Is APEC a Building Block or Stumbling Block towards Trade Liberalization?*

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September 15, 2000

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* The author wishes to thank Ken Suzuki, Akiko Tateishi, Gina Pei-Chun Liao, as well as seminar participants at Keio University for their helpful comments. Nevertheless, the author alone is responsible for any errors appearing in this paper.

1. Introduction

The current rise of "regionalism" in the world trading system, emerging in the late 1980s, was incarnated as various movements of regional economic organizations, such as the formation of the European Union (EU) and its enlargement to the north and east, the North American Free Trade Agreement (NAFTA), and the Mercosur customs union. In the 1990s, regionalism flourished to such an extent that it was considered a menace to "multilateralism" which promotes global free trade, based on the most-favored-nation (MFN) clause principle. This has been established through the effort of the General Agreement on Tariff and Trade (GATT) or the World Trade Organization (WTO). The misgivings of "regionalism" that it affects negatively the world trading system, spreading over researchers and businessmen, was phrased precisely and concisely by Bhagwati (1991), and many economists adopted his memorable phrases "building blocks" and "stumbling blocks" (p. 77) in their papers.

In the context of international economics, "regionalism" is usually considered as the trend toward freeing regional trade by forming Preferential Trade Agreements (PTAs) such as Free Trade Areas (FTAs) or Customs Unions (CUs). Among the many existing regional economic institutions, however, Asia-Pacific Economic Cooperation (APEC) is a unique forum in its process of trade liberalization. APEC does not aim PTA based on a reciprocal basis. It employs an idea of "open regionalism" for further

trade liberalization among member countries. "Open regionalism" means reduction or elimination of import tariffs levied by APEC members for imports from both member and non-APEC economies. This is tariff reductions extended to all countries on an MFN basis, with APEC providing coordination of the timing and perhaps the commodities and extent of the cuts. APEC's liberalization project is agreed in 1994 and aimed at freeing trade by the more advanced countries by 2010 and by all by 2020 (Kodama; 2000, Page; 2000).

The aim of this paper is to analyze whether APEC, featured by its "open regionalism," will become a building block or a stumbling block, by using the political-economy approach and computer simulation. In this paper, the market structure is that of imperfect competition, with oligopolistic firms producing goods that are perfect substitutes for each other. A large number of countries with asymmetric market size is taken into consideration to compare the effects of five methods of trade liberalizations on each country's welfare, world welfare, and world trading system.

The next section presents the basic multi-country model for analyzing the effects of trade liberalization. In Section 3, the procedures of trade liberalization considered in the simulation are explained. Section 4 shows the main results of the computer simulations. Conclusions and implications will be presented in Section 5.

2. The Model

The model presented here is the extension of Venables (1987), Yi (1996) and Krishna (1998). The support-for-government function, or the government policy objective, is a simplified version of Grossman and Helpman (1995a, 1995b).

The world consists of l countries, and let L be the set of countries. Each country can impose an import tariff t, the rate of which is given,[1] on its import goods from other countries. M_j is the set of countries which can supply goods to the market of country j without tariffs --- in other words, country j plus countries on which country j lifts import tariffs. If country j ($j \in L$) lifts tariffs on m_j ($0 \le m_j \le l$) countries, it means M_j has $m_j + 1$ elements. $M_j \subseteq L$, of course. The tariff which country j imposes on goods from country i ($i \in L$), t_j^i, is therefore,

$$t_j^i = \begin{cases} t & if \quad i \notin M_j \\ 0 & if \quad i \in M_j \end{cases}$$

There are two kinds of goods produced in each country: numeraire good and imperfect competition good. Both are produced under constant returns to scale with no fixed costs, and one unit of good requires one unit of labor as input. Numeraire good is produced and distributed competitively and priced one per one unit at world market. Therefore, the wage per one unit of labor is also one. These assumptions

indicate that marginal cost of two goods is one. If there exits Z_j units of labor in country j, the labor income of country j is Z_j. The numeraire good is transferred across countries to settle the balance of trade.

Regarding the imperfect competition good, each country possesses one firm which produces this good.[2] The market structure is one of imperfect competition, with oligopolistic firms producing goods that are perfect substitutes for each other. Taking tariffs into account, each firm decides the quantity of export to each country with recognition that markets in different countries are segmented. The equilibrium concept is that of Cournot-Nash. The quantity supplied by a firm in country i, firm i, to country j's market is described as q_j^i. Hereafter the imperfect competition good will mainly be referred to as "good".

Aggregate utility in country j, U_j, is assumed to take the form,

(1) $$U_j\left(K_j, Q_j\right) = K_j + \left(A_j Q_j - Q_j^2/2\right),$$

where K_j denotes the consumption of the numeraire good in country j and $Q_j = \Sigma_i q_j^i$ denotes the total sales of the imperfect competition good in country j. From equation (1), the price of imperfect competition good in country j, P_j, is deduced as follows:

(2) $$P_j = A_j - Q_j .$$

Each firm regards each country as a separate market and therefore chooses its optimal quantity for each country separately. Under the Cournot assumption, firms are assumed to be maximizing profits by taking other firms' outputs as given, with all

firms choosing their quantities simultaneously. Firm i decides the quantity of export to country j, q_j^i, by solving the following problem:

$$\max_{q_j^i} \pi_j^i = q_j^i \left[A_j - Q_j - \left(1 + t_j^i\right) \right]. \tag{3}$$

Solving equation (3) and arranging it yields

$$q_j^i = \left[\frac{A_j - 1 + \Sigma_k t_j^k}{l+1} - t_j^i \right] = \left[\frac{A_j - 1 + \left(l - m_j\right) t}{l+1} - t_j^i \right]. \tag{4}$$

The meaning of each element in equation (4) is as follows. $\left(A_j - 1\right)/\left(l+1\right)$ denotes the amount of rent that firm i receives from exporting to country j. From equation (1), A_j indicates the degree of preference to the imperfect competition good in country j. The higher the value of A_j, the higher its price, at a certain quantity of supply to country j. Or, from equation (2), A_j could be seen as the degree of market size, since at a certain price, the higher the value of A_j, the more demand for the good. And the greater (smaller) the value of A_j, the more (less) rent will each firm receive from the additional supply of the good to country j. This results in more (less) quantity of supply from country i to country j, q_j^i. $\left(l - m_j\right) t/\left(l+1\right) - t_j^i$ is the relative index of the tariff rate imposed by country j on the import good from country i. $\left(l - m_j\right) t/\left(l+1\right)$ is the index of the average tariff rate in country j (this is not the average tariff rate itself). When country j's tariff rate on firm i's export, t_j^i, is smaller (larger) than the index of the average tariff rate in country j, $\left(l - m_j\right) t/\left(l+1\right)$, this

firm can export more (less) to country j.

