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THE ECONOMIC INTEGRATION IN EAST ASIA AND ITS IMPACTS ON INDUSTRIAL RESTRUCTURING*

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This paper examines the optimal strategy of regional economic integration considering the asymmetric technologies in the Asia Pacific Region. Based on the welfare analysis of three types of FTA regimes between technologically asymmetric countries, this paper demonstrates that the optimal path of regional integration for the country with an intermediate technology level would be to form multiple bilateral FTAs, i.e., Hub & Spoke type FTA between technically asymmetric countries from the very initial stage. The second best regime is the multilateral Asia-wide FTA. The worst case for a country with an intermediate technology would be to form a FTA with a country with advanced technologies, and extend the FTA with the less developed countries in the later stage. These results imply that the optimal strategy of regional integration for a country with an intermediate technology level, such as Korea, is to form a Hub & Spoke type FTA rather than a bilateral FTA with Japan followed by the participation of other Asian countries.

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Ⅰ. INTRODUCTION

With the launch of official negotiation on the Korea-Japan Free Trade

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Agreement, a deluge of discussions and policy suggestions are provided over the future direction of FTA formation in the Asian region from the perspective of Korea, as a country with an intermediate technology and an intermediate market size. The current Korean government gives the first priority on the formation of the bilateral FTA with Japan followed by the FTA with ASEAN and other Asian countries while China remains as a partner in the future, not in a near future. Regarding the above Korean government approach, many criticisms are raised especially from the long-term industrial restructuring aspects.

One argument goes that when Korea forms a FTA with Japan excluding all the other Asian counties, Korean industrial structure, which is vertically integrated to the Japanese industries in terms of technology, might specialize in less valued-added sectors, where she has comparative advantage compared to Japan. Other counter-argument goes that with the larger market access chances and the increased competition with Japan, the efficiency of the Korean economy will be enhanced. Without theoretical consensus on the long-term industrial effects of Korea-Japan exclusive bilateral FTA, the Korean government intended to launch the agreement. However, lately, the more-in-depth analysis on the industrial effects of bilateral FTA is emphasized.[1] The arguments on the long-term industrial effects of Korea-Japan FTA can be generalized as the issue of the preferential trade agreement's long-term effects between the technologically asymmetric countries. This paper targets to examine this controversial issue focusing on the impacts of technical asymmetry on the PTA's welfare effects and the optimal path of regional integration in the Asian region considering the technological asymmetry.

Dynamic path to reach the Asian economic integration can be categorized into three groups: i) Sequential bilateral trade agreement initiated by the Korea-Japan FTA followed by Korea's FTA with other Asian countries, ii) Hub & Spoke type FTA, i.e., simultaneous multiple bilateral FTAs, and iii) a multilateral FTA such as a Pan-Asia wide FTA. This paper will examine the welfare effects and the producer surplus effects of each case, and determine the optimal path for a country with intermediate technology such as Korea.

There have been several approaches to examine the economic impacts of forming preferential trade agreement, and prior studies can be categorized into three groups. The first group, based on simulations about the impacts of FTA

[1] Refer James & Movshuk (2003), Brown, Deardorff & Stern (2003) and Yamazawa (2001) for the details of the economic and the political backgrounds of Korea-Japan FTA negotiation

formation through CGE model, tried to provide a projection on the static effects on trade balance and other macroeconomic variables.[2] The second group of studies focuses on the coalition formation issue based on the incentive mechanism to abide by the FTA arrangement. Through this analytical model based approach, they tried to examine whether FTA is a stumbling bloc or a stepping-stone towards multilateral trade liberalization. The third approach is led by economic geographic approaches with special emphasis on the spatial economy.[3] This approach has its strong points in examining industrial agglomeration and relocation effect of FTA.

