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General Equilibrium Analysis of DDA Trade Liberalization: Assessment of Alternative Scenarios

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Executive Summary

This paper aims to implement the simulation studies using a CGE approach to identify ideas on how to finalize the DDA negotiations by making some mutual concessions and deal with contentious issues yet to be agreed.

The simulation results of this paper, which lay between those of the previous literature, indicate that the DDA negotiations will boost the global economy to a substantial degree. It reveals that the world GDP effects will amount to US$ 49.9~186.2 billion (0.12~0.45%) and the welfare gain will amount to US$ 49.7~157.7 billion. The GDP growth effects are mainly due to effects of trade expansion, which amount to US$ 265.3~382.0 billion.

The simulation result also indicates that developed countries need to consider positively the arguments of developing countries on the controversial issues related to agriculture. In return for the concessions by the developed countries, the developing countries will likely accept further discussions related to the sectoral proposals and services liberalization.

국문요약

    DDA 협상은 최빈개도국에 대한 특별하고 차별적인 대우(S&D)의 부여, 서비스 자유화의 폭과 더불어 삼각쟁점이라고 불리우는 농업보조금, 농업관세율 감축, 부문별 관세 철폐를 포함하는 비농산물 시장접근 분야의 자유화 등과 같은 이슈들을 둘러싼 이해대립 때문에 8년 간의 협상에도 불구하고 아직 타결되지 못하고 있다. 본 연구는 상호양보를 통해 DDA 협상을 어떻게 마무리할 수 있으며 미해결 쟁점들을 어떻게 다루어 나갈 것인지를 제시하기 위해 시나리오별 CGE 분석을 시도하였다.

    분석결과를 보면 GDP 효과와 후생효과는 각각 499~1,862억 달러(세계 GDP의 0.12~0.45%), 497~1,577억 달러에 달할 것으로 예상된다. 또한 무역확대 효과는 2,653~3,820억 달러에 달하는 것으로 나타나며, 이는 DDA 협상이 세계경제에 큰 기여를 할 것이라는 점을 시사한다. 본 연구의 분석결과는 기존 연구가 제시하는 결과와 일치하는 수치이며, 아울러 향후 WTO 회원국 간에 균형 잡힌 타협을 이루어야 한다는 점을 시사한다. 즉, 선진국은 농업보조금 등 농업분야에 있어 개도국의 요구를 적극적으로 수용할 필요가 있으며, 이에 반해 개도국은 비농산물 분야에서 부문별 관세철폐협상과 서비스자유화협상에 대한 논의를 적극 수용할 필요가 있다. 특히 서비스협상은 ASEAN, 인도, 중남미 국가 등 개도국에게 큰 GDP 효과를 가져다 줄 것으로 기대되며, 부문별 관세철폐협상도 미국, EU 등과 같은 선진국뿐만 아니라 중국, 한국, 홍콩, 대만 등 동아시아 국가들에게도 많은 무역확대 이익을 가져다 줄 것으로 기대되기 때문이다.

핵심용어: DDA 협상, CGE, 시뮬레이션

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저서 및 논문

"Impacts of Free Trade Agreements on Structural Adjustment in the OECD: Panel Data Analysis" (KIEP Working Paper 09-05, 2009).
"DDA 비농산물분야의 협상방식이 국제관세율 구조에 미치는 영향 분석" (『무역학회지』, 2005).
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Contents

Tables

Box

General Equilibrium Analysis of DDA Trade Liberalization: Assessment of Alternative Scenarios[*]

Nakgyoon Choi[**]

I. Introduction

The Doha Development Agenda (DDA) negotiations, which were launched at the fourth WTO Ministerial Conference in November 2001, have dealt with various agendas regarding agriculture, services, non-agricultural market access, rules, TRIPS, trade and environment, trade and development among others. In December 2008, the chairpersons of the agriculture as well as non-agricultural market access (NAMA) negotiating groups circulated their latest revised draft modalities texts, which contain formulas for cutting tariffs and trade-distorting subsidies and related provisions. But the Geneva Ministerial Conference held in November of 2009 failed to produce a fruitful compromise.

There are many studies assessing potential economic effects of the DDA negotiations. Most of these studies generally point to substantial

welfare gains from reduction in trade barriers. Anderson *et al.* (2000), using a static CGE model, estimate global welfare gains amounting to US$254.3 billion from completely removing trade barriers. Francois (2001) finds that a 50% reduction in tariffs and a 1% reduction in trade costs would yield global income gains of $384.9 billion. Using a static CGE model featuring increasing returns to scale, Brown *et al.* (2002) simulate the effects of 33% reductions in trade barriers with respect to agriculture, manufactures and services. They report an increase in global welfare amounting to $574.0 billion. Fontagné *et al.* (2002), using a dynamic model, find potential welfare gain ranging from 0.1% to 1.5%, with all regions under all of the scenarios.

OECD (2003) presents estimates of welfare gains from 8 different scenarios for trade liberalization as part of the DDA using the standard GTAP model. It is reported that the total welfare gain will amount to $173 billion, the largest among the 8 options, when all merchandise tariffs are removed and reduced trading costs are introduced. Anderson *et al.* (2006) estimate the impact of merchandise trade barriers and agricultural subsidies and possible reform outcomes of the DDA using a recursive linkage model. Their results show that the benefits would range from $17.7 billion to $119.3 billion.

Decreux and Fontagné (2009) simulate the impacts of the DDA negotiations using a dynamic and sectoral model of the world economy. They identify a $57 billion gain when agricultural and manufacturing sectors are liberalized, and a gain of $68 billion when a 3% reduction of protection in services is added. Adler and *et al.* (2009) estimate the potential effects of three DDA scenarios; agriculture and NAMA, sectoral

initiatives, and liberalization of services barriers and improvement in trade facilitation. Their study reveals that the GDP gain could range between $300 billion and $700 billion annually, and well-balanced between developed and developing countries. Suh *et al.* (2009) simulate the impacts from the DDA by applying the static as well as dynamic models. They consider the four scenarios including services liberalization and sectoral proposals, and indicating that the DDA will produce world GDP effects amounting to 0.12~0.33% depending on the scenarios.

The DDA negotiations have not been finalized after more than eight years of negotiation, because there were conflicting interests about contentious triangle issues; agricultural subsidy, agricultural tariff reduction, and non-agricultural market access liberalization including sectoral proposals. In addition, the LDCs have been disappointed with the agreements on Special and Differential (S&D) treatment while the WTO member countries have not been able to make much progress in the negotiations of services liberalization. This paper implements the simulation studies to identify ideas on how to finalize the DDA negotiations by making some mutual concessions.

The recent studies take into account dynamic linkages such as changes in total factor productivity (Dessus *et al.* 1999) or the dynamic interaction of trade policy with saving and investment (Francois 2001). This paper employs the capital accumulation model as well as the static model. In addition, this paper computes the tariff rates of each industry individually since tariff rates would differ from sector to sector according to the scenario, while previous studies assume uniform re-

ductions in tariffs for all sectors.

At the same time, this paper uses the available estimates of the services trade barriers for 142 countries which estimated the effect of the services trade restrictiveness index on economic performance including price, cost and so on. It will also consider the scenarios about agricultural subsidies, sectoral proposals, and the Special and Differential (S&D) treatment to the least developed countries.

It was the US and the EC that played a main role in previous multilateral negotiations sponsored by the GATT but a bottom-up approach in the negotiations is needed under the changing environment of international political economy. India and Brazil among others began to join the major decision-making group in the negotiations. This paper aims to analyze the economic effects of various scenarios of DDA negotiations on the G-7 countries including the US, EC, India, Brazil, China, Japan, and Australia, thereby proposing a negotiation strategy to harmonize the conflicting interests and to facilitate give-and-take among the major countries. Specifically, this study examines the possible effects of the on-going Doha Development Agenda (DDA) negotiations on the GDP, welfare, trade, and terms of trade of major economies by employing a computable general equilibrium (CGE) model. It reflects the revised draft modalities presented by the negotiating groups in December 2008, because any "final bargaining" can only take place within the "landing zone" set out in the draft.[1]

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[1] *Washington Trade Daily* (2010), Vol. 19, No. 34, Wednesday, February 17.

II. The Methodology

1. Model Specification and Data

This paper employs the widely used GTAP model of global trade (Hertel 1997) as a basic model to analyze the potential economic effects of the DDA negotiations. This model captures the static effects of trade liberalization through increased efficiency of resource allocation and improved consumption possibilities. This basic GTAP model features constant returns to scale, perfect competition and a global bank designed to mediate between world savings and investment.

In addition, this paper also modifies the standard GTAP model in order to capture the capital accumulation effects of DDA negotiations. Baldwin (1989, 1992) suggests that the static efficiency gains induce higher savings and investment, which in turn yield more output. Francois *et al.* (1999) also points out that the traditional focus on static effects is potentially misleading and the savings behavior matters crucially for the qualitative implications of trade liberalization in a dynamic context. Ianchovichina and McDougall (2000) extends the standard GTAP model to include international capital mobility and capital accumulation by endogenizing international capital mobility and treating time as a variable, not as an index. McKibbin and Wilcoxen (1998) and McKibbin *et el.* (2009) developed the so-called G-Cubed model by imposing intertemporal budget constraints on households, governments

and countries, and incorporating forward-looking behavior in consumption and investment decisions. Mai (2004) and Mai and Adams (2005) developed the Monash-Multi-Country (MMC), focusing on bilateral investment flows between countries/regions at an industry level and capturing the accumulation of physical capital, foreign liabilities and assets over time.

This paper constructs a CGE model incorporating some aspects of neoclassical growth theory including the process of capital accumulation. Unlike the previous literature, this paper sets up a static model as well as a capital accumulation model, comparing the simulation results based on the same data and assumptions. Using the two different models, this paper implements the various scenarios regarding agriculture, NAMA, agricultural domestic support, sectoral proposals in the non-agricultural market access, services trade barriers, and special and differential treatment of the least developed countries. This paper constructs a new equation in the CGE model to describe the relation between capital stock and investment, and control closure so that the changes in capital stock and investment converge. This paper captures the capital accumulation effect of trade liberalization by controlling closure so that the changes in capital stock are identical to the changes in investment.[2]

Social accounting data are based on a modified version of the GTAP database (version 7). Initial protection data are representative of the world as of 2004. This paper first run the experiment in which the ser-

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[2] Francois *et al.* (1996) shows how to implement the capital accumulation model through closure rules.

vices trade barriers are applied, because the data on services trade barriers are not available in the original GTAP database. That is, it updates the tariff protection from the base year of 2004 in order to estimate the world trade environment that will exist when potential DDA commitments are implemented.

Tariff data on HS6 level products is obtained from the UNCTAD/ CEPII database called MAcMap-HS6, which provides the data on ad valorem and specific components for the bound as well as MFN tariffs. Bouët (2001, 2005) points out that it provides a consistent, ad-valorem equivalent measure of tariff duties and tariff rate quotas for 163 countries and 208 partners, at the six-digit level of the Harmonized System (5,111 products). The previous studies on the economic effect of DDA negotiations have led to various problems because they did not use a detailed and disaggregated data on tariff rates. In addition, Bchir *et al.* (2005) points out that they used to miss the binding overhang as well as the significant gap between MFN and preferential applied duties for a substantial part of word trade. WTO Secretariat provided the national tariff data, but the specific components of bound and MFN tariff are not available. This paper applies the tariff reduction formulas to the granular UNCTAD/CEPII data.

In addition, this paper makes use of the GTAP database assuming that the agricultural subsidy is equivalent to the absolute value of the negative output tax in the GTAP database, because the data on the agricultural support is not available. Hoekman *et al.* (2004) estimate the elasticity of domestic support using the information on schedules and notifications by WTO members. On the other hand, Anderson and Va-

lenzuela (2007) use the estimates of domestic subsidies contained in the GTAP data set and compiled the average applied domestic producer subsidies on goods. This paper calculates the agricultural subsidy by sector and region, depending on the GTAP database.