From equation (3) and (4), the profit of firm i gained by supplying the good at the amount of q_j^i to country j's market, π_j^i, is

$$\pi_j^i = \left[q_j^i\right]^2 .$$

The profit of a firm becomes the income of this firm's owner. Let the total profits of country i's firm from each country's market be $\Pi^i = \Sigma_j \pi_j^i$.

Here it is assumed that the objective of a government is simply to gain political support from voters, which decides the potential number of votes for existing government in the next election. The effect trade policy has could be described as a change of the value of support-for-government function. Potential number of votes comes from two domestic voting groups: general voter group and firm-owner group.

The support for country j's government, government j, from the domestic general voter group depends on labor income, Z_j, tariff revenue, which distributes to general voter through the government, $T_j = t_j^i q_j^i$,[3] and total consumer surplus which is equal to aggregate utility minus total purchase cost, $S_j = U_j - \left(K_j + P_j Q_j\right) = Q_j^2/2$. Here it is assumed that the potential number of votes from the general voter has a linear linkage with the sum of these values mentioned above. The number of votes from the firm-owner group is also assumed to have a linear linkage with the profit of firms, that is, the total income of firm-owner group, Π^j. Thus, the support-for-government function, or the government policy objective of country j, W_j,

takes form as

(5) $$W_j = \alpha\ \Pi^j + (1-\alpha)(Z_j + T_j + S_j), \quad 0 \le \alpha \le 1.$$

α denotes the relative ability of the firm-owner group to gather votes, compared to the general voter group. α has a large value when, for example, a pressure group made up of firm owners of the imperfect competition good industry heavily influences the political decision making of the government. This is done through lobbying votes for the government.

3. The Procedure of Simulations

In this paper five kinds of computer simulations are experimented and the results are compared with each other, in order to examine the effects of each method of trade liberalization on each country's welfare, world welfare and world trading system. The five methods of trade liberalization are: (1) voluntary tariff removal (VTR), (2) PTA, (3) PTA+APEC, (4) WTO, and (5) WTO+APEC.

In each case, 20 countries are considered and all assumed to be participated in WTO. Their market sizes are determined by the following equation:

(6) $$A_i = \exp(c - d \cdot \ln i), \qquad \text{i} = 1, 2, \ldots, 19, 20$$

where c and d are parameters. This means that A is modeled to be distributed exponentially, based on the fact that the distribution of the population or GNP of actual countries fits along with exponential distribution.

The values of parameters t is given as t = 20 throughout these analyses. This t can be interpreted as a remaining tariff after series of trade negotiations held by GATT/WTO and it is assumed that all 20 counties still put tariff t = 20 on goods from all other countries. There are two combinations of values concerning c and d in equation (6): (c, d) = (12, 2) and (15, 3). When (c, d) = (12, 2), the largest country's market size, A_1 = 162,754.8, is 400 (20^2) times that of the smallest country's market size, A_{20} = 406.9. A_{30} = 406.9 is the value that just satisfies the condition that all twenty countries trade with a positive quantity of trade under all circumstances. When (c, d) is (15, 3), this becomes 8,000 (20^3) times (A_1 = 3,269,017.4, A_{20} = 408.6).[4] As for α, it has five values; α = 0, 0.25, 0.5, 0.75, 1.

Throughout this simulation, it is assumed that international transfer does not exist and that each country decides its trade policy only by considering the government policy objective of its own country. Each country chooses the trade policy that increases domestic support for government. It does not consider other countries' domestic support-for-government function nor other countries' requests.

3.1. VTR

Voluntary tariff removal (VTR) is defined as each country eliminating all tariffs voluntarily and unilaterally at once without using the aide of WTO trade negotiations, i.e. in a non-preferential manner. In this case, unilateral elimination of import tariffs always reduces the firm profit gained from the home market because of the intensified competitiveness and reduced price, while the profit gained from the foreign market does not change. This can be seen from equation (4). Therefore the firm-owner group never supports voluntary tariff reduction. On the other hand, whether the general voter group supports this type of tariff elimination or not is uncertain, because this affects tariff revenue and total consumer surplus in an opposite way.

Each country's decision to eliminate or impose import tariffs in order to increase domestic support depends only on the home country's condition. It does not need to consider other countries' reaction or the number of turns of decision-making when designing the procedure of the simulation. Therefore, the procedure of the simulation in this case can be stated as below.

Step 1. Select country 1 and give it an opportunity to (1) eliminate or (2) impose tariffs in a non-preferential manner.

Step 2. This country selects its trade policy in order to increase its government policy objective.

Step 3. Repeat Step 1 and Step 2 from country 2 to country 20.

3.2. PTA

The formation of PTA is to bring complete liberalized trade among member countries. Firm-owner groups may approve the elimination of home country's tariffs if other countries simultaneously eliminate their import tariffs, which would then lead to an increase in export and hence the profit. Many PTAs in the real world are composed of three or more countries. However, in order to simplify the procedure of computer simulation and make it easy to grasp the implication of the results, it is assumed that only bilateral trade agreements (BTAs) are agreed among countries. Regional trade agreements composed of three or more countries can be considered as the accumulation of bilateral trade agreements.

Step 1. Randomly select one country and give it an opportunity to decide whether (1) to conclude a new BTA, (2) to cancel an existing BTA, or (3) to do nothing.