Regarding the economic impacts of FTA in the Asian region, most studies took the first approach, which is to estimate the impact of removing tariff barriers between FTA member countries based on computable general equilibrium model. It is well known that the CGE approach has several shortcomings caused by its static approach in addition to too strong assumptions such as perfectly competitive markets and the constant returns to scale in the production technology. Even with these shortcomings of CGE approaches, there have been few trials to provide comprehensive analytic model analysis on FTA issues in the Asia.[4]

There are several representative prior researche, which can be categorized as a second group of FTA analysis focusing on coalition formation, and policy coordination incentive issue based on analytic model, although none of them paying special attention to the Asian region. Grossman and Helpman (1995) examines the conditions for the benefit from FTA to be larger than the loss in import competing industries. They assume two small countries with no market power. A policy with respect to FTA formation issue is decided to maximize the political objective function, while the aggregate welfare of voters is given by the summation of the aggregate labor supply, the firms' profit, the tariff revenue

[2] The representative studies of CGE approaches include Hinojosa-Ojeda, Raul, S. Robinson, and F. De Paolis (1999), Scollay, Robert and J. Gilbert (2000), and Brown, Drusilla, A. Deardorff, and R. Stern (1996).

[3] The basic methodology and the major findings from economic geographic approaches are concisely summarized in M. Fujita, P. Krugman and A. Venables (2000).

[4] McKibbin (1998) and McKibbin, Lee & Cheong (2004) are the recent innovation of traditional CGE model approaches permitting an incorporation of rational expectations and forward looking inter-temporal behavior on the part of individual agents. Based on dynamically modified model, these works show that in the short run, there are adjustment costs, which reduce the short run income gains relative to the long run gains. Moreover, they demonstrate that the output gains are greater when the tariff cuts are phased out than when they are implemented at once.

and the consumer surplus. The government's objective function is the summation of firms' political contributions and the weighted aggregate welfare. Based on these assumptions, Grossman and Helpman examine the condition for the government's support for the FTA, and demonstrate that FTA is supported when the enhanced protection is more likely, which deteriorates social welfare.

Bagwell and Staiger (1997) show that the formation of FTA between symmetric countries tends to increase tariff levels temporarily to reduce the incentive to deviate from the tariff cooperation based on the self-enforcing mechanism during the transition period. However, custom union tends to decrease the temporary tariff level because of the market power effect. Krishna (1998) argues that trade-diverting preferential agreement is more likely to be supported politically, and such preferential arrangements could critically change domestic incentives. So multilateral liberalization could be rendered infeasible by preferential arrangement. Freund (2000) shows that as the multilateral tariff was lowered, it is more likely that the tariff cooperation for FTA is sustained.

The prior studies provided much progress in understanding the welfare effects of FTA formation and dynamic incentive issues. However, most of them were based on the assumption of symmetric countries with complete information assumption. North East Asian region, composed of Korea, Japan and China, is characterized by sharp differences in the technology levels and market size. In addition, information about each country's technology level and government's indirect influences on corporate sectors are not fully shared by each other country.

With these backgrounds, this paper examines the effects of technology asymmetry on the welfare level of FTA member country, and the optimal dynamic path of FTA formation among the technologically asymmetric countries. Based on a simple model of four countries with linear demand functions and differentiated products, this paper demonstrates that the optimal path of regional integration for the country with an intermediate technology level would be to form multiple bilateral FTAs, i.e., Hub & Spoke type FTA between technically asymmetric countries from the very initial stage. The second best regime is the multilateral Asia-wide FTA. The worst case for a country with an intermediate technology would be to form an FTA with a country with advanced technologies, and to extend the FTA with the less developed countries in the later stage. These results imply that the optimal strategy of regional integration for a country with an intermediate technology level, such as Korea, is forming a

Hub & Spoke type FTA rather than a bilateral FTA with Japan followed by the participation of other Asian countries.

This paper is organized as follows. In section Ⅱ, the theoretical model is described focusing on the case of FTA formation between symmetric countries as a benchmark discussion. Section Ⅲ examines the influences of technology asymmetry on the welfare level of each country, determines the optimal path of regional economic integration based on the welfare analysis. Section Ⅳ discusses policy implications and concludes.

Ⅱ. THE MODEL.

Assume that 4 countries with asymmetric technologies consider the formation of preferential trade agreements among them. Country A is assumed to have the most advanced technologies, i.e., has the lowest marginal cost to produce the same unit value output compared to other competing counties. Country B is assumed to have the intermediate level of technologies while country C and D have the lowest level of technologies, i.e., the highest marginal cost: $c_A < c_B < c_C = c_D$.[5] To focus on the impacts of asymmetric technologies, we assume that the market size and the consumer utility structure of each country are symmetric. The inverse demand function of each country is defined as follows: $P_i = a - bQ_i$ where $i = A, B, C, D$ and Q_i is the total quantity demanded in market i. There is one representative firm in each country. The inverse demand function in country A is given as follows: $P_A = a - b(q_A + \chi_{BA} + \chi_{CA} + \chi_{DA})$ where q_A is the output of firm A for the home market and χ_{BA} is the output produced by the firm in country B to export to country A.[6]