The product coverage lists for tariff elimination in the non-agricultural market access negotiations are obtained from the Annex of the fourth revision of draft modalities proposed by the WTO (2008b). There are 14 sectors currently under negotiation: automotive and related parts; bicycles and related parts; chemicals; electronics/electrical products; fish and fish products; forestry products; gems and jewelry products; raw materials; sports equipment; healthcare, pharmaceutical and medical devices; hand tools; toys; textiles, clothing and footwear; and industrial machinery. This paper focuses on 10 sectors excluding raw materials, hand tools, toys, and textiles, clothing and footwear because only one or two countries have shown some interest in these 4 sectors. In the current WTO negotiations, the participation in sectoral initiatives is on a 'non-mandatory/voluntary basis. However, there is low possibility of participation in these 4 sectors by the large countries in the future.

This paper calculates the trade value of 10 sectors for WTO member countries in 2007 and assumes that a "critical mass" of countries joining the initiative for it to take off will be satisfied.[3] It chose 4 sectors including electronics/electrical products, chemicals, gems and jewelry, and industrial machinery because the participating countries shown in

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[3] Annex reports the critical masses of 10 sectors.

the Annex occupy more than 60% of world trade, which means that there is high probability of taking off. [4]

Regarding the protection data on services, there have been a variety of approaches to measure services trade barriers. For example, Hoekman (1995) constructs 'guesstimates' of relative restrictiveness across the countries on the assumption that each WTO member has revealed its policy stance in the commitments made in the GATS. As Hardin and Holmes (1997) indicate, however, this approach may not reflect the actual impediments because it is based on the information contained in each country's schedule of GATS commitments. This paper depends on Dee (2005) which presented available estimates of the services trade barriers for 142 countries. In the GTAP database, there is no protection data on services sectors, implying that trade barriers to services do not exist. This paper incorporates the tariff equivalents for services sectors depending on Dee (2005) which estimated the effect of the services trade restrictiveness index on economic performance including price, cost and so on.[5]

This paper sets up a 15-region, 18-sector CGE model of the world economy.[6] Countries/regions are classified into 15 regions in this paper; (1) ASEAN member countries, (2) China, (3) Japan, (4) East Asian NICs including Korea, Taiwan, and Hong Kong, (5) India, (6) Other Asian

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[4] The scenario for sectoral proposal in Suh (2009) focuses on the 4 sectors only, while the scenario on services liberalization is based on the estimation results by the gravity equation. In this paper, the sectoral proposal focuses on the 10 as well as 4 sectors, while the scenario on services liberalization is based on Dee's results.

[5] Refer to Dee (2005), pp. 10-16 for detailed explanation of the methodology.

[6] Refer to Table A1~2 in the Appendix.

countries, (7) USA, (8) EU member countries, (9) Australia, (10) Other Developed countries, (11) Other East European countries, (12) Middle East countries, (13) Brazil, (14) Other Latin American countries, (15) Sub-Sahara African countries.

For analysis in this paper, all industries are classified into 18 industrial sectors: (1) grains and crops; (2) vegetables and fruit; (3) Livestock and Meat Products; (4) Processed Food; (5) Other agriculture; (6) Forestry and fisheries; (7) mining and quarrying; (8) Textiles and clothing; (9) chemical products, petroleum, plastic & rubber products; (10) steel, metal products; (11) transport equipment; (12) electric and electronic products; (13) machinery; (14) other manufacturing products including leather, timber, wooden products, pulp, paper & printing, non-metallic mineral products; (15) Trade; (16) Telecommunication and transportation; (17) Financial and business services; (18) other services including construction, electricity, gas and water supply, public administration.

2. Scenarios

This paper implements the various scenarios regarding agriculture, NAMA, agricultural domestic support, sectoral proposals in the non-agricultural market access, services trade barriers, and S&D treatment of the least developed countries.

First, this paper simulates the draft modalities in the WTO agricultural negotiations because they are expected to be a basis for the negotiations in the future. The chairmen of the committee on agriculture submitted the fourth revision of draft modalities that included higher

cuts in tariff and subsidy than the Uruguay Round. The fourth revision includes the tiered formula for tariff reductions such that developed and developing country members shall reduce their final bound tariffs in accordance with the tiered formula which is shown in Table 1.

Table 1. Tiered formula for agricultural tariff reductions

(unit: %)

	Developed countries		Developing countries	
	Tier	**Reduction**	**Tier**	**Reduction**
(a)	0∼20	50	0∼30	33.3
(b)	20∼50	57	30∼80	38
(c)	50∼75	64	80∼130	42.7
(d)	Over 75	70	Over 130	46.7

Source: WTO (2008a), p. 14.

In addition, each developed country member and developing country member shall have the right to designate up to 4% and one-third more of tariff lines as sensitive products, respectively.[7] Developing country members shall be entitled to self-designate special products guided by indicators based on the criteria of food security, livelihood security and rural development. There shall be 12% of tariff lines available for self-designation as special products. Up to 5% of lines may have no cut. The overall average cut shall, in any case, be 11%.[8] This

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[7] Refer to WTO (2008a), TN/AG/W/4/Rev.4, p. 14.

[8] WTO member countries will possibly select the sensitive/special products among the least competitive ones. This paper assumes that member countries will choose sensitive/special products among those for which product of the cut on the MFN tariff times total imports would be the highest, which is applied by Decreux and Fontagné (2008), p. 18. Refer also to WTO (2008a), TN/AG/W/4/Rev.4, p. 16, p. 23.

paper assumes that developing countries will choose 12% of tariff lines as special products and cut the tariff rates by 11%.

Second, non-agricultural market access negotiations have focused on the tariff reduction. Chairperson of the NAMA proposed the compromise that member countries should continue to work on a non-linear tariff reduction formula[9] applied on a line-by-line basis. A coefficient for the developed member countries is set to be 8, while developing member countries are allowed to choose the coefficient and flexibilities. This paper assumes that they will choose the coefficient 20 in the formula and cuts are half formula cuts for 14% of tariff lines which do not exceed 16% of the total value of a member's non-agricultural imports. Regarding the flexibilities, this paper also assumes that they will select the tariff lines for which the product of the tariff cut on the applied MFN tariff times the total imports would be the largest as Decreux and Fontagné (2008) suggested.[10] The value of imports is based on the 2002-2004 trade statistics.

Third, this paper implements the reduction in agricultural subsidies. The fourth revision also stipulates the reduction formula of the domestic agricultural support for three tiers.[11] This paper assumes that overall trade-distorting domestic support occupies 30% of the total domes-

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[9] The well-known Swiss formula is as follows: $t_1= (A \times t_0) / (A + t_0)$ where A is a coefficient, t_0 is tariff rate before reduction, and t_1 is tariff rate after reduction. According to Martin and Ivanic (2006), the top-down nature of the Swiss formula means that it automatically tends to lessen two major concerns of developing countries–tariff peaks and tariff escalation.

[10] Refer to Decreux and Fontagné (2008), p. 16.

[11] According to WTO (2008a), developed as well as developing country members shall eliminate their export subsidy entitlements.

tic agricultural support. The EU, the US, Japan, and other developed countries are assumed to reduce the domestic support by 70%, 65%, 65%, and 55%, respectively. And it also assumes that developing countries shall cut the overall trade-distorting domestic support by 36.7%. This paper simulates the two scenarios such that 30% and 50% of OTDS (Overall Trade-Distorting Domestic Support) are assumed to be reduced, respectively.

Table 2. Sliding scale for non-agricultural tariff reductions

(unit: %)

	no less than half the formula cuts		keeping tariff lines unbound, or not applying formula cuts	
	tariff lines	import value	tariff lines	import value
(a) 20	14	16	6.5	7.5
(b) 22	10	10	5	5
(c) 25	0	0	0	0

Source: WTO (2008b), pp. 3-4.

Fourth, this paper simulates the two scenarios of tariff elimination in manufacturing sectors as follows: (i) Tariff elimination in 4 sectors including chemical, electronics, industrial machinery, and jewelry is assumed; (ii) Tariff elimination in 10 sectors which attract some interests from the member countries is assumed.[12]

Sectoral tariff components have been a key issue in the NAMA negotiations. Currently, the 14 sectoral proposals are being circulated in the NAMA negotiating group. This paper includes the 10 sectoral initi-

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[12] Table A5~7 in the Appendix shows the participating countries and critical masses of each sectoral proposal.

atives including automotives, bicycle, chemicals, electronic/electrical products, fish and fish products, forest products, gems and jewelry, healthcare, industrial machinery, and sports equipment. For the HS6 level classification, this paper refers to the product coverage for each sector contained in WTO (2008b).

Fifth, scenarios with reduction in the services trade barriers are also considered in this paper as follows: (i) 10% reduction in services trade barriers of developed countries is assumed; (ii) Services trade barriers are assumed to be reduced by 30%, 20%, and 10% in developed countries, developing countries, and other countries. The WTO member countries exchanged their initial requests and offers for the services negotiations but the momentum of the services negotiation have been blunted after the failure of the WTO Ministerial Meeting at Geneva. If the negotiations get back on track, there will be pressure to liberalize further, particularly in such sectors as movie projection services and health services.

Due to the current state of negotiations, there is no data on how much the services protection will be reduced. This paper assumes that the services trade barriers in trade, telecommunication and transportation, and financial and business services will be reduced by 10%. It also assumes that ASEAN member countries, China, Japan, East Asian NICs, USA, EU member countries, Australia, Other Developed countries, and Brazil will reduce the services trade barriers in such sectors including trade, telecommunication and transportation, and financial and business services by 10%; whereas India, Other Asian countries, Other East European countries, Middle East countries, Other Latin

American countries, Sub-Sahara African countries will not liberalize the services sectors as a result of the DDA negotiations.

Sixth, this paper simulates the scenarios based on the fourth revision draft modalities without LDC[13] preferences in order to assess the impact of special and differential treatment of DDA negotiations. Agricultural and NAMA liberalization without LDC preferences are evaluated. The WTO member countries will provide special and differential treatment to the least-developed economies as follows; the developed countries including the US, the EC, Japan, Australia, and other developed countries will provide duty-free-quota-free market access for at least 97% of products originating from all LDCs.[14] Along with this special treatment, this paper assumes that the tariff reduction formula for agricultural as well as non-agricultural products will not be applied to them and they shall not be required to participate in the sectoral initiatives.

Finally, this paper also covers comprehensive trade liberalization, by summing up the separate liberalizations in specific negotiation groups. It includes the tariff reduction in agricultural and NAMA sectors, the reduction in agricultural subsidies, NAMA sectoral tariff elimination, and reduction in services trade barriers.

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[13] The list of the least developed countries for this paper is obtained from the UN homepage.

[14] WTO (2008a), TN/AG/W/4/Rev.4, para 152.

Box 1. Simulation Scenarios

1. Scenarios based on the fourth revision draft modalities
- AGRI: Agricultural liberalization based on the revised draft modalities for agricultural negotiations
- NAMA: Agricultural liberalization based on the revised draft modalities for NAMA negotiations

2. Scenarios with reduction in agricultural subsidies
- SB-1: Share of OTDS (Overall Trade-Distorting Domestic Support) is assumed to be 30% and the EU, the US, Japan, and other developed countries are assumed to reduce OTDS by 70%, 65%, 65%, and 55%, respectively.
- SB-2: Share of OTDS is assumed to be 50% and the EU, the US, Japan, and other developed countries are assumed to reduce OTDS by 70%, 65%, 65%, and 55%, respectively.