Step 2. This country selects (1) or (2) depending on which one brings a larger increase in its government policy objective. Note that to select (1), it is necessary that this conclusion raise the partner country's government policy objective in order to acquire its support. If neither (1) nor (2) raises this country's government policy objective, then this country chooses (3) and does not change its commercial policy.

Step 3. Repeat Step 1 and Step 2 400 times.

The number of turns of decision-making may affect the results of the simulation. They then are programmed to be allotted randomly to countries (Step 2). One trial of simulation consists of Step 1 to Step 3, and it reaches to a stable state after 400 times' repetition of Step 1 and 2. Simulation results presented in the next section are taken from average values of 20 trials.

3.3. PTA + APEC

The further trade liberalization, by WTO countries taking measures of PTAs and APEC, is programmed here so that some member countries of "APEC" engage in "open regionalism" which make these countries lift all import tariffs unilaterally.[5] As you see in the next section, however, no incentive exists for any country to liberalize import voluntarily and unilaterally. Therefore, APEC-type countries have to be chosen exogenously at the beginning of the simulation, disregarding their intentions about liberalizing trade. In other words, an assumption is made that APEC-type countries carry out "open regionalism" policy produced from some factors external to this analysis.

Step 1. Out of 20 countries, select 4 countries and name them APEC. These APEC countries are ordered to eliminate their import tariffs unilaterally under all circumstances. The other 16 countries are classified as non-APEC.

Step 2. Randomly select one country from 20. If it is a non-APEC country,

give it an opportunity to decide whether (1) to conclude a new BTA with non-APEC countries, (2) to cancel an existing BTA with non-APEC countries, (3) to eliminate an import tariff levied on an import from one APEC country, (4) to levy an import tariff on an import from one APEC country, or (5) to do nothing.

Step 3. This country selects one from (1) to (4), depending on which one brings the greatest increase in its government policy objective. Note that to select (1), it is necessary that this conclusion raise the partner country's government policy objective in order to acquire its support. If these choices do not raise this country's government policy objective, then this country chooses (5) and does not change its commercial policy.

Step 4. Repeat Step 2 and Step 3 600 times.

This simulation is also conducted 20 times. At present, actual APEC member economies have not yet abolished import tariff completely on the basis of "open regionalism," and many PTAs concluded with/among APEC member(s) are in effect, different from the procedure of simulation. This program, therefore, explains whether "an ideal APEC," which may actualize by 2020, is a "building block" or "stumbling block" towards trade liberalization.

3.4. WTO

It is assumed here that after a series of trade negotiations held by GATT/WTO,

tariff t still remains among WTO member countries. In this paper, the process of further trade liberalization based on WTO is modeled so that some member countries of WTO ("WTO-positive countries") have an intention to completely eliminate their tariffs with each other, while some other countries ("WTO-negative countries") are reluctant to do so.

Whether or not each WTO country should engage in further trade liberalization beyond its current situation depends on its home condition as well as other countries' attitude towards trade liberalization. The relationship of cause and effect in each country about its decision to eliminate remaining tariffs connect infinitely with those of other countries. So WTO trade round appears in order to facilitate negotiation and foster confidence among member countries about lifting tariffs, to conclude treaties with each other and actually eliminate tariffs, and to improve the procedure of settling disputes among member countries.

Considering the nature of this kind of decision-making, the procedure of the simulation to find "WTO-positive countries" is designed as follows.

Step 1. Initially, all 20 countries are WTO-positive countries and do not impose any tariffs.

Step 2. Randomly select one country and give it an opportunity to decide whether (1) to be a WTO-positive country and provide other WTO-positive countries with free access into domestic market, or (2) to be a WTO-negative country and return

to the initial situation where country imposes tariffs t on import goods from all other countries, taking it into account that other WTO-positive countries also impose tariffs on goods exported from this country.

Step 3. This country selects (1) or (2) in order to increase its government policy objective.

Step 4. Repeat Step 2 through Step 3 200 times.

Similar to PTA, the turns of decision-making may also affect the result of simulation. They then are programmed to be allotted randomly to countries (Step 2) and 20 trials are conducted to take the averaged results.

There are two notes concerning this simulation. First, while WTO-positive countries liberalize trade among WTO-positive countries, tariffs on import goods from WTO-negative countries remain. However, this is clearly against the MFN clause, principle of WTO. Second, in relation to the first one, this program intends only to find WTO-positive countries from all WTO members; it cannot say that these WTO-positive countries actually abolish their tariffs based on a reciprocal basis, because other WTO-negative countries may strongly oppose the proposal of this kind of trade liberalization. Consequently, this case shows some results of a supposed situation where WTO-positive countries can accomplish complete trade liberalization exclusively among themselves.[6]

3.5. WTO + APEC

Lastly, consider the program of further trade liberalization using WTO and APEC's "open regionalism." The characters of both have been depicted previously and here, they form the program stated below.

Step 1. Out of 20 countries, select 4 countries and name them APEC. These APEC countries are ordered to eliminate their import tariffs unilaterally under all circumstances. The other 16 countries are classified as non-APEC. These non-APEC countries are all initially WTO-positive and do not impose any tariffs.

Step 2. Randomly select one country from 20. If this is a non-APEC country, give it an opportunity to decide whether (1) to be a WTO-positive country and provide for other WTO-positive countries plus APEC countries with free access into domestic market, or (2) to be a WTO-negative country and return to the initial situation where the country imposes tariffs t on import goods from all other countries in exchange for other WTO-positive countries also imposing tariffs on goods exported from this country.

Step 3. This country selects (1) or (2) in order to increase its government policy objective.

Step 4. Repeat Step 1 through Step 3 300 times.

Simulation results are taken from average values of 20 trials, as in previous cases.

4. The Results

In simulations 3.2. – 3.5., all twenty trials end in the same results despite the randomness of decision-making turns allotted to countries. Therefore, it can be concluded that the results of this simulation are robust and stable.