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[5] Production technology of an industry is reflected in its cost structure when we assume other variables such as quality and quantity is given. In the same line, the feature of technology in this model is expressed through the marginal cost structure because fixed cost is not introduced in this model. Therefore, marginal cost in this paper does not simply reflect the production factor cost, but the general technology factors which might be usually reflected in the fixed cost structure. Consequentially, the technology gap is reflected in the marginal cost difference between the countries.

[6] The partial equilibrium analysis in this model can be extended to a general equilibrium analysis with the introduction of consumer preferences incorporating substitution effects between the commodities. However, this extension involves heavier technical terms while producing few additional economic insights on the impacts of technology asymmetry on the welfares of integrating counties. Therefore, a partial equilibrium analysis is taken in this paper mainly to

The profit function of firm A under MFN regime with no preferential agreement is described as:

$$\Pi_A=(P_A-c_A)q_A+(P_A-c_A-t_B)\chi_{AB}+(P_C-c_A-t_C)\chi_{AC} \\ +(P_D-c_A-t_D)\chi_{AD}, \quad (1)$$

where c_A is the marginal production cost of firm A, and t_i is the import tariff imposed by country i.

The inverse demand functions and the profit functions for B, C, and D are defined in the same way respectively. The government of each country decides its trade policy, i.e., FTA formation strategy and the import tariff level, and then each firm decides its output strategy after it observes the trade policies. In this two-stage game, the market equilibrium can be obtained by backward induction.

The welfare effects of MFN regime between technically asymmetric countries as a benchmark discussion

To examine the welfare effects of various types of FTA formation between technologically asymmetric countries, we check the case of MFN-type regime with no preferential trade agreement among 4 countries as a benchmark discussion.[7] When each country's trade policy is decided according to MFN (Most Favored Nation) principle with no preferential agreement, the equilibrium tariffs of country A, B, C, D under the simultaneous decision-making process are decided in the following way. By backward induction, the equilibrium output of the firm in each country is determined first. The best response functions of firm A in each market are derived from the profit maximization problem with respect to output levels as strategic variables. The

focus our analysis on the effects of technology asymmetry with the technically tractable model.

[7] The Most Favored Nation (MFN) clause, which is, As well known, the cornerstone of WTO system, represents the trading system where all member countries are treated as the most favored nation with no disadvantage compared to other member countries. That is, if one country is treated as a most favored nation, the same treatment should be extended to the all member countries according to MTN clause. In this context, FTA formation is strictly contradictory to the MFN clause, the basic principle of WTO. However, the political realities where the leading countries in the WTO system are also the leaders in the formation of PTAs, compromise two conflicting features as in GATT's Article XXIV. Refer Hoekman & Kostecki (2001) for the detailed discussion on the relationship between MFN clause and the PTF formation.

best response functions of firm B, C, D are derived in the same way. Moreover, to simply the notation, we assume the technology differences between the countries are symmetric in the following sense: $c_A = c - \gamma$, $c_B = c$, $c_C = c_D = c + \gamma$, while $\gamma > 0$. Then, the four representative firms' equilibrium outputs in country A are obtained by solving four firms' reaction functions in country A simultaneously:

$$q_A = \frac{a - c + 6\gamma + 3t_A}{5b}, \quad \chi_{BA} = \frac{a - c + \gamma - 2t_A}{5b}, \quad \chi_{CA} = \frac{a - c - 4\gamma - 2t_A}{5b},$$
$$\chi_{DA} = \frac{a - c - 4\gamma - 2t_A}{5b}. \tag{2}$$

