Should Countries Be Eager to Form Free Trade Areas?

Kar-yiu Wong
University of Washington
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Abstract

This paper examines how the production, consumption, trade, and welfare of member countries may be affected by a free trade area. The analysis is carried out by using a unified model, which allows us to derive these effects in a general setting. The model reduces to several special cases, one of which focuses on the import side of an economy, and is similar to tthe famous Viner model of trade creation and trade diversion. The present model is more fruitful than the Viner framework because it brings in the strategic and intraindustrial trade effects, the latter being what many governments emphasize when considering forming new free trade areas.

1 Introduction

The number of regional trade agreements (RTAs) in the world has been rising rapidly in recent years. Establishing RTAs has become a common way for countries to integrate their economies with others. Figure 1 presents the number of notifications sent to the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO) from 1957 to 2013. The table shows that from 1957 to 1995, the GATT or WTO received on average roughly one notification per year. Starting from the end of the nineties, the number of notifications exploded, rising rapidly over time. In 2008, a record of 27 notifications of RTAs was received.

Asian countries for a long time had not paid much attention to RTAs: They were a late comer in terms of forming RTAs. The first regional agreement in this region was an agreement signed between Thailand and Lao People's Democratic Republic in 1991. The next year, the Association of Southeast Asian Nations (ASEAN) voted to convert itself into a free trade area. Since then getting RTAs had been a more and more popular policy for many Asian governments to integrate their economies with others. For example, between 2000 and 2013, there were 109 notifications, and 89 of them, or slightly more than 80 percent, were those that involved at least one Asian economies (not including Russia, Turkey, Middle East countries, and Island countries in South Asia).

It has been recognized in the literature that setting up a regional trade agreement is only a second-best policy. By the Theory of the Second Best, having a RTA cannot be regarded as a step closer to global free trade, and it may deteriorate the welfare of individual member countries and that of the world. Jacob Viner (Viner, 1950) suggested an approach to determine whether a customs union (or free trade area, FTA) benefits a member country or the world as a whole, depending on whether trade has been created or diverted. This approach has received a lot of attention, as it provides a simple and practical way of evaluating the welfare effects of an RTA.

The Viner approach, however, has been criticized for not accurately measuring the welfare effects.[1] Despite such criticism, the Viner approach remaining an important one in the economic literature, and trade creation and trade diversion are still widely believed to be the criteria for welfare improv-

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[1]See surveys on regional trade liberalization such as Panagariya (2000) and Lloyd and MaClaren (2004).

ing and welfare deteriorating RTAs.[2]

However, it is difficult to apply the Viner approach to explain the rapid growth of regional trade agreements in Asia. Let us take an example. Singapore allows basically free trade on its import side. This means that a new FTA will not generate any significant trade creating or diverting effect. Then why is Singapore so eager to form FTAs? As a matter of fact, forming FTAs with other economies is now a popular policy of many Asian economies.

Anotehr reason why the Viner approach is not too applicable to explain the policy choice of the governments of many Asian economies in Asia is that while the approach focuses on the import side of an economy, these Asian goverments care more about the export side, not the import side, of their economies. Such emphasis on the export side suggests some similarities with the use of export subsidies. The latter policy is popular because it can generate effects to shift the profits of firms in other countries to some of the firms in its economy. (Brander and Spencer, 1985) However, the use of export subsidies generally is subject to limitations and is restricted by the World Trade Organization.[3] Many governments now see that FTAs provide an alternative way of helping local firms to raise their export levels, possibly at the expense of competitors. This point is not too difficult to see, but it has not received much attention in the literature.

The objective of this paper is to use a unified model to examine some of the crucial impacts of an FTA on member countries. The unfied model is general that it reduces to a model similar to the Viner model. Thus this model can be used to analyze the trade-creating and trade-diverting effects suggested by Viner. Yet, the model points out some other impacts that the Viner model misses.

The model can be used to analyze some other cases and some other effects. In some special cases, a member country may focus on the export side, and the government will be concerned about the strategic effect of an FTA, and can use the FTA as a way to improve the competitiveness of its local firms in a foreign market. In some other special cases, the economy may be facing intraindustry trade with a member country. An FTA will bring a different type of impact on the welfare of the economy.

The rest of this paper is organized as follows. Section 2 develops the

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[2]Panagariya (2000), for example, stated that "trade creation and trade diversion have remained central to policy debates on PTAs (preferential trade agreements)."

[3]See Grossman (1986) for some criticism of the Brander-Spencer arguments.

unified model. Section 3 examines the output effect of an FTA between two member countries, while section 4 derives the welfare effect. Section 5 considers a special case of the unified model, in which there is no local production in the economy. In this case, the questions the government has to ask and answer are, how much to import and from where the import should come from. This case is similar to the Viner model, but there is an additional effect not present in the Viner model: profit-shifting effect. Section 6 considers another special case in which a local firm is competing with a firm in a non-member country in the market of the other member country. In this case, there exists an incentive to the local government to form an FTA to help promote the export of the local firm. This strategic effect can be used to explain why governments are so eager to form FTAs. Section 7 provides yet another special case, in which intraindustry trade exists between the two member countries. Some new effects will be pointed out. The last section concludes.

2   The Model

There are three countries labelled Korea (k), China (c), and Japan (j). In each of the three countries, there is a firm producing a homogeneous product.[4] The firm in country s, $s = k$, c, j, has a technology characterized by a marginal cost $= c_s$, which is independent of output level, and a fixed cost $= f_s$. Country m, $m = k$, c, j, has a consumption demand described by an inverse demand function $p_m = p_m(q_m)$, where q_m is the demand and p_m is the market price.[5] The inverse demand function satisfies the following properties: $p'_m < 0$ and $p''_m < e_m$, where e_m is a sufficiently small positive number.[6]

The firms are allowed to supply their outputs to all markets, including the local one. Denote the flow of the good from firm s to the market in economy m by $x_{sm} \geq 0$, which is determined optimally to maximize profit by firm s, s, $m = k$, c, j. In equilibrium, demand in market m is equal to the total supply, i.e., $q_m = x_{km} + x_{cm} + x_{jm}$. Country m imposes a specific tariff

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[4]The present paper assumes only one firm in each country in order to ignore any possible competition among local firms.

[5]Since trade refers to the flow of a product from one country to another, we use "s" to represent the source country and "m" to represent the market.

[6]This assumption guarantees that the marginal revenue declines with output. It is satisfied if p''_s is negative or slightly positive.

of $t_{sm} \geq 0$ on the good imported from country s, but no tax on the local sale by its own firm. Initially, the tariffs imposed by all governments on the goods imported from other economies are positive, $t^0_{sm} > 0$ for $s \neq m$, where the superscript "0" represents the initial value of a variable. The markets of the countries are segmented and international transport costs are negligible. Firms compete in a Cournot fashion.

