AE. If Japan does respond with another FTA with China, Korea's welfare drops down to AD. If Korea forms an FTA with Japan instead, its welfare is equal to AC.

7 Concluding Remarks

By emphasizing the rivalry between the firms in Korea and the firms in Japan, this paper shows a strong argument for either Korea or Japan to form an FTA with a third country that is an important market for the products from Korea and Japan. This argument is similar to the export subsidy argument, which is familiar to trade theorists. However, the present argument is quite different from the export subsidy argument in a very important aspect. While the use of export subsidy is prohibited by the WTO, establishing FTAs is permitted by the WTO, at least under certain conditions. The interesting thing here is that establishing an FTA does involve the government revenue, and it does, in the cases considered, have the effect of promoting the trade performance of local firms, and does confer a benefit. Yet, FTAs are not excluded by the Agreement on Subsidies and Countervailing Agreement (SCM Agreement), because FTAs do not involve a direct financial contribution by the government.

To show the rivalry between the firms in two different countries and to explain how it could lead to an FTA between the countries and a third country that is a significant market of their firms, this paper makes use of a partial equilibrium framework that focuses on one single industry. The advantage of this approach is that it is simple and it is relatively easy to get intuitive results. Furthermore, the present framework implies the existence of intra-industry trade between two rivalry countries so that we can examine the simultaneous removal of trade restriction by the two rivalry countries on the goods from each other.

The present paper presents a strong case in which Korea can earn more from an FTA with China than from an FTA with Japan, even if Japan responds with its own FTA with China. The key assumption used in this paper to derive this ranking is that Korea and Japan have firms that are close competitors in the China market. We show that international rivalry can be a very strong argument for a government to form an FTA with a country that is an important market for the country and its rivalry.

The present partial equilibrium framework, like other partial equilibrium frameworks, suffers the usual shortcomings such as neglecting income distribution and cross-sectoral effects. Furthermore, because we emphasize the third country as an important market for the goods from the two rivalry countries, the present framework is not able to examine the realistic cost for each of the rivalry countries of forming an FTA with the third country. So

what we showed earlier is mainly the benefit side of such an FTA. Future research may require extending the present framework to provide a more complete analysis.

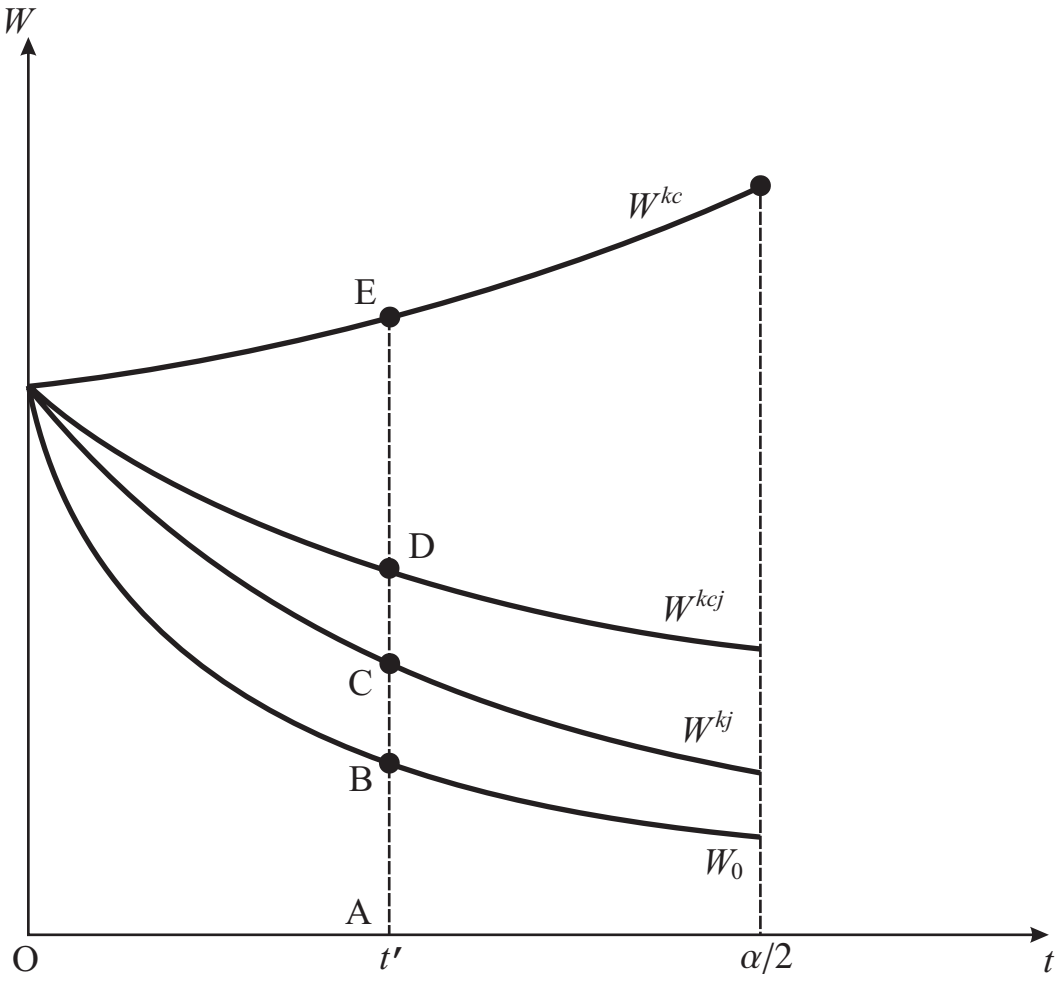

Figure 1 Welfare of different FTAs at different Tariff Rates

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