With asymmetric technologies and symmetric demand functions, the equilibrium output in country B, C and D are respectively:

$$q_B = \frac{a - c + \gamma + 3t_A}{5b}, \quad \chi_{AB} = \frac{a - c + 6\gamma - 2t_A}{5b}, \quad \chi_{CB} = \frac{a - c - 4\gamma - 2t_B}{5b},$$
$$\chi_{DA} = \frac{a - c - 4\gamma - 2t_A}{5b}$$
$$q_C = \frac{a - c - 4\gamma + 3t_C}{5b}, \quad \chi_{AC} = \frac{a - c + 6\gamma - 2t_C}{5b}, \quad \chi_{BC} = \frac{a - c + \gamma - 2t_C}{5b},$$
$$\chi_{DC} = \frac{a - c - 4\gamma - 2t_C}{5b}$$
$$q_D = \frac{a - c - 4\gamma + 3t_D}{5b}, \quad \chi_{AD} = \frac{a - c + 6\gamma - 2t_D}{5b}, \quad \chi_{BD} = \frac{a - c + \gamma - 2t_D}{5b},$$
$$\chi_{CD} = \frac{a - c - 4\gamma - 2t_D}{5b}. \tag{3}$$

The social welfare function of the country A is defined as the summation of the consumer surplus, the producer surplus, and the government surplus, i.e., the import tariff revenue:

$$SW = CS + PS + GS = \int_{P^*}^{a} D(P)dP + \prod_{AA} + \prod_{AB} + \prod_{AC} + \prod_{AD} + t(\chi_{BA} + \chi_{CA} + \chi_{DA}). \tag{4}$$

With the continuously quasi-concave well-behaving social welfare function, the optimal trade policy for country A under the MFN trading regime is derived as a solution of the first order condition of the social welfare maximization problem with respect to the tariff as follows: $t_B^* = (9a - 9c + 4\gamma)/33$. Under the

MFN trading regime, the social welfare of country A is obtained by substituting the equilibrium tariffs and equilibrium outputs into the social welfare functions respectively as follows:

$$SW_A(MFN) = \frac{54 + 891a^2 + 945c^2 - 198a(9c - 4r) + 1488r + 13457r^2}{2178b} \\ \frac{-12c(9 + 190r)}{2178b}.$$

In the same way, the equilibrium tariff and the welfare of country B are obtained as follows respectively: $t_B^* = (9 - 9c - \gamma)/33$,

$$SW_B(MFN) = \frac{927 + 18a^2 + 945c^2 + 18r + 506r^2 - 6c(309 + 13r)}{2178b} \\ \frac{+a(-36c + 60r)}{2178b}.$$

Ⅲ. WELFARE ANALYSIS OF DIFFERENT FTA FORMATION STRATEGIES AMONG TECHNICALLY ASYMMETRIC COUNTRIES

The dynamic path of FTA formation in the Asian region can be categorized into three categories as follows: i) Sequential bilateral free trade agreement initiated by the Korea-Japan FTA followed by Korea's FTA with other Asian countries, ii) Hub & Spoke type FTA, i.e., simultaneous multiple bilateral FTAs, and iii) a multilateral FTA such as a Pan-Asia wide FTA. The welfare effect of each scenario is examined in sequence. Three different paths of FTA formation produce different effects not only in static terms but in dynamic terms. Moreover, the dynamic effects amplify the static effects due to the economies of scale effects and the learning effects. In this section, to focus on the comparison of welfare effect of three different scenarios of FTA formation, the discussion is limited to the static effects of three different scenarios.[8]

[8] The basic feature of the sequential bilateral FTA in this model is that in the first stage of economic integration, just two countries such as country A and B form FTA while all the other countries remains as non-member country. In the second stage, bilateral FTA between country B and C is formed in addition to the already existing FTA between country A and B. Therefore, the first stage, there was only one bilateral FTA, while in the second stage, there are two bilateral FTAs. Meanwhile, in the Hub & Spoke FTA regime, country B, for example, forms bilateral FTA with country A, and at the same time she forms bilateral FTA with country C while country A and C have no preferential relationship to each other in the first

3.1 Equilibria of three different FTA formation strategies

When a country with an intermediate technology level (Country B) takes the strategy of forming a sequential bilateral FTA formation, first with a technologically advanced country (A) followed by the bilateral FTA with a lower-technology level country (C), the welfare effects of the strategy turns out as follows. The total of welfare of the sequential bilateral FTA formation can be obtained by summing up the each stage's welfare, first, the welfare of bilateral FTA formation with country A, and second, the welfare of multiple bilateral FTAs stage such as the simultaneous bilateral FTA between A&B and B&C. We examine the first stage welfare, and add up with the second stage welfare.