4.1. VTR

As for the case of VTR (3.1.), the results of simulation show no incentive for any country to lift tariffs voluntarily and unilaterally in a non-preferential manner, at both (c, d) = (12, 2) and (15, 3), and at any value of α. There are two reasons for it on both the firm-owner group and general voter group in all 20 countries; for the firm-owner group, intensified competitiveness in home market will only bring reduction in profit, while from the general voter group's point of view, the decrease of tariff revenue surpasses the increase of total consumer surplus.[7] In this simulation, the phenomenon that the decrease of tariff revenue always surpasses the increase of total consumer surplus is verified from the fact that no countries adopt VTR even at α = 0, where government pays attention only to general voter group. The initial situation does not change at all; hence the results of this case were excluded from the

following tables.

4.2. PTA with and without APEC

[Table 1]

Table 1 summarizes the results of simulation in the case of PTA (3.2.). It shows the number of countries that eliminates tariffs on import goods, i.e. the number of "freed channels," and the ratio of changing each country's government policy objective compared to the initial situation, with the combination of parameter values and each country's market size (Ai). The maximum number of freed channels in each country is 19 (20 minus home country). In the case of PTA, the number of freed channels is equal to the number of BTAs each country makes. The ratio of changing government policy objective is valued at $\alpha = 0.5$ and shown in Table 1 as the percent of "change of surplus," although each government makes decisions through the simulation by changing α. This is because the author wishes to show the change of each country's domestic total surplus (consumer plus producer) and world total surplus from an impartial and benevolent point of view, instead of its government policy objective.

The results where $\alpha = 0$ are not shown in this table because no country wants to conclude BTA with any other countries, being the same as VTR. The fact that the general voter group in any country does not support tariff abolition to any

other countries proves that any tariff abolition must decrease this country's tariff revenue more than increase its total consumer surplus in this model. On the other hand, the reason why the results at $\alpha = 0.75$ are not shown is that these results range evenly between those at $\alpha = 0.5$ and $\alpha = 1$.

Table 1 shows three features concerning each country's freed channels. First, in all cases, the largest country (country 1) liberalizes its imports from, i.e. concludes BTAs with, the least number of countries. The number of freed channels increases as market size decreases and after its number peaks between country 5 and country 10, it declines as market size decreases. The distribution of these numbers indicates that large countries form BTAs with only large countries and refuse to form BTAs with small countries. For example, in the case (c, d) = (12, 2) and $\alpha = 0.25$, country 1 forms BTA only with country 2, country 2 with countries 1, 3, 4, 5, country 5 with all other countries except country 1, and countries 11 – 20 could not form BTAs with countries 1 – 4.

Secondly, the larger the value of α, each countries form more BTAs, at both (c, d) = (12, 2) and (15, 3), although there exists few exceptions (country 5 and 20 at (c, d) = (12, 2) from $\alpha = 0.25$ to 0.5). This is because, as the value of α increases, governments put less weight on the intention of general voter groups, which are opposed to lifting import tariffs. And thirdly, the larger the difference of each country's market size, the less the number of freed channels, indicated from the

comparison of the case (c, d) = (12, 2) and (15, 3). This means that as some countries' market size increase compared with others, they lose their intention of liberalizing imports and of concluding BTAs with other countries.

When the market size of one country increases, the optimal number of BTAs for this country diminishes. This phenomenon can be explained as follows. When other conditions are fixed and the market size of country i, A_i, increases, not only does the revenue of country i's firm gained from the domestic market increase, but the revenue of other countries' firms gained from country i's market also increase. Yet the revenue of country i's firm gained from other countries' markets do not change. Therefore, by canceling BTAs with some existing partner countries and imposing tariffs on imports from them, even though country i's firm will suffer the loss of profit caused by decreasing export, this firm can gain profit from the home market whose market competition will ease by canceling BTAs with some countries. The firm-owner group in country i will then demand its government to cancel some of the BTAs in order to maximize its net gain, i.e. the gain from supplying more good to the home market minus the loss caused by diminishing export to the BTAs-canceled market.

From the point of country's total surplus, Table 1 shows two features. First, surpluses of all relatively small countries are decreased by forming BTAs, and the smaller the market size, the more decrease in its surplus. This is caused by discriminating methods of trade liberalization held by large countries that do not

eliminate tariffs against small countries. On the other hand, the medium- to large-sized countries show an increase in surplus. The largest country 1 suffers from a slight decreased in its surplus when (c, d) = (12, 2), but the decrease enlarges when country 1 concludes more BTAs with other countries and liberalizes an access to its home market.

Secondly, the larger the value of α, the more, in general, the ratio of increase or decrease in regard to each country's total surplus, at both (c, d) = (12, 2) and (15, 3). This is brought by the increase of BTAs concluded by large countries. As α increases, large countries lift only their import tariffs against medium-sized, not small-sized countries. This discriminating trade liberalization worsens the terms of trade for small countries and reduces the profit of the small countries' firm-owner gained from large countries. The changes of these ratios are fairly small at (c, d) = (15, 3), for two reasons: 1. the number of BTAs becomes small and 2. the market size of each country enlarges compared to the welfare effect of tariff policy produced with a given value of t = 20.

[Table 2]

Table 2 similarly summarizes the results of simulation in the case of PTA with APEC (3.3.) at (c, d) = (12, 2). Here, two kinds of APEC groups are assumed and listed to compare the case where APEC is composed of 4 larger countries among 20 (countries 1, 6, 11, 16) with the case of smaller countries (countries 5, 10, 15, 20). Figures

concerning the APEC-type countries in Table 2 are written in italic. The number of freed channels in APEC-type countries is all set at 19 from their "open regionalism." The results at (c, d) = (15, 3) are omitted from this table, as well as from the following tables, because they have the same characteristics as the results at (c, d) = (12, 2).