Korea and China are signing an agreement to form a free trade area (FTA). Under the agreement, both countries remove their tariffs on the goods from each other. Using a superscript "f" to represent the value of a variable in the presence of the free trade agreement, we have $t^f_{kc} = t^f_{ck} = 0$. The agreement between Korea and China does not affect these countries' tariffs on the goods from Japan, nor would Japan's tariff rates on the goods from Korea and China be changed, i.e., $t^f_{sj} = t^0_{sj}$ and $t^f_{js} = t^0_{js}$, $s = k, c$.

To determine the effects of the Korea-China FTA, let us first examine how firms choose their outputs. For the time being, let our analysis focus on the profit of the firm in Korea, as the same analysis can be extended to China and Japan:

$$\pi_k = p_k x_{kk} + p_c x_{kc} + p_j x_{kj} - c_k(x_{kk} + x_{kc} + x_{kj}) - t_{kc} x_{kc} - t_{kj} x_{kj} - f_k. \quad (1)$$

In (1), $(c_k + t_{km})$ can be regarded as the effective marginal cost of supplying the product to market m, $m = k, c, j$ with $t_{kk} = 0$. Thus we can define $c_{km} = c_k + t_{km}$ as the effective marginal cost for market m. The profit of firm k can be rewritten as

$$\pi_k = \sum_{m=k,c,j} (p_m - c_{km})x_{km} - f_k. \quad (2)$$

Define $\pi_{km} = (p_k - c_{km})x_{km}$ as the variable profit of firm k from market m. Therefore the profit of firm k can be written as

$$\pi_k = \pi_{kk} + \pi_{kc} + \pi_{kj} - f_k. \quad (3)$$

The same analysis can be applied to the firms in the other two countries.

Since the markets are segmented, firms compete in a Cournot sense, and marginal costs are independent of outputs, the equilibria of the markets can be solved separately. To show how that is done, we focus for the time being on the Korea market. Differentiate $\pi_{kk} = (p_k - c_{kk})x_{kk}$ with respect to x_{kk}, keeping x_{ck} and x_{jk} constant, to get

$$p_k + x_{kk}p'_k \leq c_{kk}. \quad (4)$$

For the analysis of this paper, we assume that the market is sufficiently large so that the firm supplies a positive output to the market, meaning that (4) is satisfied with an equality.[7] Equation (4) represents the reaction function of firm k.

Applying the same analysis, the first-order conditions (assuming an interior solution) for the optimal supplies by the other two firms to market k are

$$p_k + x_{ck}p'_k = c_{ck} \tag{5a}$$
$$p_k + x_{jk}p'_k = c_{jk}. \tag{5b}$$

Conditions (4) and (5) can be solved for the optimal supplies of the three firms to the market in k. For the analysis in this paper, we assume that a solution exists and is unique.

The equilibria of the markets in China and Japan can be analyzed and solved in the same way.

3 Output Effects of a China-Korea FTA

Focusing again on the market in k, differentiate the first-order conditions in (4) and (5) totally to give (in matrix form)

$$\begin{bmatrix} 2p'_k + x_{kk}p''_k & p'_k + x_{kk}p''_k & p'_k + x_{kk}p''_k \\ p'_k + x_{ck}p''_k & 2p'_k + x_{ck}p''_k & p'_k + x_{ck}p''_k \\ p'_k + x_{jk}p''_k & p'_k + x_{jk}p''_k & 2p'_k + x_{jk}p''_k \end{bmatrix} \begin{bmatrix} \mathrm{d}x_{kk} \\ \mathrm{d}x_{ck} \\ \mathrm{d}x_{jk} \end{bmatrix} = \begin{bmatrix} \mathrm{d}c_{kk} \\ \mathrm{d}c_{ck} \\ \mathrm{d}c_{jk} \end{bmatrix}. \tag{6}$$

The determinant of the matrix in (6) is equal to $\Phi_k = 4(p'_k)^3 + q_k(p'_k)^2 p''_k$. If, as assumed, p''_k is negative or not very positive, then $\Phi_k < 0$.

Suppose now that there is a small drop in the tariff imposed by Korea on the good from China, i.e., $\mathrm{d}t_{ck} < 0$ and $\mathrm{d}t_{kk} = \mathrm{d}t_{jk} = 0$. In other words, the firm in China experiences a drop in its marginal cost for the good supplied to the Korea's market, $\mathrm{d}c_{ck} < 0$ and $\mathrm{d}c_{kk} = \mathrm{d}c_{jk} = 0$. The effects on the firms' outputs of this change in the tariff rate can be obtained from (6). Cramer's rule can be used to derive the output effects of a change in the tariff rate

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[7]If (4) is satisfied with an inequality at the equilibrium, the firm will supply no output to the market.

imposed by Korea on the supplies of the firms to the Korean market:

$$\frac{\partial x_{kk}}{\partial c_{ck}} = -\frac{(p'_k)^2 + x_{kk}p'_k p''_k}{\Phi_k} > 0 \tag{7a}$$

$$\frac{\partial x_{ck}}{\partial c_{ck}} = \frac{3(p'_k)^2 + (x_{kk} + x_{jk})p'_k p''_k}{\Phi_k} < 0 \tag{7b}$$

$$\frac{\partial x_{jk}}{\partial c_{ck}} = -\frac{(p'_k)^2 + x_{jk}p'_k p''_k}{\Phi_k} > 0. \tag{7c}$$

Conditions (7) imply that the Korea-China FTA (a drop in c_{ck}) will encourage the supply from the firm in China but discourage those from the local and Japanese firms.[8] The total output effect can be obtained by adding conditions (7) together to give

$$\begin{aligned}\frac{\partial q_k}{\partial c_{ck}} &= \frac{\partial x_{kk}}{\partial c_{ck}} + \frac{\partial x_{ck}}{\partial c_{ck}} + \frac{\partial x_{jk}}{\partial c_{ck}} \\ &= \frac{(p'_k)^2}{\Phi_k} < 0,\end{aligned} \tag{8}$$

which means that the China-Korea FTA will increase the total supply to the market in Korea. The effect of the FTA on the market price of the product in Korea is

$$\frac{\partial p_k}{\partial c_{ck}} = p'_k \frac{\partial q_k}{\partial c_{ck}} = \frac{(p'_k)^3}{\Phi_k} > 0. \tag{9}$$

In other words, the FTA will lower the market price in the Korean market.

The same analysis can be applied to the market in China. This means that the China-Korea FTA will increase the total supply to the market in China but lower the market price of the product. The FTA, however, will have no effect on the market in Japan, because the agreement has no effect on the effective marginal costs of the firms for the market.

4 Welfare Effects of a China-Korea FTA

We now turn to the welfare effect of the FTA. For the sake of the present analysis, we again focus for the time being on the market in Korea. Since the

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[8]Strictly speaking, the exercises performed here are for maginal changes in c_{ck}, while an FTA involves finite changes in tariff rates. Effects of finite changes will be examined in great detail later in the paper.

present model is a partial equilibrium framework, the welfare of the market can be represented by the sum of the total variable profit of the local firm (producer's surplus), consumers' surplus, and tax revenue. How these three components are affected by the FTA is analyzed as follows.