In the first stage, when country B forms an exclusive FTA with country A excluding country C and D, the equilibrium welfare is obtained by backward induction. First, the reaction functions of four representative firms are derived with the assumption that firms observe the formation bilateral FTA between country A and B, and then the firms' equilibrium outputs are obtained as solutions of four simultaneous equations of reaction functions. By substituting these equilibrium outputs into the welfare maximization problem of each country, the optimal trade policy for each country is obtained as follows: $t_A^* = \frac{3a-3c-7\gamma}{24}$, $t_B^* = \frac{3a-3c-17\gamma}{24}$, and $t_C^* = \frac{3a-3c-2\gamma}{24}$.

The equilibrium welfare of each country is obtained as follows:

$$SW_A^* = \frac{1}{17424b}(1377 + 6534a^2 + 4911c^2 - 4356a(3c - r) + 16050r + 97951r^2 - 6c(459 + 3401r))$$

$$SW_B^* = \frac{1}{17424b}(6822 + 1089a^2 + 7911c^2 - 726a(3c - r) - 2628r + 12151r^2 + 6c(-2274 + 317r))$$

$$SW_C^* = \frac{1}{17424b}(3353 + 121a^2 + 3474c^2 - 4566r + 2226r^2 - 242a(c + 5r) + 2c(-3353 + 2888r)).$$

Moreover, the equilibrium outputs of each country under the sequential bilateral FTA formation strategy turn out as follows:

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stage. In the second stage, the two bilateral FTAs are sustained as in the first stage. Therefore, there are two FTAs in the first and second stage of integration.

$$q^A=\frac{a-c+6r+2t^A}{5b},\ x^{BA}=\frac{a-c+r+2t^A}{5b},\ x^{CA}=-\frac{-a+c+4r+3t^A}{5b},$$
$$x^{DA}=-\frac{-a+c+4r+3t^A}{5b}$$
$$q^B=\frac{1-c+r+2t^B}{5b},\ x^{AB}=\frac{1-c+6r+2t^B}{5b},\ x^{CB}=-\frac{-1+c+4r+3t^B}{5b},$$
$$x^{DB}=-\frac{-1+c+4r+3t^B}{5b}$$
$$q^C=-\frac{-1+c+4r-3t^C}{5b},\ x^{AC}=-\frac{-1+c-6r+2t^C}{5b},\ x^{BC}=\frac{1-c+r-2t^C}{5b},$$
$$x^{DC}=-\frac{-1+c+4r+2t^C}{5b}$$
$$q^D=\frac{1-c-4r+3t^D}{5b},\ x^{AD}=\frac{1-c+6r-2t^D}{5b},\ x^{BD}=\frac{1-c+r-2t^D}{5b},$$
$$x^{CD}=\frac{1-c-4r-2t^D}{5b}.$$

The output of each firm in each market shows that with the sequential bilateral FTA formation, the producer from country A with a higher technology gains more from the FTA formation and the producer from country B with an intermediate level technology loses from the arrangement as shown in the sharp increase of the A's market share in B's market. These output effects are straightforwardly reflected in the following results of producer surplus change of three types of FTA formation. As shown in the following diagram, the producer surplus of an intermediate technology level is lowest in the case of sequential bilateral FTA, decreasing further as the technology gap is increased.

When country B forms a multilateral FTA with country A and C, so called the Grand FTA coalition, the tariffs between the country A, B, and C are removed while the tariff against the non-member country, country D, is decided by each country. Under the Hub & Spoke type FTA formation, country B arranges simultaneous bilateral FTAs with country A and country C. In this case, country A has no preferential market access to country C and vice versa. The equilibrium values of social welfare and the producer surplus in each case of FTA formation are provided in the appendix 1.

3.2 Welfare effects of three different FTA formation strategies on the country with an intermediate level of technology (country B)

From the comparison of welfare effects in three different strategies of FTA

formation, the welfare effects of the Hub & Spoke type FTA formation turns out to be the highest for a country with an intermediate level of technology, followed by the Pan Asia-wide multilateral FTA formation strategy. The sequential bilateral FTA formation with a country with higher technology level produces the lowest welfare effects to a country with an intermediate technology level. The rationale behind this result lies in that producer surplus effects shows a sharp contrast between the three strategies of FTA formation, basically in the same direction as the social welfare effects while the consumer surplus effects are increased in the all three strategies. With the asymmetry between countries lying only in technologies while consumer preferences are symmetric, the welfare effects are decided by the impacts on the production sectors.