Comparing Table 1 with Table 2, two features appear about the influence "open regionalism" has on the number of freed channels. First, the total number of freed channels in the world increases more when APEC is composed of larger countries. This is because large countries conclude less BTAs in Table 1, and therefore the increase in the number of freed channels by the adoption of "open regionalism" is large. Second, when α is small, the total number of freed channels in the world increases more with the case of APEC compared with the case of PTA alone. This is because when "open regionalism" is adopted: 1. a small α brings a small number of world BTAs, highlighting an increase in the number of freed channels in APEC-type countries, 2. a large α brings a large reduction in the number of freed channels in each non-APEC country. The latter effect can be called a "free-ride" on APEC effort by non-APEC countries.

These two tables also show two features concerning the influence of "open regionalism" on the change of total surplus in each country. First, most APEC countries has a reduction in their rates of surplus change (the only exception is country 16 when APEC is composed of larger countries), while most non-APEC countries has an

increase of their rates of surplus change (the exceptions are country 2-4 when, again, APEC is composed of larger countries), compared with rates in Table 1. The complete elimination of import tariffs among APEC countries reduces APEC countries' tariff revenues and also reduces profits of APEC firms and the firms located in former BTA partners of some APEC countries, whereas it increases profits of firms located in countries that formerly do not conclude BTAs with some APEC countries. For most APEC countries the former negative effect on surplus exceeds the latter positive effect, while for most non-APEC countries the positive effect of "open regionalism" on surplus exceeds its negative effect (some exceptions mentioned above are caused by inversion of the amounts of these effects). Second, the surplus in medium- to small-size countries has a larger increase or smaller decrease when APEC is composed of larger countries, because the larger APEC market the more the revenues of firms located in the medium- to small-size countries, i.e. the more positive effect of APEC.

What can be said from this examination is that whether APEC will become "a building block" or "a stumbling block" depends on the circumstances. When APEC includes many large (small) countries or when each government takes into account relatively the intention of the general voter group (the firm-owner group), APEC will have a positive (negative) effect on promoting world-wide trade liberalization. From the viewpoint of each country's surplus, an APEC that is composed of large countries is preferable to that of composed small countries, although both can increase most

countries' domestic surpluses. Note that, however, APEC's positive effects on world trade liberalization and on other non-APEC countries' surplus sacrifice APEC countries' domestic surplus.

4.3. WTO with and without APEC

[Table 3]

The results of simulation in the case of WTO (3.4.) at (c, d) = (12, 2) are in Table 3. The signs "p." or "n." indicate whether this country is WTO-positive or WTO-negative. This table shows that relatively smaller countries compose the WTO-positive group, and the greater the value of α, the more countries belonging to the WTO-positive group. The reasoning to explain this phenomenon is the same as that in the case of PTA. The most striking point in this table is that relatively small countries increase their surpluses, and the smaller one country's market size is the greater the ratio of increase in its surplus, while large countries decrease their surpluses. This result is quite opposite to the case of PTA. The reason why this kind of contraposition occurs is that, in the case of WTO, large countries in WTO-positive group (country 3 and 4 at α = 0.5, for example) open their home market to small countries, while they keep levying tariffs against super-large WTO-negative countries (country 1 and 2 in this case), which promote exports from small countries to large countries in WTO-positive group and increase firm profit located in small countries.

Small countries can indeed export without tariff to medium- or large-size countries even in the case of PTA. However, these import countries also conclude free trade agreements with large countries and allow them to export goods without imposing tariffs. Consequently, the competition in medium- and large-size countries intensifies and the profit from these market decreases. The larger the value of α is, the larger increase of small countries' surpluses, which is brought by the increase of WTO-positive countries.

[Table 4]

Table 4 shows the results of WTO with APEC (3.5.) at (c, d) = (12, 2). The sign A. indicates that this country belongs to APEC. Upon comparing Table 3 with Table 4, "open regionalism" has two influences on the number of freed channels. First, the total number of freed channels in the world increases on a larger scale when APEC is composed of larger countries, which is the same result and has the same reason as the case of PTA with APEC. Second, the total number of freed channels in the world is larger when α is large. This contradictory result is brought from the fact that WTO can deter WTO-positive countries from "free-riding" on APEC effort.

Concerning the influence of "open regionalism" on the change of total surplus in each country, you can also see two features from the two tables. First, in almost all cases, the countries' surpluses increase when APEC is composed of larger countries, while they decrease when APEC is composed of smaller countries, when compared with

the case of WTO alone. This is because the large APEC market produces the positive effect of "open regionalism," more than its "negative effect" of APEC on each country's surplus. Second, most APEC countries increase their surplus in both cases when APEC is formed of larger countries and smaller countries, although the largest country (country 1 or 5) reduces its domestic surplus. This result is quite contrary to the case of PTA with APEC, where the surpluses of APEC countries decrease. The reason why surpluses of APEC countries increase at the case WTO with APEC is that WTO can minimize the negative effect of "open regionalism" on APEC itself.

The judgment whether APEC will become "a building block" or "a stumbling block" in the case of WTO, again, depends on circumstances. When APEC includes many large (small) countries or when each government relatively takes into account the intention of the firm-owner group (the general voter group), APEC will have a positive (negative) effect on promoting world-wide trade liberalization. From the viewpoint of each country's surplus, APEC composed of larger countries increase most countries' surplus, while APEC formed of smaller countries decrease them, compared with the case of WTO. The advantage of WTO system is that APEC countries sacrifice fairly little in order to liberalize world trade by "open regionalism."

5. Concluding Remarks

This paper mainly examines the conditions when APEC will become "a building block" or "a stumbling block." Three main criteria of being "a building block" that promote trade liberalization, can be seen from the careful investigations of the simulation results. First and foremost, the inclusion of many large countries in APEC is crucial. Second, "open regionalism" has good and vigorous effects on world trade liberalization and each country's surplus if it goes along with WTO-based liberalization. Third, when the prominent method for furthering trade liberalization is by forming PTAs, it is important to deter non-APEC countries from "free-riding" on APEC efforts. The form of "open regionalism" still remains at the proposal stage, and it is not clear whether any of the present economies or groups in APEC would follow it. However, the analysis shows that this policy has a potential ability to become "a building block" in world trading system.