4.1 Profits of the Firms

Condition (2) or (3) shows that the profit of firm k consists of the variable profits from the three markets minus the fixed cost, f_k. How may the total profit of the firm be affected by the removal of Korea's and China's tariffs on the imported good from each other? To answer this question, let us first look at π_{kk}, firm k's variable profit from its own market. Condition (3) shows $\pi_{kk} = (p_k - c_{kk})x_{kk}$. For this market, the Korea-China FTA lowers c_{ck}, while the effective marginal costs of the other two firms will remain unchanged. Differentiate it with respect to c_{ck}, using the Envelope Theorem, to give[9]

$$\frac{\partial \pi_{kk}}{\partial c_{ck}} = x_{kk}\frac{\partial p_k}{\partial c_{ck}} = \frac{x_{kk}(p'_k)^3}{\Phi_k} > 0. \tag{10}$$

A change in c_{ck} affects also the variable profits of the other two firms. First, note that the variable profit of the firm in China derived from the Korean market is given by $\pi_{ck} = (p_k - c_{ck})x_{ck}$. Using again the Envelope Theorem, the effect of a change in c_{ck} on the variable profit of the China firm is given by

$$\begin{aligned}\frac{\partial \pi_{ck}}{\partial c_{ck}} &= x_{ck}\left[\frac{(p'_k)^3}{\Phi_k} - 1\right] \\ &= -\frac{x_{ck}[3(p'_k)^3 + (p'_k)^2(p''_k)^2]}{\Phi_k} < 0.\end{aligned} \tag{11}$$

Condition (11) shows that, not surprisingly, the China firm is hurt by an increase in c_{ck} (e.g., caused by a rise in the tariff on its good exported to Korea). Similarly, the variable profit of the firm in Japan is equal to $\pi_{jk} = (p_k - c_{jk})x_{jk}$. The Envelope Theorem can be applied again to determine the following effect:

$$\frac{\partial \pi_{jk}}{\partial c_{ck}} = x_{jk}\frac{\partial p_k}{\partial c_{ck}} = \frac{x_{jk}(p'_k)^3}{\Phi_k} > 0. \tag{12}$$

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[9]The Envolope Theorem states that in evaluating comparative-static responses of an objective function due to a change in an exogenous variable, the endogenous variable that is always chosen optimally to maximize the function can be treated as a constant.

Like what the Korean firm gets, the Japanese firm benefits from a rise in the marginal cost experienced by the Chinese firm, which is a competitor of the Korean and Japanese firms. Conversely, a Korea-China FTA means a drop in c_{ck}, implying that, in terms of the Korean market, it directly hurts the Korean and Japanese firms but benefits the Chinese firm.

Let us now go back to the profit of the Korean firm, which derives its profit from the three markets. The Japanese market will not be affected by the FTA because of segmentation of markets and constant marginal costs of the firms. Condition (10) shows how the variable profit of the Korean firm from the Korean market is affected by a change in c_{ck}. Since the FTA will also change c_{kc}, due to a removable to the tariff imposed by the Chinese government on the good from Korea, we need to see how the variable profit of the Korean firm derived from the Chinese market may be affected. The analysis can be greatly simplified by noting that the Korean market and the Chinese market are symmetric (but not necessarily identical). Thus, condition (11) implies the following:

$$\frac{\partial \pi_{kc}}{\partial c_{kc}} = -\frac{x_{kc}[3(p'_c)^3 + (p'_c)^2(p''_c)^2]}{\Phi_c} < 0, \tag{13}$$

where p_c is the market price of the product in the Chinese market and Φ_c is the determinant of a matrix for the Chinese market, analogous to the one in (6).

Condition (13) shows, not surprisingly, that the Korean firm's profit from the Chinese market decreases with a rise in its marginal cost. This implies that the Korean market can expect to get more profit from the Chinese market because of the FTA and a drop in c_{kc}.

Since the Japanese market remains undisturbed by the FTA, the (approximate) change in the profit of the Korean firm is equal to

$$\Delta \pi_k = \frac{\partial \pi_{kk}}{\partial c_{ck}}\Delta c_{ck} + \frac{\partial \pi_{kc}}{\partial c_{kc}}\Delta c_{kc}. \tag{14}$$

The present analysis shows that because of the FTA with China, the Korean firm gets less profit from its own market but more profit from the Chinese market. How its total profit is affected depends on the extend of the tariff reduction in the two countries and on how the firms compete. In general, the Korean firm should be able to avoid less damage from its own market if its initial tariff is smaller, and to get more profit from the Chinese market if the initial Chinese tariff is larger.

To get more insight into the impacts of the FTA, we can consider a special case in which the Korean and Chinese economies are identical, including the initial tariff rates they impose. This implies that $t_{ck}^0 = t_{kc}^0 > 0$ and $t_{ck}^f = t_{kc}^f = 0$. Thus $p_k = p_c$, and both market prices depend in the same way on the demand. Thus conditions (10), (11), and (14) are combined together to give

$$
\begin{aligned}
\frac{\partial \pi_k}{\partial c_{ck}} &= \frac{\partial \pi_{kk}}{\partial c_{ck}} + \frac{\partial \pi_{kc}}{\partial c_{kc}} \\
&= \frac{(x_{kk} - 3x_{kc})(p_k')^3 + q_k(p_k')^2 p_k''}{\Phi_k}.
\end{aligned} \tag{15}
$$

The effect of the FTA on the profit of the Korean firm as given by (15) is ambiguous. We can, however, develop the following two results (assuming identical Korean and Chinese economies):

1. If the demand functions of the Korean and Chinese markets are linear, then the Korean (and also the Chinese) firm benefits from a small reduction in both countries' mutual tariffs if and only if its local sale is less than three times its export to each other's market.

2. If the demand curves of the Korean and Chinese markets get steeper with more demand (so that $p_k'' = p_c'' < 0$), and if the local sale of the Korean (or Chinese) firm is greater than three times its export to the other partner market, then it is hurt by a small reduction in the two countries' mutual tariffs.

Condition (1) implies the following corollary for finite changes in the tariffs:

Corollary: If the demand curves of the Korean and Chinese markets are identical and are linear or approximately linear, then the Korean and Chinese firms benefits from the Korea-China FTA if each firm's initial local sale is less than three times its export to each other's market.

This corollary comes from the fact that a reduction in the countries' tariff will encourage each firm's export but discourage its local sale, meaning that as the tariffs are reduced, local sale of each firm is always less than three times its export to each other's market.