3. Scenarios with tariff elimination in manufacturing sectors
- SE-1: Tariff elimination in 4 sectors including chemical, electronics, industrial machinery, and jewelry is assumed.
- SE-2: Tariff elimination in 10 sectors attracting some interest from the member countries is assumed.

4. Scenarios with reduction in the services trade barriers
- SV-1: 10% reduction in services trade barriers of developed countries is assumed.
- SV-2: Services trade barriers are assumed to be reduced by 30%, 20%, and 10% in developed countries, developing countries, and other countries.

5. Scenarios based on the fourth revision draft modalities without LDC preferences
- AG-LD: Agricultural liberalization without LDC preferences
- NA-LD: NAMA liberalization without LDC preferences

6. Scenarios based on the comprehensive assumptions
- MINI: AGRI + NAMA + SB-1 + SE-1 + SV-1
- MEGA: AGRI + NAMA + SB-2 + SE-2 + SV-2

Ⅲ. Simulation Results

This paper simulates the various scenarios depending on the DDA negotiation agenda including agriculture, NAMA, services, agricultural domestic support, NAMA sectoral tariff elimination, and LDC S&D among others. It also constructs a mini/mega package which assumes the modest/ambitious compromise among the major countries, using the static as well as capital accumulation model.

1. Potential Impacts of the DDA Negotiations by Various Scenarios

A. GDP Effects

Table 3~4 reveals that the static effects turned out to be smaller than the dynamic effects and that the mega package will provide more benefits for the WTO member countries than the mini package, which is not surprising at all. That implies also that WTO members need to put more emphasis on the dynamic context of savings behavior, rather than the static effects of tariff reduction.

The static model simulations reveals that the GDP effects of the DDA negotiations amount to US$ 49.9 billion (0.12%) and US$ 58.6 billion (0.14%) in the mini and mega packages, respectively. On the other hand, the capital accumulation model simulations indicates that the GDP effect of the DDA negotiations amounts to US$ 136.1 billion (0.33%) and US$ 186.2 billion (0.45%) in the mini and mega packages,

respectively.[15]

When we look into the specific simulation results, the detailed implications will be revealed.[16] First, when we compare the GDP effects of the agricultural and NAMA negotiations, the static GDP effect of the agricultural negotiations turns out to be US$ 32.8 billion, which is greater than that of the NAMA negotiations (US$ 15.0 billion).[17] However, it turns out to be US$ 46.4 billion which is smaller than that of the NAMA negotiations (US$ 87.0 billion) in the case of the capital accumulation model. That means that more dynamic effects will be expected from the manufacturing sectors, because they can accumulate capital more efficiently than the agricultural sectors.[18]

Second, if the OTDS (Overall Trade-Distorting Domestic Support) is reduced by 30%, then the world GDP will increase by US$ 1.1 billion in the static model, but it will decrease by US$ 9.1 billion in the other model. When the OTDS is reduced by 50%, then the world GDP will decrease by US$ 2.4 billion in the static model, but it will increase by US$ 14.9 billion in the capital accumulation model. The reason why the

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[15] According to Anderson *et al.* (2006) based on the Harbinson draft, the DDA will generate a GDP gain of US$ 17.7 billion (0.04%) to US$ 119.3 billion (0.28%).

[16] Table A3 in the Appendix indicates the welfare effects (equivalent variation) of the DDA negotiations.

[17] Decreux and Fontagené (2009) reveals that the long run effect of trade liberalization in goods amount to 0.08 % of world GDP annually, i.e. US$ 57 billion and that the increase in world exports amounts overall to 1.51 %, i.e. US$ 226 billion.

[18] OECD (2003) based on the 2003 draft modalities indicates that 100% reduction in all merchandise tariffs and reduction in trade costs equivalent to 1% of value of trade will produce a world GDP gain of 0.60% while 100% reduction in tariffs on manufactured goods and reduction in trade costs equivalent to 1% of value of trade will produce a world GDP gain of 0.48%.

Table 3. GDP Effects of the Various Scenarios of DDA Negotiations (Static Model)

	AGRI	NAMA	SB-1	SB-2	SE-1	SE-2	SV-1	SV-2	AG-LD	NA-LD	MINI	MEGA
GDP Impact, Percent												
ASA	0.04	0.18	0.00	0.00	-0.01	-0.01	0.00	0.18	0.02	0.12	0.21	0.39
ASN	0.04	0.18	0.00	0.00	0.03	0.06	0.00	0.20	0.04	0.18	0.24	0.45
AUS	0.01	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.06	0.07	0.08
BRA	-0.01	0.06	0.00	0.00	0.05	0.07	0.00	0.01	-0.01	0.06	0.06	0.08
CHN	0.01	0.25	0.00	0.00	0.06	0.09	0.00	0.08	0.01	0.26	0.27	0.35
DVC	0.23	0.01	0.00	0.00	-0.01	0.00	0.00	0.01	0.23	0.01	0.24	0.24
ECA	0.02	0.06	0.00	0.00	0.01	0.01	0.00	0.12	0.02	0.06	0.08	0.20
EU	0.14	0.00	0.00	0.00	-0.01	-0.01	0.01	0.02	0.14	0.00	0.15	0.15
IND	0.03	0.19	0.00	0.00	-0.01	0.02	0.00	0.13	0.04	0.19	0.21	0.36
JPN	0.18	0.02	0.02	-0.03	0.01	0.02	0.00	0.00	0.18	0.02	0.22	0.18
LAT	-0.06	0.04	0.00	0.00	-0.02	-0.02	0.00	0.11	-0.06	0.04	-0.04	0.07
MID	0.04	0.14	0.00	0.00	0.01	0.02	0.00	0.14	0.04	0.14	0.18	0.32
NIC	0.09	0.10	0.01	-0.02	0.06	0.09	0.00	0.02	0.09	0.10	0.22	0.22
SSA	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.17	0.01	0.11	0.13	0.31
USA	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
World	0.08	0.04	0.00	-0.01	0.00	0.01	0.00	0.03	0.08	0.04	0.12	0.14
GDP Impact, Billions of Dollars												
ASA	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.3	0.5	0.9
ASN	0.4	1.4	0.0	0.0	0.2	0.4	0.0	1.6	0.4	1.4	1.9	3.6
AUS	0.1	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.4	0.4	0.5
BRA	-0.1	0.4	0.0	0.0	0.3	0.4	0.0	0.1	-0.1	0.4	0.4	0.5
CHN	0.2	4.3	0.0	-0.1	1.1	1.6	0.0	1.4	0.2	4.3	4.6	5.9
DVC	3.9	0.1	0.0	0.0	-0.1	-0.1	0.1	0.2	4.0	0.1	4.1	4.2
ECA	0.2	0.7	0.0	0.0	0.1	0.1	0.0	1.3	0.2	0.7	0.9	2.2
EU	18.3	0.2	0.3	-0.5	-1.5	-0.9	0.9	2.2	17.7	0.4	18.9	19.5
IND	0.2	1.2	0.0	0.0	-0.1	0.2	0.0	0.8	0.2	1.2	1.3	2.3
JPN	8.5	1.0	0.7	-1.6	0.6	0.9	0.0	0.1	8.5	1.0	10.5	8.3
LAT	-1.0	0.6	0.0	0.0	-0.2	-0.4	0.0	1.6	-1.0	0.6	-0.6	1.1
MID	0.4	1.5	0.0	0.0	0.1	0.2	0.0	1.5	0.4	1.5	2.1	3.6
NIC	1.0	1.1	0.1	-0.2	0.6	1.0	0.0	0.2	1.1	1.1	2.5	2.5
SSA	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.9	0.1	0.6	0.7	1.6
USA	0.3	1.1	0.0	0.0	0.2	0.3	0.1	0.3	0.3	1.1	1.6	1.9
World	32.8	15.0	1.1	-2.4	1.2	3.9	1.1	12.6	32.1	15.2	49.9	58.6

Note: Refer to Table A1 and Box 1 for the regional aggregation and the scenarios, respectively.

Source: Author's Calculations.

ambitious scenario of agricultural subsidy leads to a decrease in the world GDP is that the drastic reduction in the OTDS will have a short-

term negative impact on agricultural production. It turns out that the economic impact of subsidy reduction on the world economy is not so much as developing economies used to expect. It is because agricultural tariff barriers in OECD countries have a much larger impact on developing countries than subsidies, with the exception of subsidies applied to the production of cotton, as Tokarick (2006) points out. Anderson and Valenzuela (2007) also shows that more than two-thirds of the gains to developing country farm incomes from high-income country agricultural policy reform would come from removal of tariffs, and that domestic rather than export subsidies contribute most of the rest.

Third, when the tariffs in 4 sectors including chemical, electronics, industrial machinery, and jewelry is eliminated, then the world GDP will be increase by US$ 1.2 billion in the static model, but it will increase by US$ 15.0 billion in the capital accumulation model.[19] When we assume tariff elimination in 10 industrial sectors, then the world GDP will be increase by US$ 3.9 billion in the static model, but it will increase by US$ 28.1 billion in the capital accumulation model. We need to interpret this result carefully for the following reason. The tariff elimination itself will provide greater economic benefits than the above-mentioned number, but this paper provided the additional cut in the industrial tariffs beyond the tariff cut by the agreed-upon formula.

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[19] Focusing on the two sectors including chemicals and electronic/electrical products, Adler (2009) reveals that the estimated GDP attributable to a sector initiative in chemicals and electronic/electrical goods is US$ 26.6 billion and US$ 66 billion, respectively.