The analysis developed here has much room for improvement. The interpretation of the structure of basic model and the procedure of computer simulation alone leave many problems: lack of the restriction of production and supply in each country, exogenous determination of APEC-type countries, disagreement of MFN principle with the procedure of WTO-positive countries, and so on. The revision of these points may result in quite different outcomes. The examination concerning

many plans of modifications is my next subject.

Download of Program

The program used in this paper will be available from the following Website.

http://www.fbc.keio.ac.jp/~endoh/index.htm

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[1] Previous papers concerning the stability of PTAs, Riezman (1985), Kennan and Riezman (1990), Bond and Syropoulos (1996) and Yi (1996), among others, consider the import tariffs adjustable to optimal rates. Here, however, the rate of tariff t is treated as given, therefore the choice for each country is to impose t or 0 on its imports, for the clarity of analyses, as well as because it is rarely observed that countries influence their terms of trade with each other through the change of their tariff rates.

[2] It makes little difference if plural firms are admitted to exist in one country, as Krishna (1998). If the number of firms is decided endogenously in order to reduce excess revenue to zero, like Venables (1987), the results may change largely.

[3] Here tariff revenue is assumed to be distributed to the general voter group. If this model is modified to the situation that the firm-owner group can gain a part of the tariff revenue, some outcomes presented in the following are largely changed.

[4] When these differences are shown by each country's GNP, compared with U.S.A., which has the largest GNP (7,783,092 millions $), Slovak Republic (19,801 millions $), Tunisia (19,433 millions $) and Ecuador (18,785 millions $) are 1/400 of it while Mongolia (998 millions $), Burundi (924 millions $) and Eritrea (852 millions $) are 1/8000. Using population, these differences are demonstrated alike. Compared with China, which has the largest population (1,227,177 thousands), Uruguay (3,266 thousands), Singapore (3,104 thousands) and Liberia (2,886 thousands) are 1/400 of it while Vanuatu (177 thousands), St. Lucia (159 thousands) and São Tomé and Principe (138 thousands) are 1/8000. These data are given as of 1997 by the World Bank, World Bank Atlas 1999.

[5] This definition that APEC is a subset of WTO could be justified from the fact that among 18 economies belonging to APEC, only China and Taiwan are not participants of WTO.

[6] In the case where WTO-positive countries abolish their tariffs based on the MFN clause and do not impose tariffs on WTO-negative countries, the procedure of simulation becomes the same as the case of VTR where no country wants to lift tariffs, presented in Section 4.

[7] In the case where the difference of each country's A is relatively small (small d) and the general voter group heavily affects the government policy objective (small α), the results of the simulations show that some small countries adopt VTR, when the increase of total consumer surplus surpasses the decrease of firm profit and tariff revenue. The combination of parameter values examined in this paper, however, does not produce this phenomenon.

Table 1 Results of simulations in the case (2) PTA

Country No. (i)	Ai	(c, d) = (12, 2)					
		α = 0.25		α = 0.5		α = 1	
		No. of F. Ch.	change of surplus	No. of F. Ch.	Change of Surplus	No. of F. Ch.	Change of Surplus
1	162,754.8	1	-0.0001%	2	-0.0001%	3	-0.0003%
2	40,688.7	4	0.0350%	6	0.0322%	7	0.0295%
3	18,083.9	5	0.0166%	9	0.1503%	11	0.1397%
4	10,172.2	8	0.0550%	11	0.0299%	14	0.2859%
5	6,510.2	18	0.0956%	17	0.0561%	17	0.0262%
6	4,521.0	17	0.0109%	18	0.0717%	18	0.0378%
7	3,321.5	17	0.0161%	18	0.0808%	18	0.0448%
8	2,543.0	16	-0.0315%	17	-0.0283%	18	0.0492%
9	2,009.3	16	-0.0299%	17	-0.0266%	17	-0.0643%
10	1,627.5	16	-0.0287%	17	-0.0253%	17	-0.0633%
11	1,345.1	15	-0.0575%	16	-0.0770%	17	-0.0625%
12	1,130.2	15	-0.0569%	16	-0.0764%	17	-0.0619%
13	963.0	15	-0.0563%	16	-0.0759%	16	-0.1143%
14	830.4	15	-0.0559%	15	-0.1054%	16	-0.1139%
15	723.4	15	-0.0556%	15	-0.1051%	16	-0.1136%
16	635.8	15	-0.0553%	15	-0.1048%	15	-0.1432%
17	563.2	15	-0.0550%	15	-0.1046%	15	-0.1430%
18	502.3	15	-0.0548%	15	-0.1044%	15	-0.1428%
19	450.8	15	-0.0546%	15	-0.1042%	15	-0.1426%
20	406.9	15	-0.0544%	14	-0.1230%	14	-0.1614%
World	-----	268	0.0003%	284	0.0004%	296	0.0005%

Country No. (i)	(c, d) = (15, 3)						
	Ai	α = 0.25		α = 0.5		α = 1	
		No. of F. Ch.	Change of Surplus	No. of F. Ch.	Change of Surplus	No. of F. Ch.	Change of Surplus
1	3,269,017.4	0	0.0000%	1	0.0000%	1	0.0000%
2	408,627.2	1	0.0001%	3	0.0059%	4	0.0059%
3	121,074.7	3	0.0024%	5	0.0012%	6	0.0010%
4	51,078.4	4	0.0007%	7	0.0021%	8	0.0018%
5	26,152.1	6	0.0010%	8	-0.0007%	11	0.0022%
6	15,134.3	7	0.0002%	10	-0.0006%	12	-0.0008%
7	9,530.7	9	0.0002%	13	-0.0005%	14	-0.0008%
8	6,384.8	11	-0.0001%	16	-0.0014%	17	-0.0007%
9	4,484.2	15	-0.0001%	16	-0.0014%	16	-0.0017%
10	3,269.0	14	-0.0003%	15	-0.0018%	16	-0.0016%
11	2,456.1	14	-0.0002%	15	-0.0018%	15	-0.0020%
12	1,891.8	13	-0.0004%	14	-0.0020%	15	-0.0020%
13	1,487.9	13	-0.0004%	14	-0.0020%	15	-0.0020%
14	1,191.3	12	-0.0004%	13	-0.0021%	14	-0.0022%
15	968.6	12	-0.0004%	13	-0.0021%	14	-0.0022%
16	798.1	12	-0.0004%	13	-0.0021%	13	-0.0023%
17	665.4	11	-0.0005%	12	-0.0021%	13	-0.0023%
18	560.5	11	-0.0005%	12	-0.0021%	12	-0.0024%
19	476.6	11	-0.0005%	12	-0.0021%	12	-0.0024%
20	408.6	11	-0.0005%	12	-0.0021%	12	-0.0024%
World	-----	190	0.0000%	224	0.0000%	240	0.0000%