4.2 Consumers' Welfare

Let us again focus on the market in Korea. Consumers' welfare is represented by consumers surplus, which can be measured by

$$CS_k = \int_0^{q_k} p_k(v)\mathrm{d}v - p_k q_k. \tag{16}$$

Note that the welfare of the consumers in Korea depends only on the local market but not on the other two markets. The effect of a change in c_{ck} on the consumers surplus can be obtained by differentiating both sides of (16) to give:

$$\frac{\partial CS_k}{\partial c_{ck}} = -q_k \frac{\partial p_k}{\partial c_{ck}} = -\frac{q_k (p'_k)^3}{\Phi_k} < 0. \tag{17}$$

Condition (17) implies that a small reduction in c_{ck} improves consumers surplus. Since the sign of the expression in (17) does not depend on the magnitude of the demand, it can be concluded that a Korea-China FTA benefits the consumers in Korea. The same conclusion applies to the Chinese economy as well.

4.3 Tariff Revenue

The removal of mutual tariffs by the member countries when an FTA is formed means that the countries are likely to lose tariff revenue. For Korea, the tariff revenue is equal to

$$T_k = t_{ck} x_{ck} + t_{jk} x_{jk}. \tag{18}$$

Using the initial values of the tariff rates and the initial import levels, Korea's tariff revenue prior to the formation of the Korea-China FTA is equal to

$$T_k^0 = t_{ck}^0 x_{ck}^0 + t_{jk}^0 x_{jk}^0, \tag{19}$$

where the superscript "0" represents the value of a variable before the FTA is formed. When there is a small change in t_{ck}, which will lead to a corresponding change in c_{ck}, the effect on Korea's tariff revenue is equal to

$$
\begin{aligned}
\frac{\partial T_k}{\partial t_{ck}} &= x_{ck} + t_{ck}\frac{\partial x_{ck}}{\partial c_{ck}} + t_{jk}\frac{\partial x_{jk}}{\partial c_{ck}} \\
&= x_{ck} + t_{ck}\frac{3(p'_k)^2 + (x_{kk} + x_{jk})p'_k p''_k}{\Phi_k} - t_{jk}\frac{(p'_k)^2 + x_{jk}p'_k p''_k}{\Phi_k}
\end{aligned} \tag{20}
$$

The effect of a small increase in t_{ck} on Korea's tariff revenue is in general ambiguous: The positive impacts of a small increase in t_{ck} is due to the import from China and an increase in the import from Japan, but the negative impact comes from a decrease in the import from China.

The Korea-China FTA requires that both t_{ck} and t_{kc} be reduced to zero. Thus the new tariff revenue is equal to $T_k^f = t_{jk}^0 x_{jk}^f$. The change in the tariff revenue is equal to

$$
\begin{aligned}
\Delta T_k &= T_k^f - T_k^0 \\
&= t_{jk}^0 x_{jk}^f - (t_{ck}^0 x_{ck}^0 + t_{jk}^0 x_{jk}^0) < 0.
\end{aligned}
\tag{21}
$$

The sign in (21) is due to the fact that $x_{jk}^f < x_{jk}^0$. Thus the new FTA will cause a drop in the tariff revenue received by Korea (and thus by China as well).

As mentioned, welfare of Korea for the present market is equal to the sum of the firm's profit, the consumers surplus, and the tariff revenue, i.e.,

$$
W_k = \pi_k + CS_k + T_k.
\tag{22}
$$

The welfare effect of the FTA is in general ambiguous: The FTA is good for the consumers, bad in terms of tariff revenue, and has ambiguous effect on the local firm's profit.

5 Special Cases and Special Effects

To better understand the implications of the Korea-China FTA and why some governments are so eager to form FTAs, let us consider several special cases.

5.1 The Pure Import Case

Consider the special case in which $c_k \to \infty$. In this case, the Korean firm is entirely not competitive, and in the presence of imports from China and Japan, no output is expected from the Korean firm, i.e., $x_{kk} = 0$. Therefore the Korean market reduces to a model of duopoly. Since there is no local production, consumers' demand for the product is satisfied by imports. In equilibrium, we have

$$
q_k = x_{ck} + x_{jk}.
$$

Because of zero local production, the welfare of the market in Korea can then be defined as the sum of the consumers surplus and tariff revenue. The present model thus resembles the one Viner used in his analysis. As a matter of fact, the concepts Viner employed can be applied here.

We use a diagram to illustrate the change in the welfare of the Korean market. Figure 2 describes the consumption of the Korean market. Curve D_k represents the Korean demand curve, which is downward sloping.[10] In the diagram, the initial tariff rate imposed by the Korean government on the product imported from all other countries is denoted by $t = t_{ck}^0 = t_{jk}^0 > 0$. Given the demand, the Chinese firm supplies x_{ck}^0 and the Japanese firm supplies x_{jk}^0 to the market. This leads to a market price equal to p_k^0, with a demand equal to $q_k^0 = x_{ck}^0 + x_{jk}^0$. When the Korea-China FTA is formed, Korea removes the tariff on the product from China but maintains the initial tariff on the product from Japan; $t = t_{jk}^f = t_{jk}^0$, $t_{ck}^f = 0$. As analyzed above, the change in the Korean tariff policy encourages import from China but discourages that from Japan, with an increase in the total import. This means that $q_k^f > q_k^0$, $x_{ck}^f > x_{ck}^0$, and $x_{jk}^f < x_{jk}^0$. These changes in the quantities of import and demand are shown in Figure 2. Because of the rise in total sale, the market price of the product drops, $p_k^f < p_k^0$. This new market price is what the Chinese will receive (ignoring transport costs), but the per-unit after-tax revenue for the Japanese firm is only $p_k^f - t$.

We now examine how the Korean welfare, W_{kk}, is affected by the FTA. Recall that the welfare is equal to the sum of consumers surplus from this market CS_{kk} and the tariff revenue T_{kk}. Let us first consider the situation before the FTA. In terms of the areas labeled in Figure 2, $CS_{kk}^0 = a$ and $T_{kk}^0 = b + c + d + f + g + h$. Therefore the total welfare is

$$
\begin{aligned}
W_{kk}^0 &= CS_{kk}^0 + T_{kk}^0 \\
&= a + b + c + d + f + g + h.
\end{aligned}
\tag{23}
$$

After the FTA has been formed, the market price drops to p_k^f. This improves the consumers surplus, which is now equal to $CS_{kk}^f = a + b + c + d + e$. In terms of the tariff revenue, only the Japanese firm has to pay a tariff when supplying the product to the Korean market but the Chinese firm does not have to. As a result, the new tariff revenue is $T_{kk}^f = f + j$. The new welfare

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[10]For simplicity, curve D_k is shown as a straight line.

level of the market is equal to

$$
\begin{aligned}
W_{kk}^f &= CS_{kk}^f + T_{kk}^f \\
&= a + b + c + d + e + f + j.
\end{aligned}
\tag{24}
$$

The change in the welfare can be obtained by subtracting condition (23) from condition (24), and is equal to

$$
\begin{aligned}
\Delta W_{kk} &= W_{kk}^f - W_{kk}^0 \\
&= e + j - g - h.
\end{aligned}
\tag{25}
$$

The four terms in condition (25) are the shaded areas in Figure 2. In general, the change in welfare can be positive or negative, depending on the magnitudes of these four areas, which in turn depend on the initial tariff rates, the demand, and the technology of the firms.