**Table 4. GDP Effects of the Various Scenarios of DDA Negotiations
(Capital Accumulation Model)**

	AGRI	NAMA	SB-1	SB-2	SE-1	SE-2	SV-1	SV-2	AG-LD	NA-LD	MINI	MEGA
GDP Impact, Percent												
ASA	0.10	1.00	-0.06	0.11	-0.16	-0.17	0.01	0.22	0.06	0.62	0.94	1.30
ASN	0.00	1.28	-0.06	0.11	0.25	0.39	0.01	0.45	0.00	1.28	1.42	2.14
AUS	0.15	0.19	-0.05	0.08	0.00	0.16	0.00	0.00	0.15	0.18	0.31	0.55
BRA	0.76	0.29	-0.05	0.08	0.30	0.38	-0.01	0.00	0.75	0.29	1.25	1.45
CHN	0.07	1.63	-0.01	0.01	1.17	1.41	-0.01	0.08	0.06	1.63	2.18	2.38
DVC	0.31	-0.04	-0.04	0.07	-0.10	-0.11	0.01	0.03	0.32	-0.03	0.20	0.32
ECA	0.07	0.28	-0.06	0.11	-0.10	-0.11	0.00	0.18	0.07	0.28	0.24	0.58
EU	0.15	-0.02	-0.03	0.05	-0.06	-0.05	0.02	0.07	0.15	-0.01	0.10	0.22
IND	0.11	1.85	-0.06	0.11	0.33	0.41	0.00	0.24	0.11	1.85	2.03	2.48
JPN	0.19	0.05	0.01	-0.03	-0.01	0.01	0.00	-0.01	0.19	0.05	0.24	0.19
LAT	-0.17	0.24	0.09	-0.15	-0.25	-0.26	-0.01	0.10	-0.18	0.25	0.02	-0.12
MID	0.12	1.44	-0.07	0.11	0.02	0.07	0.01	0.19	0.11	1.44	1.54	1.93
NIC	0.20	0.83	-0.03	0.05	0.80	1.00	0.00	0.06	0.20	0.83	1.53	1.78
SSA	0.15	0.63	-0.06	0.11	-0.11	-0.09	0.00	0.21	0.10	0.62	0.65	1.04
USA	0.02	-0.03	-0.02	0.04	-0.03	-0.03	0.00	0.00	0.02	-0.02	-0.05	0.02
World	0.11	0.21	-0.02	0.04	0.04	0.07	0.01	0.06	0.11	0.21	0.33	0.45
GDP Impact, Billions of Dollars												
ASA	0.2	2.4	-0.1	0.3	-0.4	-0.4	0.0	0.5	0.1	1.5	2.2	3.1
ASN	0.0	10.1	-0.5	0.9	2.0	3.1	0.1	3.6	0.0	10.2	11.3	17.0
AUS	1.0	1.2	-0.3	0.5	0.0	1.0	0.0	0.0	0.9	1.2	1.9	3.5
BRA	4.7	1.8	-0.3	0.5	1.9	2.4	-0.1	0.0	4.7	1.8	7.8	9.0
CHN	1.1	27.4	-0.1	0.1	19.7	23.8	-0.2	1.4	1.1	27.5	36.8	40.1
DVC	5.4	-0.6	-0.7	1.2	-1.7	-1.9	0.2	0.6	5.5	-0.6	3.4	5.6
ECA	0.8	3.1	-0.7	1.2	-1.1	-1.2	0.0	2.0	0.7	3.1	2.6	6.4
EU	19.7	-2.4	-3.7	6.3	-8.0	-5.9	3.1	9.1	18.9	-1.0	12.5	29.0
IND	0.7	11.9	-0.4	0.7	2.1	2.6	0.0	1.5	0.7	11.9	13.1	16.0
JPN	8.9	2.3	0.6	-1.6	-0.6	0.5	-0.1	-0.7	8.9	2.3	11.3	9.0
LAT	-2.7	3.8	1.4	-2.4	-3.9	-4.1	-0.1	1.5	-2.8	3.9	0.3	-2.0
MID	1.4	16.3	-0.7	1.3	0.2	0.8	0.1	2.2	1.3	16.3	17.4	21.8
NIC	2.3	9.5	-0.4	0.6	9.2	11.5	0.0	0.7	2.2	9.5	17.6	20.5
SSA	0.8	3.2	-0.3	0.6	-0.6	-0.5	0.0	1.1	0.5	3.2	3.3	5.4
USA	2.2	-2.9	-2.8	4.9	-4.0	-3.6	-0.1	-0.4	2.1	-2.8	-5.5	1.8
World	46.4	87.0	-9.1	14.9	15.0	28.1	2.9	23.2	44.9	87.9	136.1	186.2

Note: Refer to Table A1 and Box 1 for the regional aggregation and the scenarios, respectively.

Source: Author's Calculations.

Fourth, when 10% reduction in services trade barriers of developed countries is assumed, the world GDP will increase by US$ 1.1 billion in

the static model, but it will increase by US$ 2.9 billion in the capital accumulation model. If services trade barriers are assumed to be reduced by 30%, 20%, and 10% in developed countries, developing countries, and other countries, then the effect will be magnified by a substantial degree: the world GDP will increase by US$ 12.6 billion in the static model, but it will increase by US$ 23.2 billion in the capital accumulation model.[20]

This implies that the positive effects of trade liberalization in services are never negligible. As services are an input into the production of most industries, an inefficient service sector can be very costly to the economy as a whole. From the general equilibrium perspective, liberalization in services gives manufacturing industries access to low-cost, high-quality service inputs so that they can be competitive. The services liberalization with modest assumptions will provide substantial benefits, which will be greater in more ambitious plans. The DDA negotiations have focused on agricultural and NAMA issues, but the WTO members will need to develop some interest in the services liberalization issues.

Fifth, the LDC preferences, namely special and differential treatment of DDA negotiations, turn out to be marginal in terms of the GDP effect.[21] When we compare the agricultural and NAMA liberalization scenarios with/without LDC preferences, the differences between the two scenarios are very tiny for the least developed countries. In case of

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[20] According to Decreux and Fontagené (2009), the additional GDP and trade gains expected from a three percent liberalization in certain services will be US$ 11 billion and US$ 36 billion, respectively.

[21] Martin and Mattoo (2008) also reveal that duty-free-quota-free market access for the 97% of the exports by the LDCs is very far from 100% tariff elimination.

the static model, the agricultural liberalization scenario with the S&D treatment (AGRI) will provide a 0.02% GDP gain for the Sub-Sahara African countries (SSA) and 0.04% gain for other Asian countries (ASA), while the scenario without the S&D treatment (AG-LD) will provide a 0.01% GDP gain for the Sub-Sahara African countries (SSA) and 0.02% gain for other Asian countries (ASA). The differences between the two turn out to be 0.01% and 0.02%, respectively.

On the other hand, the scenario with the S&D treatment (NAMA) will provide a 0.12% GDP gain for the Sub-Sahara African countries (SSA) and 0.18% gain for other Asian countries (ASA), while the scenario without the S&D treatment (NA-LD) will provide the 0.11% GDP gain for the Sub-Sahara African countries (SSA) and 0.12% gain for other Asian countries (ASA). The differences between the two turn out to be 0.01% and 0.06%, respectively. The differences between the scenarios with/without S&D treatment will be greater in case of the capital accumulation model. However, it may be disappointing to see such small GDP gains because their expectations have been magnified by the name of current multilateral negotiations, Doha Development Agenda.

This result is disappointing to the LDCs but it may not be surprising. It is partly because the actual impact of the GSP (Generalized System of Preferences) on exports from developing countries, which is the most significant area of S&D, has been questioned, as Dessus (1999) indicates. In addition, Martin and Mattoo (2008) points out that some countries already offer extensive preferences on a wide range of products and exports by LDCs that are strongly concentrated in a few products.

B. Trade Expansion Effects

According to the static model, the trade expansion effects will amount to US$ 265.3 billion and US$ 321.4 billion in the mini and mega packages, respectively. They will increase to US$ 309.6 billion and US$ 382.0 billion in the mini and mega packages, respectively.[22] More than half of the trade expansion effects come from the NAMA sectors, the remaining effects accrue from the agricultural and services sectors.

Table 5~6 reveal the trade expansion effects of each scenario. The export effects of each country turn out to be different from the import effects, but the world export total is almost same as the world import total. This paper deals with the export effects in discussing the general picture of various scenarios.

The trade expansion effects of the mini scenario will amount to US$ 265.3 billion and US$ 309.6 billion in the static and capital accumulation model, respectively. On the other hand, the trade expansion effects of the mega scenario will amount to US$ 321.4 billion and US$ 382.0 billion in the static and capital accumulation model, respectively. This result reveals the static effects turned out to be smaller than the dynamic effects, but the difference between the two is not great compared to the GDP effects. It is because trade liberalization will have the short-term trade expansion effect. The dynamic saving behavior, which is captured by the capital accumulation model, will have the long-term trade expansion effect to a limited degree.

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[22] The Table 5~6 reveal that the import effects turn out to be a little bit less than the export effects.

Table 5. Trade expansion effects of the Various Scenarios of DDA Negotiations (Static Model)

(unit: billions of dollars)

	AGRI	NAMA	SB-1	SB-2	SE-1	SE-2	SV-1	SV-2	AG-LD	NA-LD	MINI	MEGA
Export Effects												
ASA	0.1	1.1	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.9	1.3	1.4
ASN	1.0	3.9	0.2	-0.4	2.5	3.1	-0.2	3.7	1.0	3.9	6.9	10.7
AUS	0.0	1.8	0.1	-0.1	1.0	1.6	0.1	0.5	0.0	1.8	2.8	3.4
BRA	-1.6	2.0	0.1	-0.1	2.2	2.9	0.0	0.6	-1.6	2.0	2.3	3.2
CHN	1.7	41.4	-0.6	1.1	32.4	38.2	0.0	2.4	1.7	41.4	57.2	63.8
DVC	6.4	2.1	0.2	-0.4	0.9	1.0	0.8	2.5	6.7	2.1	10.1	11.4
ECA	0.9	5.1	0.1	-0.1	1.0	1.1	0.0	2.2	1.0	5.1	6.8	8.9
EU	17.2	23.5	0.7	-1.2	13.6	18.4	6.8	21.0	17.1	25.1	55.7	70.7
IND	0.3	9.7	0.1	-0.1	4.5	5.7	0.0	0.8	0.3	9.7	12.3	13.7
JPN	12.6	11.8	-1.8	3.2	7.3	9.7	1.2	4.2	12.6	11.8	28.0	37.4
LAT	1.0	4.9	-0.5	0.9	0.8	1.0	0.1	1.9	1.0	4.9	5.9	9.3
MID	1.3	8.7	0.0	0.1	1.0	1.1	0.0	2.4	1.3	8.7	10.6	13.2
NIC	0.7	10.7	-0.3	0.5	12.5	14.6	-0.1	1.8	0.7	10.8	19.4	23.4
SSA	0.6	2.1	0.0	-0.1	0.2	0.3	0.0	-0.4	0.4	2.0	2.8	2.3
USA	4.0	26.6	0.9	-1.5	16.3	20.5	2.2	7.7	4.0	26.2	43.3	48.6
World	46.3	155.3	-0.9	1.7	96.3	119.4	11.1	51.4	46.3	156.5	265.3	321.4
Import Effects												
ASA	0.4	2.5	0.0	0.0	0.0	0.0	2.8	0.2	0.2	1.6	2.8	3.0
ASN	1.2	8.3	0.0	-0.1	3.7	4.8	12.1	4.2	1.2	8.3	12.1	17.2
AUS	1.2	2.0	-0.1	0.1	0.9	1.9	4.0	0.5	1.2	1.9	3.9	5.1
BRA	3.3	2.4	0.0	0.1	2.9	3.7	8.2	0.5	3.3	2.4	8.1	9.4
CHN	1.8	46.7	-0.2	0.3	37.6	43.8	66.2	1.7	1.8	46.7	65.7	70.8
DVC	6.7	0.6	0.0	0.0	-0.2	-0.4	8.2	2.7	7.1	0.6	8.1	10.0
ECA	1.2	5.4	0.0	0.1	0.9	1.0	7.2	2.0	1.2	5.3	7.1	9.3
EU	9.9	14.7	0.2	-0.3	8.7	12.3	36.6	24.6	10.2	17.3	37.0	55.1
IND	0.5	11.1	0.0	0.0	4.6	5.5	13.9	0.8	0.5	11.1	13.8	15.3
JPN	10.6	13.5	0.1	0.0	8.9	12.6	29.7	2.5	10.6	13.5	29.9	33.8
LAT	1.2	5.1	0.2	-0.4	-0.7	-0.8	5.8	1.6	1.2	5.2	6.2	7.2
MID	1.3	12.7	-0.1	0.1	1.3	1.5	15.1	2.2	1.3	12.6	14.9	17.4
NIC	0.9	15.0	-0.1	0.3	15.7	18.5	26.3	2.0	0.9	15.0	26.0	30.2
SSA	1.3	2.8	0.0	0.1	-0.1	0.0	4.0	-0.4	0.8	2.7	4.0	3.8
USA	4.8	12.5	-0.8	1.4	12.2	14.9	27.1	6.2	4.8	12.2	25.5	33.7
World	46.3	155.2	-0.9	1.7	96.2	119.3	267.2	51.4	46.2	156.4	265.2	321.3

Note: Refer to Table A1 and Box 1 for the regional aggregation and the scenarios, respectively.

Source: Author's Calculations.

It is not surprising to see that more than half of the trade gains come from the manufacturing sectors. In the mini package, the expected

trade gain for the manufacturing sector (NAMA) will amount to US$ 155.3 billion out of the total US$ 265.3 billion in the static model, while it will amount to US$ 190.5 billion out of the total US$ 309.6 billion in the capital accumulation model. Agricultural liberalization (AGRI) is expected to provide US $ 46.3 billion for the world economy.