Ta le 2 Results of simulations in the case (3) PTA + APEC at (c, d) = (12, 2)

APEC-type countries : 1, 6, 11, 16 (larger countries)						
Country	a = 0.25		a = 0.5		a = 1	
No.	No. of	Change of	No. of	Change of	No. of	Change of
(i)	F. Ch.	Surplus	F. Ch.	Surplus	F. Ch.	Surplus
1	*19*	*-0.0003%*	*19*	*-0.0004%*	*19*	*-0.0006%*
2	3	0.0017%	4	0.0007%	5	-0.0001%
3	4	0.0306%	7	0.0287%	8	0.0249%
4	7	0.0813%	9	0.0725%	11	0.0662%
5	8	0.1195%	11	0.1086%	15	0.1016%
6	*19*	*-0.0418%*	*19*	*-0.0667%*	*19*	*-0.0897%*
7	14	0.0521%	15	0.1455%	15	0.1340%
8	13	0.0055%	14	0.0384%	15	0.1410%
9	17	0.0085%	14	0.0411%	14	0.0290%
10	17	0.0102%	14	0.0429%	14	0.0308%
11	*19*	*-0.0472%*	*19*	*-0.0753%*	*19*	*-0.1012%*
12	16	-0.0177%	17	-0.0064%	14	0.0330%
13	15	-0.0364%	17	-0.0057%	13	-0.0192%
14	15	-0.0360%	16	-0.0352%	13	-0.0187%
15	15	-0.0356%	16	-0.0348%	13	-0.0183%
16	*19*	*-0.0477%*	*19*	*-0.0760%*	*19*	*-0.1022%*
17	15	-0.0350%	15	-0.0535%	12	-0.0475%
18	15	-0.0348%	15	-0.0533%	12	-0.0473%
19	15	-0.0346%	15	-0.0531%	12	-0.0471%
20	15	-0.0344%	15	-0.0529%	12	-0.0470%
World	280	0.0002%	290	0.0002%	274	0.0003%

APEC-type countries : 5, 10, 15, 20 (smaller countries)						
Country	a = 0.25		a = 0.5		a = 1	
No.	No. of	Change of	No. of	Change of	No. of	Change of
(i)	F. Ch.	Surplus	F. Ch.	Surplus	F. Ch.	Surplus
1	1	0.0001%	2	0.0001%	3	0.0000%
2	3	0.0368%	5	0.0343%	6	0.0316%
3	4	0.0231%	7	0.1568%	9	0.1466%
4	6	0.0653%	9	0.0418%	12	0.2985%
5	*19*	*-0.0567%*	*19*	*-0.0977%*	*19*	*-0.1334%*
6	13	0.0224%	14	0.0859%	14	0.0542%
7	13	0.0281%	14	0.0955%	14	0.0618%
8	12	-0.0192%	13	-0.0131%	14	0.0666%
9	12	-0.0176%	13	-0.0113%	13	-0.0465%
10	*19*	*-0.0721%*	*19*	*-0.1243%*	*19*	*-0.1697%*
11	15	-0.0444%	12	-0.0615%	13	-0.0447%
12	15	-0.0437%	12	-0.0610%	13	-0.0441%
13	15	-0.0432%	16	-0.0595%	12	-0.0964%
14	15	-0.0427%	15	-0.0891%	12	-0.0960%
15	*19*	*-0.0732%*	*19*	*-0.1261%*	*19*	*-0.1722%*
16	15	-0.0421%	15	-0.0885%	12	-0.0955%
17	15	-0.0418%	15	-0.0882%	11	-0.1249%
18	15	-0.0416%	15	-0.0880%	11	-0.1248%
19	15	-0.0414%	15	-0.0879%	11	-0.1246%
20	*19*	*-0.0733%*	*19*	*-0.1264%*	*19*	*-0.1726%*
World	260	0.0002%	268	0.0003%	256	0.0004%

Ta le 3 Results of simulations in the case (4) WTO at (c, d) = (12, 2)

Country No. (i)	Ai	a = 0.25			a = 0.5			a = 1		
		p./n.	No. of F. Ch.	Change of Surplus	p./n.	No. of F. Ch.	Change of Surplus	p./n.	No. of F. Ch.	Change of Surplus
1	162,754.8	n.	0	-0.0004%	n.	0	-0.0007%	n.	0	-0.0013%
2	40,688.7	n.	0	-0.0062%	n.	0	-0.0099%	p.	18	-0.0104%
3	18,083.9	n.	0	-0.0237%	p.	17	-0.0133%	p.	18	-0.0108%
4	10,172.2	p.	16	-0.0090%	p.	17	-0.0065%	p.	18	-0.0013%
5	6,510.2	p.	16	-0.0006%	p.	17	0.0030%	p.	18	0.0101%
6	4,521.0	p.	16	0.0064%	p.	17	0.0106%	p.	18	0.0187%
7	3,321.5	p.	16	0.0113%	p.	17	0.0158%	p.	18	0.0245%
8	2,543.0	p.	16	0.0146%	p.	17	0.0194%	p.	18	0.0284%
9	2,009.3	p.	16	0.0170%	p.	17	0.0218%	p.	18	0.0310%
10	1,627.5	p.	16	0.0187%	p.	17	0.0236%	p.	18	0.0329%
11	1,345.1	p.	16	0.0199%	p.	17	0.0249%	p.	18	0.0343%
12	1,130.2	p.	16	0.0208%	p.	17	0.0258%	p.	18	0.0353%
13	963.0	p.	16	0.0216%	p.	17	0.0266%	p.	18	0.0361%
14	830.4	p.	16	0.0221%	p.	17	0.0272%	p.	18	0.0367%
15	723.4	p.	16	0.0226%	p.	17	0.0276%	p.	18	0.0372%
16	635.8	p.	16	0.0230%	p.	17	0.0280%	p.	18	0.0376%
17	563.2	p.	16	0.0233%	p.	17	0.0283%	p.	18	0.0379%
18	502.3	p.	16	0.0235%	p.	17	0.0286%	p.	18	0.0382%
19	450.8	p.	16	0.0237%	p.	17	0.0288%	p.	18	0.0384%
20	406.9	p.	16	0.0239%	p.	17	0.0290%	p.	18	0.0386%
World	-----	--	272	0.0002%	--	306	0.0003%	--	342	0.0006%