When we assume that the technology gap takes the feature of 10% difference in the marginal cost, the simulation results show that the Hub and Spoke type FTA formation increases the social welfare of the country with an intermediate technology (country *B*) by 13.8%, while the multilateral FTA formation increases it by 6.9%. The growth rate of social welfare from the sequential bilateral FTA formation is lowest at 2.0%.

[Table 1] The impacts of three FTA formation strategies on country *B*

		Sequential Bilateral FTA	Hub & Spoke FTA	Multilateral FTA
Country with an intermediate technology (*B*)	Growth rate of Social Welfare (%)	2.01132%	13.8156%	6.88445%
	Growth Rate of Producer Surplus (%)	-19.7688%	12.1471%	-10.1981%

In the production sectors, when we assume that the marginal cost of country A is 10% lower than that of country *B*, the Hub & Spoke type FTA formation increases the producer surplus of the country with an intermediate technology level by 12.1%, while the multilateral FTA formation decreases it by 10.2%. The producer surplus of country *B* decreases most sharply in the case of the sequential FTA formation by 19.8%. The intuition behind this result is that in case of Hub & Spoke type FTA formation, the country with an intermediate technology (country *B*) obtains a preferential market access that the country with a higher technology (country *A*) does not have. However, in case of

multilateral FTA formation, the country with a higher technology obtains the same preferential market access chances as country B, which provides larger market share to country A while the domestic market share of firm B is decreased. The industrial impact of the sequential bilateral FTA formation on country B is worst because it plays a losing game in terms of producer surplus with country A while the market access chance to country C, that is available in case of multilateral FTA formation, is no longer available.

The equilibrium producer surplus of each country under the sequential bilateral FTA formation strategy turns out as follows:

$$PS_A^* = \frac{54 + 891a^2 + 945c^2 - 198a(9c - 4r) + 1488r + 13457r^2 - 12c(9 + 190r)}{2178b}$$

$$PS_B^* = \frac{1377 + 1089a^2 + 2466c^2 - 726a(3c - r) + 1002r + 2834r^2 - 54c(51 + 32r)}{17424b}.$$

3.3 The welfare effects of three FTA formation strategies on the country with a higher technology level (country B)

The welfare impacts of three FTA formation strategies are characterized by the complementarity effects of trade policies, in which each government tries to maximize its own social welfare considering the strategic interaction of the firms' output decision making strategies and the each government's strategic policy decision making process. The equilibria of three FTA formation strategies show that the social welfare level of the country with a higher technology is highest under the multilateral FTA formation strategy. Hub & Spoke FTA formation strategy provides a higher welfare level than the bilateral sequential FTA formation strategy to country A due to the complementarity effects caused by the increased number of countries who participate in the preferential trade arrangements.

Ⅳ. POLICY IMPLICATION AND CONCLUDING REMARKS

This paper examined the welfare effects of forming FTA between technologically asymmetric countries, by comparing three different paths of FTA formation. Based on a model analysis assuming symmetric preferences and markets size with four representative firms of each country competing in Cournot fashion, this paper demonstrated that the optimal path of regional integration for

the country with an intermediate technology level would be to form simultaneous and multiple bilateral FTAs, i.e., Hub & Spoke type FTA between technically asymmetric countries from the very initial stage. The second best regime is the multilateral Asia-wide FTA. The worst scenario for a country with an intermediate technology would be to form a FTA with a country with an advanced technology, and extend the FTA with the less developed countries in the later stage. These results imply that the optimal strategy of regional integration for a country with an intermediate technology level, such as Korea, is to form a Hub & Spoke type FTA rather than a bilateral FTA with Japan followed by the participation of other Asian countries.