The trade expansion effects of the modest reduction in the agricultural subsidy (SB-1) turn out to be negative, while the trade expansion effects of a more ambitious reduction in the agricultural subsidy (SB-2) turn out to be positive, results that can also be found in the case of the capital accumulation model. The reduction in the domestic support will harm the agricultural exporting sector, but it will benefit that sector if the distortion is cured by the more ambitious action.[23]

The sectoral proposals are expected to increase the exports to a substantial degree. If the tariff is eliminated in the 4 sectors including chemical, electronics, industrial machinery, and jewelry (SE-1), then the world exports will be increase by US$ 96.3 billion and US$ 108.0 billion in the static model and the capital accumulation model, respectively. When we assume tariff elimination in 10 industrial sectors (SE-2), then the world exports will increase by US$ 119.4 billion and US$ 135.9 billion in the static model and the capital accumulation model, respectively. This result implies that the sectoral proposals will provide huge trade gains for the WTO participating member countries, and more benefits will be reaped by the more ambitious proposals.[24]

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[23] Hoekman and Olarreaga (2004) indicates that reduction in domestic support have small impact on the exports, imports, or welfare of world economy. A 50 % tariff cut by WTO members, however, boosts world economy welfare to a substantial degree.

[24] Adler (2009) reveals that the trade gains from the chemicals and electronic/electrical sectors would be an increase of US$ 25.1 billion and US$ 35.4 billion in exports, respectively.

Table 6. Trade expansion effects of the Various Scenarios of DDA Negotiations (Capital Accumulation Model)

(unit: billions of dollars)

	AGRI	NAMA	SB-1	SB-2	SE-1	SE-2	SV-1	SV-2	AG-LD	NA-LD	MINI	MEGA
Export Effects												
ASA	0.2	1.9	0.0	0.0	0.0	0.0	0.0	0.2	0.1	1.4	2.0	2.3
ASN	0.5	14.6	-0.4	0.6	4.7	6.3	-0.1	6.2	0.5	14.6	18.4	27.1
AUS	0.4	2.0	0.0	0.0	1.0	2.0	0.1	0.4	0.4	2.0	3.3	4.3
BRA	1.0	2.7	0.0	0.0	3.2	4.1	0.0	0.5	1.0	2.7	6.3	7.6
CHN	2.0	52.3	-0.6	1.0	41.6	49.1	0.0	2.3	2.0	52.3	72.9	80.3
DVC	7.4	0.8	-0.1	0.2	-0.4	-0.6	0.9	2.7	7.7	0.8	8.8	11.0
ECA	1.1	6.0	-0.2	0.3	0.4	0.5	0.0	2.4	1.1	5.9	7.2	10.2
EU	16.6	19.3	-1.0	1.7	10.5	15.6	8.2	25.1	16.5	21.7	49.0	71.3
IND	0.4	13.2	0.0	0.0	5.4	6.6	0.0	1.0	0.4	13.2	16.3	18.1
JPN	12.2	11.8	-1.2	2.2	7.5	10.2	0.9	3.1	12.2	11.8	27.9	35.1
LAT	0.0	6.2	0.3	-0.6	-0.8	-0.8	0.0	1.8	0.0	6.2	6.0	7.0
MID	1.6	16.1	-0.3	0.6	0.8	1.1	0.1	2.6	1.6	16.1	18.2	21.9
NIC	1.5	17.1	-0.5	0.9	19.3	22.8	-0.1	2.1	1.5	17.1	30.9	36.8
SSA	0.9	3.4	-0.1	0.2	-0.2	-0.1	0.0	-0.3	0.6	3.4	4.2	4.1
USA	4.2	23.1	0.1	-0.2	15.1	19.0	1.9	6.7	4.2	22.8	38.4	44.9
World	49.9	190.5	-4.1	7.1	108.0	135.9	11.9	56.9	49.7	192.0	309.6	382.0
Import Effects												
ASA	0.4	2.9	0.0	0.1	-0.1	0.0	0.0	0.2	0.2	1.9	3.2	3.6
ASN	1.0	14.0	-0.3	0.6	4.9	6.5	-0.1	5.5	1.0	14.0	18.4	26.3
AUS	1.2	2.3	-0.1	0.2	1.0	2.0	0.1	0.5	1.2	2.3	4.3	5.7
BRA	3.2	2.6	-0.1	0.1	2.9	3.7	0.0	0.5	3.2	2.6	8.1	9.5
CHN	2.2	55.3	-0.3	0.5	44.3	51.9	-0.1	1.8	2.2	55.3	78.2	84.5
DVC	7.0	0.7	-0.2	0.4	-0.5	-0.7	0.9	2.9	7.4	0.7	8.2	10.7
ECA	1.4	6.1	-0.2	0.4	0.7	0.8	0.1	2.2	1.4	6.1	7.8	10.7
EU	11.0	17.8	-1.1	2.0	7.7	11.9	8.2	26.3	11.2	20.6	40.0	63.2
IND	0.6	12.7	-0.1	0.2	4.8	5.8	0.0	0.9	0.6	12.7	15.6	17.4
JPN	10.9	15.2	-0.2	0.4	9.5	13.5	0.8	2.9	10.9	15.2	32.0	37.1
LAT	1.3	5.6	0.2	-0.4	-1.2	-1.2	0.0	1.6	1.3	5.7	6.6	7.5
MID	1.6	15.7	-0.3	0.5	1.6	2.0	0.1	2.4	1.6	15.7	18.3	21.8
NIC	1.4	18.9	-0.4	0.6	19.3	23.0	-0.1	2.2	1.4	18.9	32.7	38.3
SSA	1.3	3.3	-0.1	0.2	0.0	0.1	0.1	-0.3	0.8	3.2	4.6	4.6
USA	5.2	17.3	-0.8	1.3	13.0	16.2	1.7	7.1	5.2	17.1	31.5	40.7
World	49.9	190.4	-4.1	7.1	107.8	135.7	11.9	56.9	49.6	191.8	309.4	381.8

Note: Refer to Table A1 and Box 1 for the regional aggregation and the scenarios, respectively.

Source: Author's Calculations.

The scenarios with LDC preferences (AGRI, NAMA) will provide more export gains for the relatively poor regions such as SSA and ASA.

But the gains represented by the difference between AGRI and AG-LD, and NAMA and NA-LD, are not impressive as expected. That means that they need capacity building in order to utilize the export opportunities through the no-duty and no-quota preferences.

2. Economic Effects of the DDA Negotiations on the G-7 Countries

The GDP gain for the US will range from US$ 1.6 billion to 1.9 billion in the static model and the GDP impacts turn out to be -5.5 billion to 1.8 billion in the capital accumulation model, which is shown in Table 3 and 4. But, Tables 5 and 6 reveal that the trade gains for US is expected to range from US$ 38.4 billion to 48.6 billion, which is the third biggest among the economic regions in the model. The reason that GDP impacts turn out to be unsurprisingly modest is that the terms of trade for the US are expected to be negative, ranging from -0.20% to -0.42%, which is one of the worst numbers shown in Table 7.

The EU is expected to gain the GDP effects of US$ 18.9 billion in the mini package and US$ 19.5 billion in the mega package, respectively, according to the static model. Those gains are the biggest among the WTO members along with the Japan, China, and other developed countries. Agricultural liberalization is the most important factor contributing to the GDP gain for the EU. In the capital accumulation model, the GDP gains turn out to be US$ 12.5 billion and US$ 29.0 billion in the mini and mega packages, respectively. The GDP gain for the EU in the dynamic context turn out to be substantial, but the relative size just follows China, NICs, MID, and India. The reason why the GDP gain for the EU will not

be magnified in the dynamic context is that the terms of trade turn out to deteriorate in the static as well as dynamic context, although the intra-regional trade dominates the inter-regional trade in the case of the EU.

Table 7. Terms of Trade expansion effects of the Various Scenarios of DDA Negotiations

(unit: %)

	AGRI	NAMA	SB-1	SB-2	SE-1	SE-2	SV-1	SV-2	AG-LD	NA-LD	MINI	MEGA
Static Model												
ASA	0.54	1.15	0.00	0.00	0.01	0.04	0.03	0.11	0.27	0.46	1.69	1.74
ASN	0.19	0.22	-0.02	0.03	0.11	0.14	0.01	-0.06	0.19	0.22	0.44	0.42
AUS	0.68	0.00	-0.04	0.06	-0.02	-0.09	0.01	0.05	0.68	0.00	0.62	0.70
BRA	3.17	-0.11	-0.04	0.07	-0.24	-0.32	0.01	-0.03	3.16	-0.12	2.74	2.78
CHN	0.02	-0.14	-0.01	0.02	-0.33	-0.41	0.00	-0.02	0.02	-0.14	-0.20	-0.21
DVC	-0.04	-0.07	0.00	0.00	-0.01	-0.04	0.00	0.01	-0.03	-0.07	-0.12	-0.12
ECA	0.10	-0.01	0.00	-0.01	0.11	0.11	0.02	-0.02	0.10	-0.02	0.16	0.12
EU	-0.14	-0.05	0.00	0.01	-0.05	-0.07	0.00	0.01	-0.13	-0.04	-0.22	-0.21
IND	0.16	-1.08	-0.02	0.04	-0.69	-0.87	0.02	-0.08	0.16	-1.09	-1.25	-1.39
JPN	-0.38	0.66	0.08	-0.15	0.50	0.75	-0.03	-0.06	-0.38	0.66	0.59	0.48
LAT	0.33	-0.17	-0.01	0.01	-0.08	-0.10	0.01	-0.02	0.33	-0.16	0.12	0.09
MID	-0.03	-0.04	0.02	-0.03	0.12	0.14	0.02	-0.02	-0.03	-0.04	0.02	-0.05
NIC	-0.02	0.57	0.01	-0.02	0.16	0.24	0.02	0.03	-0.02	0.57	0.63	0.64
SSA	0.31	-0.17	0.01	-0.01	0.03	0.04	0.02	0.08	0.17	-0.19	0.17	0.23
USA	0.04	-0.40	-0.02	0.03	-0.05	-0.10	-0.01	0.02	0.03	-0.39	-0.42	-0.36
Capital Accumulation Model												
ASA	0.53	0.95	0.01	-0.02	0.07	0.12	0.03	0.10	0.27	0.37	1.52	1.55
ASN	0.21	0.04	-0.01	0.02	0.09	0.10	0.01	-0.11	0.21	0.04	0.26	0.16
AUS	0.63	0.16	-0.03	0.06	0.08	-0.03	0.01	0.08	0.63	0.15	0.78	0.85
BRA	2.75	-0.15	-0.03	0.05	-0.38	-0.48	0.01	-0.01	2.74	-0.15	2.20	2.20
CHN	0.02	-0.36	-0.02	0.02	-0.52	-0.63	0.00	-0.01	0.02	-0.36	-0.49	-0.50
DVC	-0.06	0.00	0.00	0.00	0.04	0.03	0.00	0.01	-0.05	0.00	-0.05	-0.04
ECA	0.10	0.04	0.00	0.00	0.18	0.20	0.02	-0.02	0.10	0.04	0.26	0.23
EU	-0.13	-0.02	0.00	0.00	-0.04	-0.06	-0.01	0.01	-0.12	-0.01	-0.18	-0.18
IND	0.15	-1.61	-0.01	0.02	-0.85	-1.05	0.02	-0.11	0.14	-1.62	-1.84	-2.04
JPN	-0.37	0.72	0.06	-0.11	0.51	0.77	-0.02	-0.03	-0.36	0.72	0.67	0.64
LAT	0.39	-0.17	-0.05	0.08	0.00	0.00	0.02	-0.01	0.40	-0.17	0.19	0.27
MID	-0.02	-0.07	0.01	-0.02	0.25	0.29	0.02	0.00	-0.02	-0.07	0.06	0.04
NIC	-0.03	0.46	0.02	-0.03	0.02	0.06	0.02	0.02	-0.03	0.46	0.40	0.38
SSA	0.30	-0.10	0.00	0.00	0.15	0.19	0.02	0.10	0.17	-0.11	0.30	0.39
USA	0.04	-0.27	0.00	0.01	-0.02	-0.05	-0.01	0.04	0.04	-0.26	-0.25	-0.20

Note: Refer to Table A1 and Box 1 for the regional aggregation and the scenarios, respectively.
Source: Author's Calculations.