These four areas have nice interpretation, and indicate different types of impacts on the Korean welfare. The following effects can be identified.

- *Trade-Diverting Effect* (area g). This effect comes from the part of the original sale of the Japanese firm that is replaced by the Chinese firm. So $x_{jk}^0 - x_{jk}^f$ is the volume of trade diverted from the Japanese firm to the Chinese firm. This volume multiplied by the per unit tariff represents the loss in tariff revenue. Out of this loss, area c is captured by the consumers because of the drop in market price. So the net loss in welfare due to trade diversion is area g.

- *Revenue Effect* (area h). When Korea removes the tariff on the good from China, it loses a tariff revenue equal to areas $h+d$. Of this amount, area d is captured by the consumers because of the drop in the market price. So the true loss of revenue is equal to area h.

- *Trade-Creating Effect* (area e). The removal of the tariff on the good from China expands the total import volume from q_k^0 to q_k^f, driving down the market price. Area e is the newly created consumers surplus.

- *Profit-Shifting Effect* (area j). Before the formation of the FTA, the per unit revenue of the Japanese firm for its export to Korea is $p_k^0 - t$. In the presence of the FTA, the per unit revenue of the firm drops to $p_k^f - t$. As a result, for its new export to Korea, its profit drops by an amount equal to area j, which is being shifted to the Korean government.

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Identifying these four effects is helpful because we can understand better the sources of the welfare impacts. The Viner approach focuses entirely on the import side, and tries to explain the welfare change in terms of trade creation and trade diversion. The present case is a more general one. Although only the import side is considered, like the Viner model, the home economy is not necessarily a small one, and it identifies not only trade creation and trade diversion, it also examines the change in tariff revenue and points out the profit-shifting effect that is missing in many other models. The latter effect comes from the fact that the Chinese and Japanese firms are competing in the Korean market. The present model shows that the Korean government can use the FTA policy to extract more profit from the Japanese firm.

The welfare effect of the FTA on the Korean market depends on the magnitudes of these four effects.

5.2 The Strategic Case

Consider another special case of Korea-China FTA, assuming that $c_c \to \infty$. In this case, the Chinese firm is entirely not competitive in the international market. As a result, the firm cannot compete with the Korean and Japanese firms, and so the demand for the product by the Chinese market is satisfied by the imports from the latter two firms, $x_{kc} = 0$ and $q_c = x_{kc} + x_{jc}$. In this case, the Korean firm and the Japanese firm are duopolists competing in both the Chinese market and the Korea market. There will be no export of the product to Korea by the Chinese firm.

In this special case, the formation of the Korea-China FTA will not affect the Korean market (because of no sale of the product by the Chinese firm) or the Japanese market (because of no change in the tariffs imposed by Japan). Therefore Korea will experience a change in the welfare it derives from the Chinese market. For that market, Korea's welfare comes from the (variable) profit that the Korean firm receives. To determine how the Korean welfare is affected by the FTA, we need to find out how the profit the Korean firm from the Chinese market may be affected.

Figure 3 shows the demand curve of the Chinese market, which is downward sloping and not too convex to the origin. Initially the Chinese government imposes a specific tariff of t on the goods from both Korea and Japan. The Korean firm chooses to supply x_{kc}^0 and the Japanese chooses to supply x_{jc}^0 to the market, leading to a market price of p_c^0. The total demand is equal to $q_c^0 = x_{kc}^0 + x_{jc}^0$.

When the Korea-China FTA is formed, China removes its tariff on the good from Korea but maintains that on the good from Japan. The above analysis shows that the new tariff policy of China will lower the market price of the product, encourage the Korean firm's supply, but suppress the Japanese firm's sale to the market. Denote the new market price by p_c^f, and the new sales of the Korean and Japanese firms by x_{kc}^f and x_{jc}^f, respectively. The total consumption is then equal to $q_c^f = x_{kc}^f + x_{jc}^f$. The new supplies and demand and the new market price are shown in Figure 3.

From the Chinese market, the welfare of Korea comes entirely from the (variable) profit that the Korean firm can get. Recall that the profit of the Korean firm from this market is equal to $\pi_{kc} = (p_c - c_{kc})x_{kc}$. In Figure 3, the marginal cost of the Korean firm, c_k, is labeled. Therefore the gap between the after-tax price and the marginal cost represents the per unit profit of the Korean firm.

Before the FTA, Korea's export to China is equal to $x_{kc}^0 = q_c^0 - x_{kc}^0$. Therefore the variable profit of the Korean firm from this market is equal to $\pi_{kc}^0 = (p_c^0 - c_k - t)x_{kc}^0 = $ areas $\ell + o$.

With the formation of the Korea-China FTA, the Korean firm's export to China increases to $x_{kc}^f = q_c^f - x_{jc}^f$. So the variable profit of the firm from the market becomes

$$\pi_{kc}^f = (p_c^f - c_k)x_{kc}^f = g + h + i + k + \ell + n + o + r.$$

Since the welfare of Korea from this market is equal to the (variable) profit of the firm from this market, the change in the Korean welfare caused by the FTA is

$$\begin{aligned} \Delta W_{kc} &= \pi_{kc}^f - \pi_{kc}^0 \\ &= g + h + i + k + n + r. \end{aligned} \tag{26}$$

These areas are shaded in Figure 3. They can be interpreted by dividing them into three groups, which represent the sources of welfare changes.

- *Profit-Shifting Effect* (areas $g + k + n$). This effect comes from the fact that the removal of the tariff imposed by the Chinese government on the good from Korea but not from Japan improves the competitiveness of the Korea firm in the Chinese market and helps the firm steal market share from the Japanese firm. Areas $g+k+n$ is the (variable) profit the Korean firm gets for the market share it captures from the Japanese firm.

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- *Revenue Effect* (area h). This effect represents the saving in tariff revenue that the Korean firm receives for its initial export to China. Before the formation of the FTA, the firm pays a tariff equal to areas $d + h$. With the FTA and the removal of the tariff, its pays nothing to the Chinese government, but the market price drops to p_c^f. Therefore the increase in profit that the firm receives is equal to area h.

- *Trade-Creating Effect* (areas $i + r$). As mentioned, the formation of the FTA increases the total supply of the product to the market and lowers the market price. The increase in total supply (and demand) is equal to $q_c^f - q_c^0$, which comes entirely from the Korean firm. This represents a further increase in the firm's profit equal to areas $i + r$.