The above results imply that positive static effects on the producer surplus of a country with an intermediate level of technology is available only in the case of Hub & Spoke type FTA formation. Moreover, the static positive effects from the Hub & Spoke FTA formation might be amplified dynamically through the path of industrial agglomeration effect when the industries show strong forward and backward linkage effects. The same dynamic effects in addition to the industrial agglomerating effect will induce a sharp reduction of industrial sectors when the country with an intermediate technology forms a sequential bilateral FTA starting with a partner country with a higher technology. Interpreting these results in geographic perspective provides the following message: When we assume South Korea as a country with an intermediate technology, the optimal strategy of South Korea to form FTA in the Asian region would be to take the Hub & Spoke FTA formation strategy, not a sequential FTA formation with first taking Japan as the partner country, followed by other Asian countries. Moreover, from the perspective of South Korea, it is welfare dominant that Korea forms separate bilateral FTAs with Japan and China to the case of trilateral FTA formation with Japan and China. The pre-requirement for the multiple bilateral FTAs is the fundamental industrial restructuring of the Korean industries, such as reallocating the human and economic resources from the sectors of comparative disadvantage to the sectors with comparative advantage. The successful FTAs assumes the nation-wide efforts involving the massive restructuring cost including the establishment of the social-safety net during the transition period.

Moreover, important policy implications can be acquired from the successful examples of precedent regional economic integration. One of the most successful economic integration would be the case of integrating states in the U.S.. With

the full removal of trade barriers between inter-state trades, each state shows the classic example of specialization in the sectors of comparative advantage providing nation-wide efficiency enhancement of resource allocation. As explained by Professor Krugman, the main driving force for the successful economic integration of 52 states is the strong fiscal federalism. Even in the case of EU, although much limited compared to the case of US, active income and technology transfer between the member countries under the form of 'structural payments' has played the major role for a successful integration. For a genuine economic integration, the East Asian countries should find the effective means and tools that will establish Asian type fiscal federalism, such as an effective system of technology and capital transfer from technologically advanced country to less advanced country.

Notwithstanding with strong message, this paper should be extended in the following aspects to provide more realistic and feasible policy implications. First, further in-depth analysis on the effects of asymmetric market size and the asymmetric consumer preferences is required. In addition, to examine the dynamic effects and the relocation effect of industries after FTA formation, it requires to introduce concrete production function incorporating the forward and backward linkage in the industries. These issues should be addressed in the future studies

Appendix A: The equilibria of three FTA formation strategies

The equilibrium values of social welfare that the country with intermediate technology level (country B) obtains are as follows:

$$SW_B(\text{Sequential Bilateral FTA}) = \frac{6822 + 1089a^2 + 7911c^2 - 726a(3c - r) - 2628r}{17424b} + \frac{1215r^2 + 6c(-2274 + 317r)}{17424b}$$

$$SW_B(\text{Hub \& Spoke FTA}) = \frac{566449 + 88209a^2 + 654658c^2 - 58806a(3c - r)}{1411344b} + \frac{406364r - 407459r^2 - 2c(566449 + 232585r)}{1411344b}$$

$$SW_B(\text{Multilateral FTA}) = \frac{139105 + 15488a^2 + 154593c^2 - 7744a(4c - 3r)}{331298b} + \frac{-20598r + 105954r^2 - 2c(139105 + 1317r)}{331298b}.$$

In the same way, the equilibrium producer surplus of country B (country with an intermediate technology level is obtained as follows:

$$PS_B(\text{MFN}) = \frac{162 + 9a^2 + 171c^2 - 6a(3c - 5r) + 252r + 223r^2 - 6c(54 + 47r)}{1089b}$$

$$PS_B(\text{Sequential Bilateral FTA}) = \frac{1377 + 1089a^2 + 2466c^2 - 726a(3c - r) + 1002r}{17424b} + \frac{2834r^2 - 54c(51 + 32r)}{17424b}$$

$$PS_B(\text{Hub \& Spoke FTA}) = \frac{194737 + 88209a^2 + 282946c^2 - 58806a(3c - r)}{1411344b} + \frac{133388r + 161725r^2 - 2c(194737 + 96097r)}{1411311b}$$

$$PS_B(\text{Multilateral FTA}) = \frac{16857 + 7744a^2 + 24601c^2 - 3872a(4c - 3r) + 19830r}{165649b} + \frac{19097r^2 - 18c(1873 + 1747r)}{165649b}.$$

Country B's equilibrium consumer surplus is obtained as follows:

$$CS_A(\text{MFN}) = \frac{(-7 + 7c + 2r)^2}{242b}$$

$$CS_B(\text{Sequential Bilateral FTA}) = \frac{(9-9c+r)^2}{288b}$$

$$CS_B(\text{Hub \& Spoke FTA}) = \frac{2(10-10c+r)^2}{729b}$$

$$CS_B(\text{Multilateral FTA}) = \frac{(-29+29c+4r)^2}{2738b}.$$

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