The DDA is expected to produce the huge trade expansion effects for Japan, US$ 27.9~37.4 billion and US$ 29.9~37.1 billion in exports and imports, respectively, which is one of the largest trade gains along with China, the EU, the US, and NICs. The export gains for Japanese agricultural sectors will be larger than the import gains according to Table 5~6, but the import gains will dominate in the manufacturing sectors. The GDP effects for Japan is expected to be US$ 10.5 billion and US$ 8.3 billion in the mini and mega packages, respectively, which implies that Japan will be one of the main beneficiaries next to EU according to the static model. Terms of trade for Japan will be improved by 0.48%~0.67% depending on the model.

Not surprisingly, the DDA will produce the largest trade gains for China according to Table 5~6. Chinese exports and import gains will range from US$ 57.2~80.3 billion, US$ 65.7~84.5 billion, respectively. Overall terms of trade will fall by 0.20%~0.50% depending on the model, and sectoral proposals will worsen the terms of trade by 0.33%~ 0.63%. It is notable that the GDP gains for China in the short-term will amount to US$ 4.6~5.9 billion, which is the largest next to the EU and Japan. But the GDP gains for China in the dynamic context will amount to US$ 36.8~40.1 billion, which is the largest followed by NICs, MID, and India. Specifically, Chinese participation in the sectoral proposals in manufacturing sectors will produce huge GDP gains in the capital accumulation model. This result implies that the economic benefits for the Chinese economy will be amplified in the dynamic context of saving behavior.

DDA negotiations will produce large, dynamic effects for Brazil.

The range of static GDP effect will be about US$ 0.4~0.5 billion, but the dynamic GDP effect will rise to the level of US$ 7.8~9.0 billion. It will be equivalent to 1.25~1.45% increase in the GDP, which is one of the largest along with China, India, MID, NICs, and ASN. Specifically, the positive GDP effects will be largest in the case of static scenarios of NAMA and sectoral proposals (SE-1 and SE-2), and in the case of dynamic scenarios of agricultural liberalization (AGRI). In case of Brazil, the export effects will range from US$ 2.3 billion to US$ 7.6 billion, which is dominated by the import effects ranging from US$ 8.1 billion ~US$ 9.5 billion. Terms of trade for Brazil will dramatically improve by 2.20~2.78%, which is the largest among all regions listed in Table 7. It is notable that agricultural liberalization will improve the terms of trade (2.75~3.17%), but sectoral proposals will deteriorate the terms of trade (-0.24~-0.48%).

India will be one of the winners in the DDA negotiations in terms of the GDP. The static GDP effect for India will range US$ 1.2~2.3 billion, but the dynamic GDP effect will rise to US$ 13.1~16.0 billion. The contribution of DDA gains to India's GDP will occupy 0.21~0.36% in the static model, and rise to 2.03~2.48% in the capital accumulation model. It is partly because the DDA will produce substantial trade expansion effect for India, US$ 27.9~37.4 billion and US$ 13.8~17.4 billion in exports and imports, respectively. Specifically, India is expected to substantially increase the manufacturing trade due to NAMA as well as sectoral proposals. Terms of trade for India will fall by 1.25~2.04%, which is one of the largest among all regions listed in Table 7. However, it is notable that the agricultural liberalization will improve the terms

of trade (0.15~0.16%), along with the mild subsidy reduction scenario (0.02~0.04%) and modest service liberalization (0.02%).

The DDA will produce the dynamic GDP effects for the Australian economy, 0.07~0.08% (US$ 0.4~0.5 billion) in the static model, which is below the world average, 0.12~0.14%. Interestingly, however, the dynamic GDP effects will amount to 0.31~0.55% (US$ 1.9~3.5 billion) in the capital accumulation model, which is above the world average. The dynamic scenarios of agricultural liberalization (AGRI), market access in the manufacturing sectors (NAMA), and sectoral proposals (SE-2) will produce GDP gains of 0.15%, 0.19%, and 0.16%, respectively. The DDA is expected to produce substantial trade expansion effects for Australia, US$ 2.8~4.3 billion and US$ 3.9~5.7 billion in exports and imports, respectively. Terms of trade will improve by 0.62~0.85%, which is one of the largest along with Brazil, ASA (other Asian countries), Japan, and NICs.

Ⅳ. Conclusion and Discussion

This paper implements the various scenarios regarding agricultural liberalization, NAMA, reduction in the agricultural domestic support, sectoral proposals in the manufacturing industries, and services liberalization. According to previous literature including Anderson *et al.* (2006), Francois (2001), OECD (2003), Decreux and Fotagné (2009), Adler and *et al.* (2009), and Suh (2009), the DDA will produce 0.1~1.5% GDP gains for an economic region, ranging from US$ 17.7 billion to US$ 700 billion, depending on the assumptions and scenarios.[25] On the other hand, Mattoo and Subramanian (2008) points out that DDA would have minimal trade effects both in goods and services.

The simulation result of this paper belongs to the range of economic gains produced by the previous literature. It turns out that the GDP effects will amount to US$ 49.9~186.2 billion (0.12~0.45%)[26] and the welfare gain will amount to US$ 49.7~157.7 billion depending on the scenarios.[27] The GDP growth effects are mainly due to the trade expansion effects, which amount to US$ 265.3~382.0 billion. It indicates

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[25] Mensbrugghe (2006) examines why the estimate numbers of GDP gains can vary widely. Besides the methodological issues, it emphasizes the differences of the scenario under analysis – whether it is full liberalization or partial reforms; whether the analysis is static or dynamic; and whether the scenario includes services or not. For the comparison of the previous literature, refer to Table A8.

[26] Table A4 in the Appendix reveals that there are some differences between the GDP impacts using MFN rate and bound rate.

[27] Welfare effects of the various scenarios are reported in Table A3 in the Appendix.

that the DDA negotiations will boost the global economy to a substantial degree.

Currently, the DDA negotiations are confronted with the so-called triangle issues comprising of agricultural subsidy, the agricultural tariff reduction, and the non-agricultural market access (NAMA) liberalization including sectoral proposals. In addition, the negotiations for the services trade liberalization has been delayed due to the insufficient motivation while there have been plenty of discussions on how to strengthen and clarify support for the LDCs. This paper also provides valuable insights towards a desired future path of the WTO negotiations as follows.

First, agricultural liberalization is an efficient vehicle for expanding global trade as well as GDP along with market access in the manufacturing sectors. The simulations in this paper is based on the draft modalities for agricultural liberalization as well as NAMA set out in 2008, which is expected to be the "landing zone" for "final bargaining." The GDP growth effect by agricultural liberalization will range from 0.08 to 0.11% depending on the model and export expansion effects will amount to US\$ 16.3~49.9 billion. Brazil, other developing countries (DVC), the EU, Japan, and NICs will be the winners, while the potential GDP gains will not be impressive for the US, ASEAN, and Latin American countries (LAT). If terms of trade will be improved substantially by the agricultural liberalization, however, it will be good news for some countries including the US, Latin American countries (LAT), Brazil, and India.

On the other hand, Non-Agricultural Market Access negotiations

(NAMA) will produce potential gains for China, India, ASEAN, other Asian countries (ASA) while EU, the US, and other developing countries (DVC) will enjoy the benefits to a limited degree. However, NAMA will produce the huge trade expansion effects of US$ 155.3~190.5 billion and contribute to global GDP growth by 0.04~0.21%.

Second, agricultural subsidy needs to be reduced in a balanced manner. That means that too ambitious reduction may be detrimental to the interests of the WTO members. The agricultural subsidy is called one of the triangle issues along with the modalities of agriculture as well as NAMA, which implies that it has been very sensitive to any reduction plan. According to the simulation results, the world GDP will decrease under the ambitious scenario because drastic reduction in the OTDS (Overall Trade-Distorting Domestic Support) will have a short-term negative impact on agricultural production.

It also turns out that a modest reduction scenario (SB-1) will produce potential GDP gains for Latin American countries (LAT) and Japan among others, but result in no GDP gains in the short-term and GDP losses in the long-term for India, ASEAN, other Asian countries, other European countries (ECA), and Mid East Asian countries (MID). However, a more ambitious scenario for the reduction scenario (SB-2) indicates the different consequences. It will produce potential GDP losses for Latin American countries (LAT) and Japan, but the GDP gains for India, ASEAN, other Asian countries, other European countries (ECA), and Mid East Asian countries (MID).

Third, sectoral proposals have the potential of becoming an unexpected opportunity for the WTO members. The simulation results indi-

cate that the world GDP will increase by US$ 1.2~15.0 billion when the tariffs in 4 sectors will be eliminated. The GDP growth effects will be magnified with sectoral proposals for 10 industries: the world GDP will increase by US$ 3.9~28.1 billion whose maximum is almost half of the GDP effects of agricultural liberalization, US$ 32.8~46.4 billion.

The result also reveals that sectoral proposals for tariff elimination in the 4 manufacturing sectors (SE-1), which will be a relatively modest scenario, and will produce the GDP gains for China, NICs, India, Brazil among others; but the EU, Japan, Latin American countries (LAT), and other developed countries (DVC) might become the losers. On the other hand, the more ambitious scenario for sectoral proposals for tariff elimination in the 10 manufacturing sectors (SE-2) will produce the GDP gains for China, NICs, Brazil, the ASEAN, India; but GDP losses for the EU, Latin American countries (LAT), other Asian countries (ASA) among others.

Fourth, services liberalization needs to be discussed in the DDA in order to upgrade the economic efficiency of the developed as well as developing members. The simulation result indicates that the world GDP will increase by US$ 1.1~2.9 billion under the modest 10% reduction in services trade barriers, it will increase by US$ 12.6~23.2 billion under the more ambitious reduction.

Currently, however, services liberalization is not an issue of major interest in the DDA process and there is a low level of expectation for the successful completion of request and offer by the members. This paper reveals that the mild services liberalization (SV-1) will produce GDP gains for the EU, Mid East Asian countries (MID), other devel-

oped countries (DVC), and the ASEAN; but short-term GDP losses for Brazil, China, and Latin American countries (LAT). The more ambitious services liberalization (SV-2) will produce GDP gains for the ASEAN, India, other Asian countries (ASA), Mid East Asian countries (MID), and countries in Sub-Saharan Africa, but short-term GDP losses for Japan.

Fifth, the WTO members need to establish comprehensive and efficient rules on special and differential treatment (S&D) provisions contained in the various WTO agreements and decisions, in order to support the least developed countries. This paper reveals that the LDC preferences turn out to be marginal in terms of the GDP effect.[28] When this paper compares the GDP growth effect with/without LDC preferences, it turns out that the difference between the two amounts to 0.01~0.06% for the Sub-Sahara African countries (SSA) and other Asian countries (ASA), respectively. This result implies that the provision of duty-free-quota-free market access for the LDCs may not be enough.