It should be noted that all these three effects are positive for the Korean firm and the Korean economy. These effects are probably the main rationale to many governments for forming new FTAs with other economies. The rationale is even more obvious for those governments that care a lot about the export performance of some local firms.

5.3 The Intraindustry Trade Case

We now turn to another special case, in which $c_j \to \infty$. In this case, the Japanese firm is not competitive, and so for the Korean and Chinese markets, the supply of the product from the Japanese firm does not exist, $x_{jk} = x_{jc} = 0$. Both the Korean firm and the Chinese firm supply the product to its own market and to the other market.[11] When the Korea-China FTA is formed, the supply of each firm to either market will in general be affected.

For the time being, let us focus on the Korean market. As explained, the welfare of the present market can be represented by the sum of consumers surplus, (variable) profit of the Korean firm (from this market), and the tariff revenue: $W_{kk} = CS_{kk} + \pi_{kk} + T_{kk}$.

The welfare and how it may change in the presence of the Korea-China FTA are illustrated by Figure 4, with D_k standing for the market demand.[12] The initial tariff rate imposed by Korea on all imported goods is $t > 0$. Given the technology of the Korean and Chinese firms, the market price

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[11]As we mentioned earlier, it is assumed that both markets are big enough to support two or even three firms.

[12]The demand curve is downward sloping and is not too convex to the origin.

before the formation of the FTA is p_k^0, with the supplies by the Korean and Chinese firms equal to x_{kk}^0 and x_{ck}^0, respectively. The total supply (demand) is $q_k^0 = x_{kk}^0 + x_{ck}^0$. Note that without any FTA, only the Chinese firm faces the tariff but the Korean firm is not. The consumers surplus is equal to $CS_{kk}^0 = $ area a. The profit of the Korean firm from the market is $\pi_{kk}^0 = (p_k^0 - c_k)x_{kk}^0 = $ areas $b + c + f + g + j + k$, noting that the Korean firm does not have to pay the tariff to the government. The tariff revenue (based on the import from Chinese) is equal to $T_{kk}^0 = tx_{ck}^0 = $ areas $d + h$. Therefore the total welfare of the market is equal to

$$
\begin{aligned}
W_{kk}^0 &= CS_{kk}^0 + \pi_{kk}^0 + T_{kk}^0 \\
&= a + b + c + d + f + g + h + j + k.
\end{aligned}
\tag{27}
$$

\\When the FTA is formed, the Chinese firm's export is no longer subject to the tariff. This increases the Chinese firm's supply, lowers the Korean firm's supply, but raises the total supply (and demand), resulting in a drop in the market price to p_k^f.

At the new equilibrium, the consumers surplus is $CS_{kk}^f = a + b + c + d + e$. With a drop in its market share and the market price, the profit of the Korean firm becomes $\pi_{kk}^f = f + j$. The tariff revenue is now zero, as the tariff on the good imported from China has been removed, $T_{kk}^f = 0$. So the new welfare level is

$$
\begin{aligned}
W_{kk}^f &= CS_{kk}^f + \pi_{kk}^f + T_{kk}^f \\
&= a + b + c + d + e + f + j.
\end{aligned}
\tag{28}
$$

By contracting condition (27) from (28), we get the change in the welfare of Korea from its own market:

$$
\begin{aligned}
\Delta W_{kk} &= W_{kk}^f - W_{kk}^0 \\
&= e - (g + h + k).
\end{aligned}
\tag{29}
$$

Before we turn to the change in the welfare of Korea from the Chinese market, let us first determine how the Chinese firm's profit from the Korean market may be affected. For simplicity, assume that both the Korean firm and the Chinese firm have the same marginal cost, $c_k = c_c$. The initial profit of the Chinese firm is $\pi_{ck}^0 = \ell$. With the formation of the FTA and the removal of the tariff, its new profit is $\pi_{ck}^f = g + h + i + k + \ell$. Therefore the change in

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the profit of the Chinese firm derived from this market is

$$\begin{aligned}
\Delta\pi_{ck} &= \pi_{ck}^f - \pi_{ck}^0 \\
&= g + h + i + k > 0.
\end{aligned} \qquad (30)$$

This means that the FTA will improve the Chinese firm's profit derived from the Korean market because the FTA improves the firm's competitiveness in this market.

Let us now go back to the welfare of the Korean market. Its welfare derived from the Chinese market is the firm's variable profit from the market. That profit is analogous to what the Chinese firm can get from the Korean market. To apply what we have just analyzed, we can consider a even more special case, in which the Korean and Chinese economies are identical. In this case, the Chinese market can be represented by a diagram similar to Figure 4. For example, the demand can be shown by a curve like D_k, and, applying condition (30), the change in the profit of the Korean firm derived from the Chinese market is equal to the sum of areas $g + h + i + k$.

Now let us make use of Figure 4 to find out how in the present case the welfare of Korea derived from the two markets may be affected by the FTA. Combining conditions (29) and (30) together, the change in the total welfare of Korea is

$$\begin{aligned}
\Delta W_k &= \Delta W_{kk} + \Delta\pi_{kc} = e - (g + h + k) + g + h + i + k \\
&= e + i > 0.
\end{aligned} \qquad (31)$$

Areas e and i can be termed the *Trade-Creating Effect*. It measures the increase in welfare that each economy is able to get when trade and demand increase in both markets. Note that condition (31) can also be applied to China, indicating that the FTA between the two identical economies benefit both economies.

6   Concluding Remarks

Regional economic integration has been getting more important and receiving more attention, as many governments regard it as an important way to promote economic welfare. However, many papers and policy makers are still relying on the traditional approach like that suggested by Jacob Viner

more than sixty years ago. It has been pointed out that Viner's approach is limited in the situations faced by many Asian countries.

This paper suggests an alternative approach, which, as compared with the Viner approach, is more general as it covers both the import and export sides of an economy. The present approach is explained in a three-country model, which is constructed to examine how the production and consumption of an economy may be affected by a new free trade area (FTA).

The model reduces to three special cases to examine the fundamental effects of an FTA: the pure import case, the strategic case, and the intraindustry trade case. In the pure import case, the local economy has no production, and its consumption is satisfied by import from a member country and a non-member country. Therefore, the welfare of the economy is closely related to whether the economy imports the right amount of the product and whether it imports from the right source. This case is very close to the Viner approach because it emphasizes the import side of the economy. However, the present model is more fruitful in the analysis because it identifies not only trade creation, trade diversion, and changes in revenue, which are well known in the traditional analysis, but it also points out that the FTA can be used by the local economy to extract a bigger share of the profit of the firms in the non-member country.[13]

The second special case examined in this paper is the strategic case, in which a local economy and a non-member country are competing in the market of a member country. An FTA is regarded as a direct way of increasing the competitiveness of local firms in the market of the other member country. The FTA thus has the effect of diverting trade from the non-member country firm to the local firm, and this will shift profit in favor of the local firm. This profit-shifting effect is a very big incentive to the governments to form new FTAs with other countries: helping local firms in overseas markets, usually at the expense of those non-member firms that are competing in the same market. In addition to this strategic benefit, local firms can gain from a new FTA because of some more factors: the revenue effect because of the removal of the tariffs, and the trade-creating effect due to an increase in the trade volume.