Ta le 4 Results of simulations in the cases (5) WTO + APEC at (c, d) = (12, 2)

APEC-type countries : 1, 6, 11, 16 (larger countries)									
Country	a = 0.25			a = 0.5			a = 1		
No.	A./	No. of	Change of	A./	No. of	Change of	A./	No. of	Change of
(i)	p./n.	F. Ch.	Surplus	p./n.	F. Ch.	Surplus	p./n.	F. Ch.	Surplus
1	*A.*	*19*	*-0.0034%*	*A.*	*19*	*-0.0034%*	*A.*	*19*	*-0.0033%*
2	n.	0	0.0016%	n.	0	-0.0055%	p.	19	-0.0080%
3	n.	0	0.0062%	p.	18	-0.0024%	p.	19	-0.0013%
4	n.	0	0.0119%	p.	18	0.0146%	p.	19	0.0171%
5	n.	0	0.0158%	p.	18	0.0313%	p.	19	0.0348%
6	*A.*	*19*	*0.0360%*	*A.*	*19*	*0.0430%*	*A.*	*19*	*0.0469%*
7	p.	15	0.0420%	p.	18	0.0501%	p.	19	0.0545%
8	p.	15	0.0462%	p.	18	0.0547%	p.	19	0.0593%
9	p.	15	0.0491%	p.	18	0.0578%	p.	19	0.0625%
10	p.	15	0.0510%	p.	18	0.0599%	p.	19	0.0647%
11	*A.*	*19*	*0.0540%*	*A.*	*19*	*0.0619%*	*A.*	*19*	*0.0662%*
12	p.	15	0.0535%	p.	18	0.0625%	p.	19	0.0674%
13	p.	15	0.0543%	p.	18	0.0634%	p.	19	0.0683%
14	p.	15	0.0549%	p.	18	0.0640%	p.	19	0.0689%
15	p.	15	0.0554%	p.	18	0.0646%	p.	19	0.0695%
16	*A.*	*19*	*0.0576%*	*A.*	*19*	*0.0655%*	*A.*	*19*	*0.0699%*
17	p.	15	0.0561%	p.	18	0.0653%	p.	19	0.0702%
18	p.	15	0.0563%	p.	18	0.0656%	p.	19	0.0705%
19	p.	15	0.0566%	p.	18	0.0658%	p.	19	0.0708%
20	p.	15	0.0568%	p.	18	0.0661%	p.	19	0.0710%
World	--	256	0.0011%	--	346	0.0013%	--	380	0.0016%

APEC-type countries : 5, 10, 15, 20 (smaller countries)									
Country No. (i)	a = 0.25			a = 0.5			a = 1		
	A./ p./n.	No. of F. Ch.	Change of Surplus	A./ p./n.	No. of F. Ch.	Change of Surplus	A./ p./n.	No. of F. Ch.	Change of Surplus
1	n.	0	-0.0002%	n.	0	-0.0005%	n.	0	-0.0011%
2	n.	0	-0.0026%	n.	0	-0.0081%	p.	18	-0.0105%
3	n.	0	-0.0098%	p.	17	-0.0141%	p.	18	-0.0112%
4	n.	0	-0.0186%	p.	17	-0.0080%	p.	18	-0.0021%
5	*A.*	*19*	*-0.0068%*	*A.*	*19*	*0.0011%*	*A.*	*19*	*0.0092%*
6	p.	15	-0.0010%	p.	17	0.0083%	p.	18	0.0176%
7	p.	15	0.0034%	p.	17	0.0134%	p.	18	0.0233%
8	p.	15	0.0065%	p.	17	0.0169%	p.	18	0.0272%
9	p.	15	0.0087%	p.	17	0.0193%	p.	18	0.0298%
10	*A.*	*19*	*0.0117%*	*A.*	*19*	*0.0219%*	*A.*	*19*	*0.0321%*
11	p.	15	0.0114%	p.	17	0.0223%	p.	18	0.0330%
12	p.	15	0.0123%	p.	17	0.0232%	p.	18	0.0340%
13	p.	15	0.0130%	p.	17	0.0240%	p.	18	0.0348%
14	p.	15	0.0135%	p.	17	0.0246%	p.	18	0.0354%
15	*A.*	*19*	*0.0157%*	*A.*	*19*	*0.0260%*	*A.*	*19*	*0.0364%*
16	p.	15	0.0143%	p.	17	0.0254%	p.	18	0.0363%
17	p.	15	0.0146%	p.	17	0.0257%	p.	18	0.0366%
18	p.	15	0.0149%	p.	17	0.0260%	p.	18	0.0369%
19	p.	15	0.0151%	p.	17	0.0262%	p.	18	0.0371%
20	*A.*	*19*	*0.0171%*	*A.*	*19*	*0.0275%*	*A.*	*19*	*0.0378%*
World	--	256	0.0002%	--	314	0.0003%	--	346	0.0006%