Sixth, the WTO member countries will have to strike a balance among the developed and developing countries. Currently, the DDA negotiations are faced with remaining key issues including agricultural special safeguard mechanism (SSM) and sectoral proposals. The simulation results of this paper indicate that the developed countries need to consider positively the arguments of the developing countries, including India, on controversial issues related to agriculture. In return for concessions by the developed countries, the developing countries

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[28] As Anderson *et al.* (2000) points out, most of the gains accrue to the liberalizing region.

will likely accept further discussion related to sectoral proposals and the services liberalization. Specifically, the ambitious liberalization of services is expected to produce huge GDP gains for developing countries including the ASEAN, India, and Latin American countries (LAT) among others, while the ambitious sectoral proposals will provide outstanding trade expansion effects for China and the Asian NICs (NIC) along with the US and the EU.

Finally, it is worthwhile to note that the estimated gains of the DDA negotiations are just potential gains. They do not come to pass automatically, but rather, will require deliberate efforts; such as investing in R&D and human capital and simplifying administrative processes. Furthermore, this paper reveals that the economic interests of the WTO member countries will be very different, and even contradict each other in the specific negotiation agenda. Indeed, though the benefits of the DDA negotiations are not evenly distributed among countries, trade liberalization is not a zero-sum game.

As shown above, the effects of the DDA negotiations can be further increased in the long-term if each country makes greater efforts to realize increasing returns to scale and boost capital accumulation. This implies that the DDA negotiations may provide an opportunity to improve the economic system of the WTO member countries.

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Appendix

Table A1. Regional Aggregation

Region	Country Name
1. ASN	ASEAN member countries
2. CHN	China
3. JPN	Japan
4. NIC	East Asian NICs including Korea, Taiwan, and Hong Kong
5. IDN	India
6. ASA	Other Asian countries
7. USA	The United States
8. EU	EU member countries
9. AUS	Australia
10. DVC	Other Developed countries
11. ECA	Other East European countries
12. MID	Middle East countries
13. BRA	Brazil
14. LAT	Other Latin American countries
15. SSA	Sub-Sahara African countries.

Source: Author's classification.

Table A2. Sectoral Aggregation

Sector	GTAP Classification
1. Grains and crops	1, 5, 8, 23
2. Vegetables and fruit	4
3. Meat and Dairy	19, 20, 22
4. Processed Food	21, 25, 26
5. Other Agriculture	2, 6, 7, 9, 10, 11, 12, 24
6. Forest and fisheries	13-14
7. Mining and quarrying	15-18
8. Textiles and clothing	27-28
9. Chemical products	32-33
10. Steel and metal products	35-37
11. Transport equipment	38, 39
12. Electronic products	40
13. Machinery	41
14. Other Manufacturing	29-31, 34, 42
15. Trade	47
16 Telecommunication and transportation	48-51
17. Financial and Business services	52-54
18. Other Services	43-46, 55-57

Source: GTAP Database.

Table A3. Welfare Effects of the Various Scenarios of DDA Negotiations

<div align="right">(unit: billions of dollars)</div>

	AGRI	NAMA	SB-1	SB-2	SE-1	SE-2	SV-1	SV-2	AG-LD	NA-LD	MINI	MEGA
Static Model												
ASA	0.4	1.2	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.6	1.6	2.1
ASN	1.5	2.9	-0.1	0.2	0.8	1.2	0.1	1.2	1.5	2.9	4.7	6.3
AUS	0.9	0.4	0.0	0.1	0.0	0.0	0.0	0.1	0.9	0.4	1.2	1.4
BRA	2.5	0.4	0.0	0.1	0.2	0.3	0.0	0.0	2.5	0.4	2.9	3.1
CHN	0.4	4.0	-0.1	0.1	-0.7	-0.4	0.0	1.2	0.4	4.0	4.1	5.4
DVC	3.6	0.0	0.0	0.0	-0.1	-0.2	0.1	0.2	3.7	0.0	3.6	3.7
ECA	0.6	0.8	0.0	-0.1	0.5	0.6	0.1	1.3	0.6	0.8	1.8	3.0
EU	12.8	-1.3	0.2	-0.4	-3.2	-3.4	0.7	2.7	12.5	-0.7	10.5	11.3
IND	0.4	-0.2	0.0	0.0	-0.9	-0.9	0.0	0.7	0.4	-0.2	-0.3	0.5
JPN	6.4	4.9	1.2	-2.4	3.4	5.1	-0.1	-0.2	6.4	4.9	14.2	11.4
LAT	0.4	0.1	0.0	0.0	-0.5	-0.7	0.0	1.5	0.4	0.1	0.2	1.7
MID	0.4	2.2	0.1	-0.1	0.8	1.0	0.1	1.5	0.4	2.2	3.1	4.4
NIC	0.9	4.4	0.1	-0.3	1.6	2.5	0.1	0.3	1.0	4.4	6.2	6.3
SSA	0.6	0.4	0.0	0.0	0.0	0.1	0.0	1.0	0.3	0.4	1.1	2.1
USA	0.8	-5.1	-0.2	0.4	-0.7	-1.2	-0.1	0.5	0.8	-5.0	-5.0	-4.0
World	32.7	15.0	1.1	-2.4	1.2	3.8	1.1	12.6	32.1	15.1	49.7	58.5
Capital Accumulation Model												
ASA	0.5	2.6	-0.1	0.2	-0.3	-0.2	0.0	0.6	0.3	1.5	2.8	3.6
ASN	1.3	8.4	-0.5	0.8	2.0	3.0	0.1	2.4	1.3	8.5	10.7	14.9
AUS	1.5	1.1	-0.3	0.4	0.1	0.7	0.0	0.1	1.4	1.1	2.4	3.6
BRA	5.7	1.4	-0.2	0.4	1.2	1.6	0.0	0.0	5.6	1.4	7.9	8.9
CHN	1.1	20.5	-0.2	0.3	12.7	15.5	-0.1	1.2	1.0	20.6	27.1	30.0
DVC	4.5	-0.2	-0.5	0.8	-0.9	-1.1	0.2	0.5	4.7	-0.2	3.5	5.1
ECA	1.1	3.1	-0.6	1.0	-0.2	-0.2	0.1	1.8	1.0	3.0	3.5	6.9
EU	14.1	-1.8	-2.6	4.4	-7.6	-6.8	2.2	7.2	13.7	-0.4	7.7	19.6
IND	0.8	7.7	-0.3	0.6	0.6	0.8	0.0	1.3	0.8	7.7	8.3	10.6
JPN	6.8	5.9	1.0	-2.2	2.7	4.9	-0.2	-0.6	6.8	5.9	14.9	12.5
LAT	-0.7	2.5	0.9	-1.5	-3.0	-3.2	0.0	1.5	-0.8	2.6	1.1	0.1
MID	1.2	14.4	-0.6	1.0	1.5	2.2	0.2	2.1	1.1	14.3	16.1	20.0
NIC	1.8	10.2	-0.2	0.3	7.4	9.5	0.1	0.7	1.8	10.2	16.4	18.6
SSA	1.1	2.5	-0.2	0.4	-0.2	0.0	0.0	1.2	0.7	2.4	3.3	5.2
USA	2.1	-5.9	-1.9	3.3	-3.0	-3.3	-0.2	0.5	2.0	-5.7	-7.3	-1.7
World	42.8	72.4	-6.3	10.1	13.0	23.5	2.4	20.5	41.5	72.9	118.6	157.7

Note: Refer to Table A1 and Box 1 for the regional aggregation and the scenarios, respectively.

Source: Author's Calculations.

Table A4. GDP Impacts of DDA using MFN Rate and Bound Rate

(unit: %)

	Static Model				Capital Accumulation Model			
	MFN Rate		Bound Rate		MFN Rate		Bound Rate	
	MINI	MEGA	MINI	MEGA	MINI	MEGA	MINI	MEGA
ASA	0.21	0.39	0.30	0.48	0.94	1.30	1.55	1.91
ASN	0.24	0.45	0.30	0.51	1.42	2.14	2.16	2.84
AUS	0.07	0.08	0.09	0.09	0.31	0.55	0.45	0.63
BRA	0.06	0.08	0.08	0.10	1.25	1.45	1.65	1.81
CHN	0.27	0.35	0.21	0.30	2.18	2.38	1.96	2.21
DVC	0.24	0.24	0.29	0.30	0.20	0.32	0.29	0.41
ECA	0.08	0.20	0.17	0.29	0.24	0.58	0.76	1.10
EU	0.15	0.15	0.14	0.15	0.10	0.22	0.10	0.22
IND	0.21	0.36	0.41	0.55	2.03	2.48	2.60	3.03
JPN	0.22	0.18	0.19	0.15	0.24	0.19	0.20	0.15
LAT	-0.04	0.07	0.10	0.20	0.02	-0.12	1.09	0.92
MID	0.18	0.32	0.25	0.39	1.54	1.93	2.69	3.06
NIC	0.22	0.22	0.33	0.33	1.53	1.78	2.11	2.31
SSA	0.13	0.31	0.16	0.33	0.65	1.04	0.78	1.16
USA	0.01	0.02	0.01	0.01	-0.05	0.02	-0.06	0.00
World(%)	0.12	0.14	0.13	0.15	0.33	0.45	0.46	0.57
World(Bil$)	49.9	58.6	55.1	63.7	136.1	186.2	187.6	235.6

Note: Refer to Table A1 for the regional aggregation.
Source: Author's Calculations.

Table A5. Sectoral Proposals and Participating Countries

Sectoral Proposals	Participating Countries
Electronics/Electrical products	US, Japan, Singapore, Korea, Thailand, Hong Kong
Automotives and related parts	Japan
Bicycle and related parts	Singapore, Swiss, Taiwan, Thailand
Chemicals	US, EU, Japan, Canada, Norway, Taiwan, Singapore, Swiss
Raw material	Arab Emirates
Industrial machinery	US, EU, Japan, Canada, Norway, Taiwan, Singapore, Swiss
Hand tools	Taiwan
Healthcare	US, Singapore, Swiss, Taiwan
Gems and jewelry	US, EU, Japan, Canada, India, Norway, Hong Kong, Taiwan, Singapore, Swiss, Thailand
Sports equipment	US, Norway, Singapore, Swiss, Taiwan
Toys	Hong Kong, Taiwan
Forest products	US, Canada, Hong Kong, New Zealand, Singapore, Thailand, Swiss
Textile, clothing and footwear	EU
Fish and fish products	Canada, Hong Kong, Iceland, New Zealand, Norway, Oman, Singapore, Thailand, Uruguay

Source: WTO (2008b).