The third special case identified in this paper is the one in which intraindustry trade exists between the two member countries. In this case, an FTA

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[13]In the Viner model, perfect competition and a small open economy are assumed. So the profit-shifting effect does not exist.

will encourage mutual trade between the member countries, and at least one of the member countries will be able to gain, or if both member countries are identical, both will gain from the FTA.

Identifying these cases helps us understand better how and why the welfare of a member country may be affected by a free trade area. In the present analysis, these cases are examined using a unified model, which allows us to pinpoint the sources of impacts of a new free trade area.
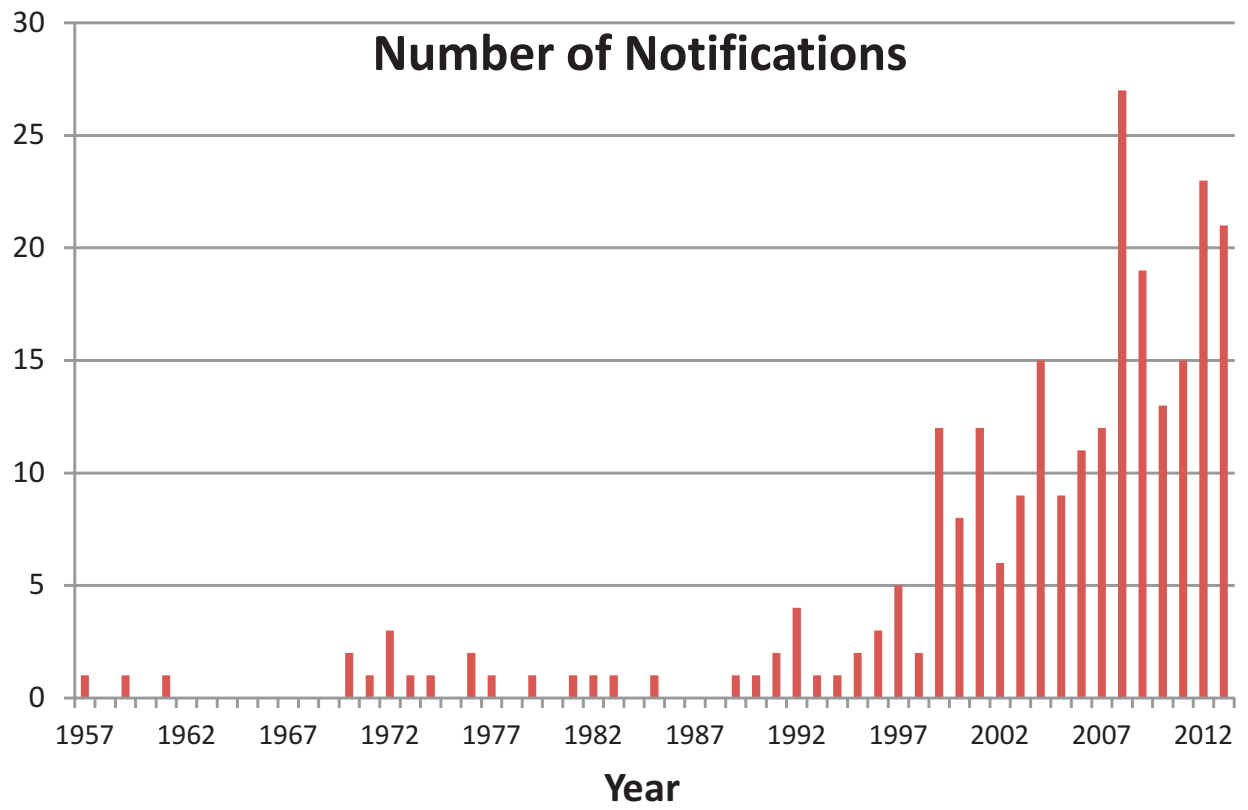
Figure 1 Number of Notifications of RTAs
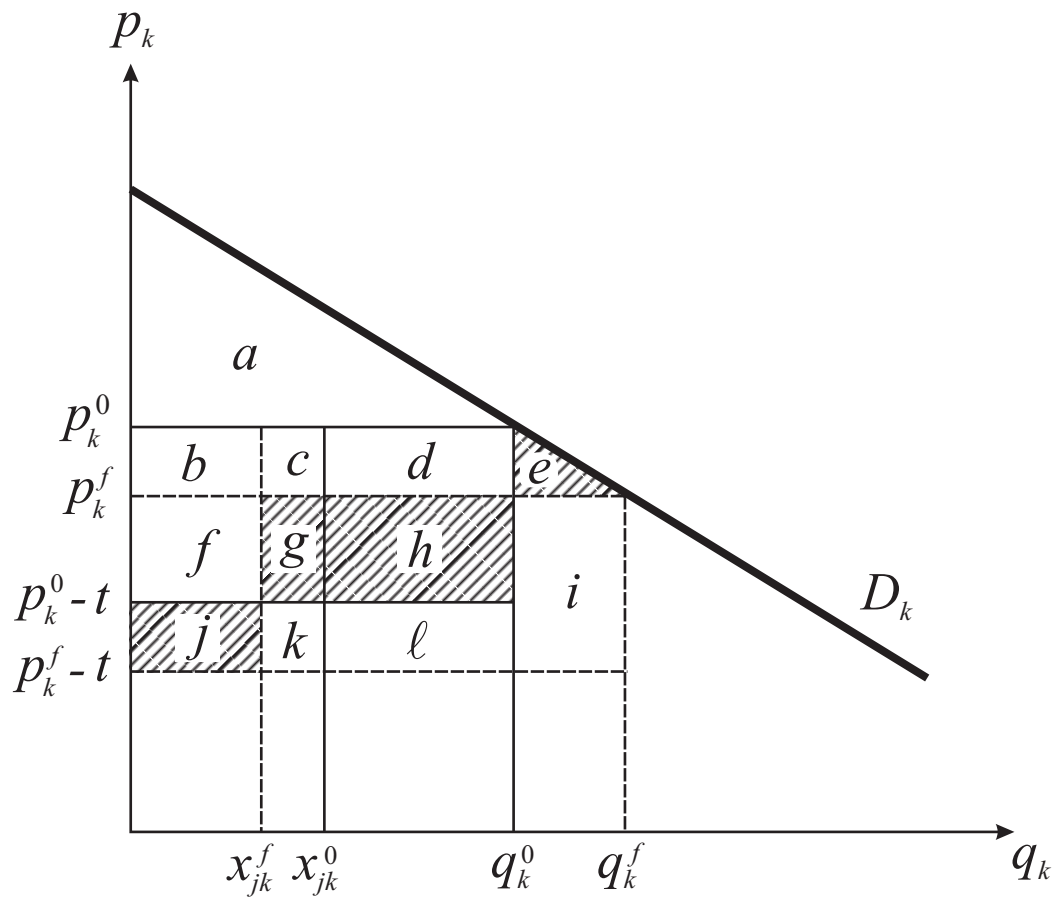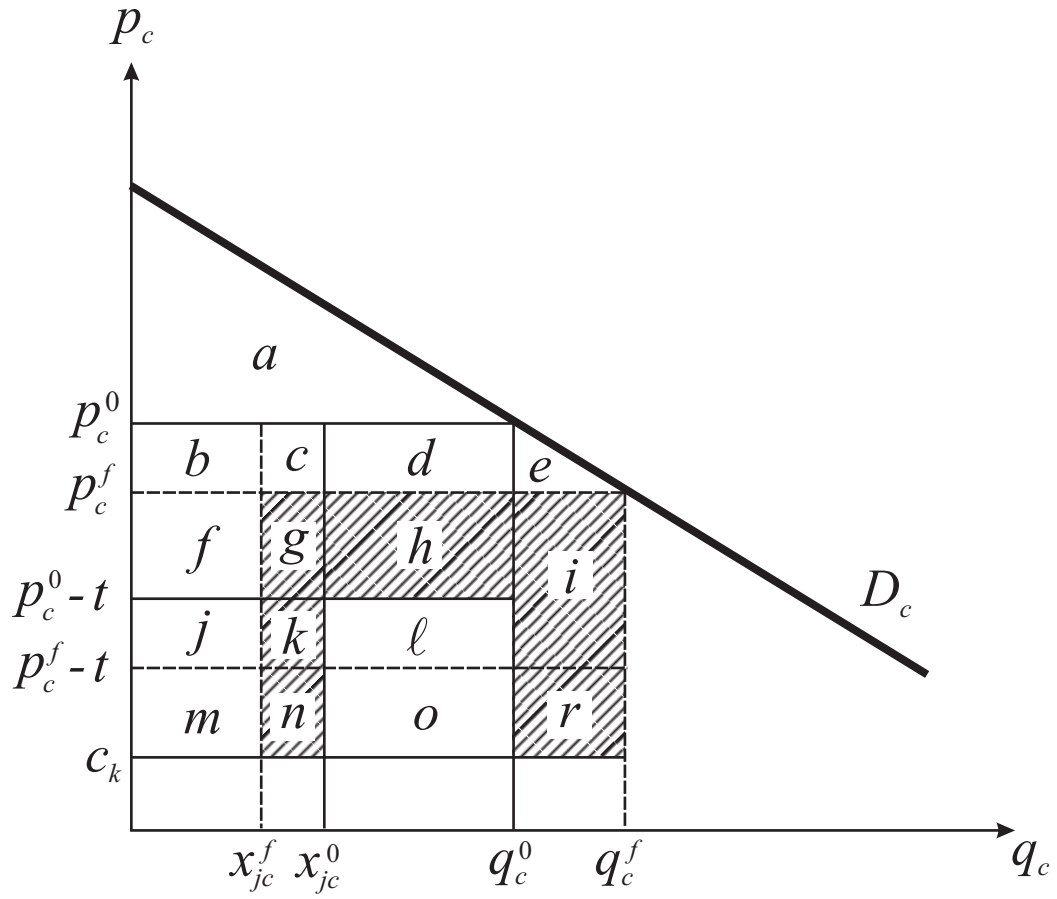
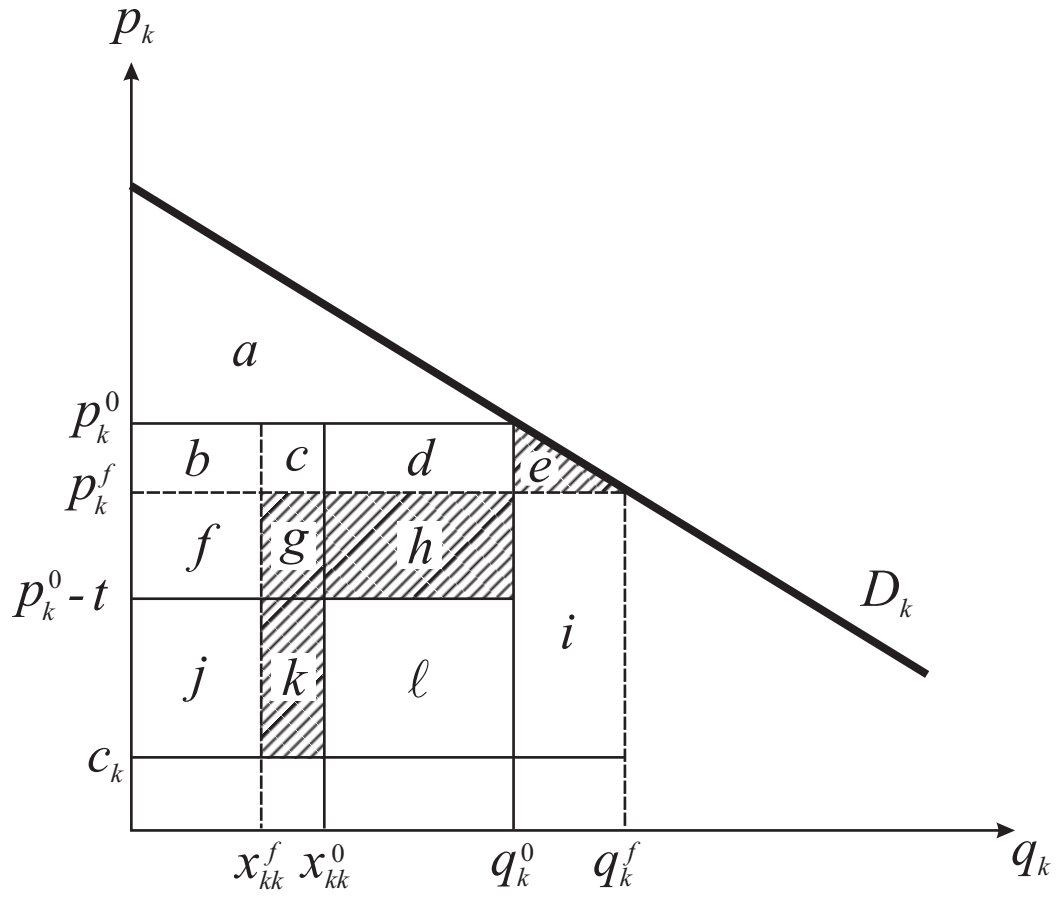Figure 2 The Pure Import Case

Figure 3 The Strategic Case

Figure 4 The Intra-industry Trade Case

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