Table A6. Critical Mass for Sectoral Proposals -1

(unit: millions of dollars, %)

Ranking	Electronic/Electrical Products				Automotives and Related Parts				Chemicals				Industrial Machinery				Healthcare			
	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share
1	China	885,467.1	20.2	20.2	US	337,493.7	24.7	24.7	EU	449,360.0	22.5	22.5	EU	250,225.9	24.6	24.6	EU	56,872.3	29.1	29.1
2	US	665,772.5	15.2	35.4	EU	257,579.7	18.9	43.5	US	344,688.8	17.2	39.7	US	166,285.1	16.3	40.9	US	51,740.9	26.5	55.6
3	EU	663,090.8	15.1	50.6	Japan	171,578.1	12.6	56.1	China	189,110.2	9.5	49.2	China	106,258.3	10.4	51.3	Japan	12,367.9	6.3	61.9
4	Hong Kong	399,137.8	9.1	59.7	Canada	122,795.7	9.0	65.1	Japan	116,361.1	5.8	55.0	Japan	83,101.6	8.2	59.5	China	10,285.8	5.3	67.2
5	Japan	328,391.9	7.5	67.2	Mexico	78,384.7	5.7	70.8	Swiss	99,224.5	5.0	60.0	Singapore	54,491.1	5.4	64.9	Swiss	9,457.5	4.8	72.0
6	Korea	233,934.7	5.3	72.5	China	60,270.8	4.4	75.2	Canada	84,070.1	4.2	64.2	Canada	36,095.3	3.6	68.4	Mexico	6,348.1	3.3	75.3
7	Singapore	233,109.4	5.3	77.8	Korea	57,047.1	4.2	79.4	Korea	71,191.9	3.6	67.7	Korea	27,683.2	2.7	71.1	Canada	4,690.8	2.4	77.7
8	Taiwan	205,496.2	4.7	82.5	Turkey	26,195.6	1.9	81.3	Taiwan	58,534.9	2.9	70.7	Swiss	24,712.9	2.4	73.6	Singapore	4,090.9	2.1	79.8
9	Mexico	154,255.2	3.5	86.0	Brazil	22,326.2	1.6	83.0	Singapore	51,027.5	2.6	73.2	Mexico	22,866.3	2.3	75.8	Australia	3,762.9	1.9	81.7
10	Malaysia	150,439.4	3.4	89.5	Australia	20,507.6	1.5	84.5	Mexico	49,978.9	2.5	75.7	Hong Kong	19,482.8	1.9	77.7	Malaysia	2,886.0	1.5	83.2
11	Canada	93,434.4	2.1	91.6	Thailand	18,243.1	1.3	85.8	Hong Kong	45,019.3	2.3	78.0	Taiwan	15,204.4	1.5	79.2	India	2,772.8	1.4	84.6
12	Thailand	87,953.9	2.0		Arab Emirates	13,941.5	1.0	86.8	India	39,032.3	2.0	79.9	Turkey	14,974.2	1.5	80.7	Korea	2,761.4	1.4	86.0
13	Philippines	61,178.4	1.4		Swiss	12,293.5	0.9	87.7	Brazil	34,856.0	1.7	81.7	India	14,504.3	1.4	82.1	Hong Kong	2,304.8	1.2	87.2
14	Swiss	52,407.6	1.2		Saudi Arabia	10,924.7	0.8	88.5	Thailand	30,617.5	1.5	83.2	Australia	13,159.9	1.3	83.4	Taiwan	2,082.8	1.1	88.2
15	India	35,026.3	0.8		South Africa	10,882.7	0.8	89.3	Australia	30,046.5	1.5	84.7	Brazil	12,076.9	1.2	84.6	Thailand	1,984.7	1.0	89.3
16	Australia	34,815.5	0.8		Argentina	10,737.8	0.8	90.1	Turkey	28,605.0	1.4	86.1	South Africa	11,315.1	1.1	85.7	Turkey	1,800.6	0.9	90.2
17	Turkey	30,248.2	0.7		Taiwan	9,374.2	0.7		Malaysia	25,899.2	1.3	87.4	Saudi Arabia	10,446.3	1.0	86.7	Brazil	1,771.7	0.9	
18	Brazil	24,000.7	0.6		Singapore	8,709.2	0.6		Saudi Arabia	23,062.5	1.2	88.6	Arab Emirates	10,081.4	1.0	87.7	Israel	1,465.5	0.8	
19	Arab Emirates	21,928.9	0.5		Ukraine	8,060.3	0.6		Israel	15,728.6	0.8	89.4	Thailand	9,634.6	1.0	88.7	Norway	994.5	0.5	
20	Norway	20,490.4	0.5		Norway	7,390.6	0.5		Indonesia	13,750.7	0.7	90.1	Norway	9,629.8	1.0	89.6	South Africa	855.6	0.4	
21	Saudi Arabia	16,779.3	0.4		India	7,055.7	0.5		Ukraine	13,278.6	0.7		Malaysia	9,104.1	0.9	90.5	Costa rica	842.8	0.4	
22	South Africa	14,680.7	0.3		Indonesia	6,389.5	0.5		Argentina	13,268.6	0.7		Ukraine	6,139.3	0.6		New Zealand	625.3	0.3	

Source: Author's Calculations.

Table A7. Critical Mass for Sectoral Proposals -2

(unit: millions of dollars, %)

Rank-ing	Forest Products				Gems and Jewelry				Sports Equipment				Bicycle and Related Parts				Fish and Fish Products			
	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share	Country	Trade Value	Trade Share	Cumu-lative Share
1	EU	106,765.3	20.6	20.6	EU	90,309.8	18.0	18.0	EU	15,095.0	29.6	29.6	EU	20,494.8	24.2	24.2	EU	26,923.8	18.6	18.6
2	US	98,430.6	19.0	39.6	US	88,028.7	17.6	35.6	US	12,023.5	23.6	53.2	US	14,509.8	17.1	41.3	US	18,949.9	13.1	31.7
3	China	51,929.4	10.0	49.6	India	46,595.1	9.3	44.9	China	6,955.6	13.7	66.9	China	13,392.2	15.8	57.1	Japan	14,924.8	10.3	42.1
4	Canada	50,154.2	9.7	59.3	Hong Kong	40,364.1	8.1	52.9	Hong Kong	3,233.6	6.4	73.2	Japan	5,521.1	6.5	63.7	China	13,874.6	9.6	51.6
5	Japan	22,954.8	4.4	63.7	Arab Emirates	34,820.4	7.0	59.9	Canada	2,935.7	5.8	79.0	Taiwan	3,962.8	4.7	68.3	Norway	7,409.5	5.1	56.8
6	Swiss	12,199.5	2.4	66.0	Israel	29,399.3	5.9	65.7	Japan	2,629.9	5.2	84.2	Canada	3,881.0	4.6	72.9	Thailand	7,397.2	5.1	61.9
7	Mexico	11,407.9	2.2	68.2	Swiss	19,835.0	4.0	69.7	Taiwan	1,606.8	3.2	87.3	Mexico	3,625.7	4.3	77.2	Canada	5,715.4	4.0	65.8
8	Malaysia	10,347.8	2.0	70.2	Japan	18,437.8	3.7	73.4	Australia	1,250.7	2.5	89.8	Korea	2,385.6	2.8	80.0	Vietnam	4,151.2	2.9	68.7
9	Brazil	10,037.9	1.9	72.2	Australia	16,768.7	3.4	76.7	Norway	936.1	1.8	91.6	Singapore	1,872.2	2.2	82.2	Korea	4,141.3	2.9	71.6
10	Korea	9,750.2	1.9	74.0	Canada	15,632.6	3.1	79.8	Korea	878.5	1.7		Swiss	1,492.1	1.8	84.0	Chile	3,891.9	2.7	74.3
11	Hong Kong	9,478.3	1.8	75.9	China	14,379.4	2.9	82.7	Singapore	638.8	1.3		Thailand	1,278.0	1.5	85.5	Hong Kong	2,647.4	1.8	76.1
12	Australia	7,640.0	1.5	77.3	South Africa	14,326.7	2.9	85.6	Swiss	512.2	1.0		Australia	1,227.6	1.5	86.9	Iceland	2,152.0	1.5	77.6
13	Indonesia	7,407.7	1.4	78.8	Thailand	9,544.3	1.9	87.5	Mexico	509.6	1.0		India	1,153.5	1.4	88.3	Peru	2,000.0	1.4	79.0
14	Norway	7,142.4	1.4	80.2	Turkey	8,529.9	1.7	89.2	Thailand	475.2	0.9		Turkey	1,078.6	1.3	89.6	Australia	1,962.4	1.4	80.3
15	Thailand	6,748.2	1.3	81.5	Singapore	7,755.6	1.6	90.7	New Zealand	389.1	0.8		Saudi Arabia	977.0	1.2	90.7	India	1,806.2	1.3	81.6
16	Turkey	6,356.9	1.2	82.7	Korea	5,368.2	1.1		Arab Emirates	380.9	0.8		Hong Kong	902.2	1.1		Taiwan	1,790.2	1.2	82.8
17	Taiwan	6,063.0	1.2	83.9	Mexico	4,974.9	1.0		Malaysia	339.8	0.7		Arab Emirates	852.4	1.0		Indonesia	1,680.6	1.2	84.0
18	Chile	6,020.2	1.2	85.0	Peru	4,845.9	1.0		South Africa	321.7	0.6		Brazil	832.4	1.0		Morocco	1,441.8	1.0	85.0
19	Ukraine	5,609.1	1.1	86.1	Malaysia	4,751.5	1.0		Croatia	301.6	0.6		Malaysia	751.4	0.9		Malaysia	1,393.8	1.0	85.9
20	India	5,353.1	1.0	87.1	Taiwan	4,308.6	0.9		Turkey	270.3	0.5		Norway	749.3	0.9		Mexico	1,339.5	0.9	86.9
21	Singapore	4,830.5	0.9	88.1	Vietnam	1,722.6	0.3		India	148.0	0.3		Indonesia	544.6	0.6		Argentina	1,213.4	0.8	87.7
22	Vietnam	4,213.7	0.8	88.9	Brazil	1,675.4	0.3		Brazil	113.4	0.2		South Africa	478.4	0.6		Singapore	1,204.6	0.8	88.5
23	New Zealand	3,892.6	0.8	89.6	Saudi Arabia	1,251.0	0.3		Saudi Arabia	105.9	0.2		Israel	417.8	0.5		New Zealand	1,039.5	0.7	89.3
24	South Africa	3,691.2	0.7	90.3	Chile	1,079.4	0.2		Ukraine	94.2	0.2		Vietnam	327.4	0.4		Brazil	920.6	0.6	89.9
25	Arab Emirates	3,533.6	0.7		Colombia	1,031.8	0.2		Vietnam	82.1	0.2		Argentina	315.2	0.4		South Africa	707.1	0.5	90.4

Source: Author's Calculations.

Table A8. Simulation Results of Selected Previous Literature

Study	Model	Main Scenarios considered	Simulation Results
Dessus *et al.* (1999)	Trade Policy Simulation model	Full tariff liberalization	Welfare gain of US$ 82 billion in static mode (0.2 percent of world GDP), US$ 1,212 billion with endogenous TFP (3 percent of world GDP)
Anderson *et al.* (2000)	Standard GTAP model	Complete liberalization	Welfare gains: US$ 254.3 billion
Francois (2001)	CGE model (imperfect competition)	50% reduction in tariffs and 1 percent reduction in trade costs	Global income gains: US$ 384.9 billion
Brown *et al.* (2002)	Michigan Model	33% reduction in trade barriers with respect to agriculture, manufacturing, and services	Global welfare gains: US$ 574.0 billion
Fontagné *et al.* (2002)	Dynamic CGE model	Four scenarios are considered	Welfare gains for an economic region range from 0.1% to 1.5%.
OECD (2003)	Standard GTAP model	All merchandise tariffs are removed and trade costs are reduced.	Welfare gains: US$ 173 billion
Anderson *et al.* (2006)	Recursive linkage model	Liberalization of merchandise trade barriers and agricultural subsidies, and possible reform	Benefits would range from US$17.7 billion to $119.3 billion
Decreux and Fontagné (2009)	Dynamic and sectoral model	Agricultural and manufacturing sectors are liberalized. 3 percent reduction of protection in services and trade facilitation is assumed.	Goods: US$ 57 billion (0.08% of world GDP) Services: US$ 68 billion (0.10% of world GDP) Trade Facilitation: US$ 167 billion (0.24% of world GDP)
Adler *et al.* (2009)	Elasticity approach	liberalization of agriculture, NAMA, and services barriers, sectoral initiatives, and improvement in trade facilitation	GDP gain could range between $300 billion and $700 billion

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General Equilibrium Analysis of DDA Trade Liberalization: Assessment of Alternative Scenarios

Nakgyoon Choi

This paper aims to implement the simulation studies using a CGE approach to identify ideas on how to finalize the DDA negotiations by making some mutual concessions and deal with contentious issues yet to be agreed. The simulation results of this paper, which lay between those of the previous literature, indicate that the DDA negotiations will boost the global economy to a substantial degree. It reveals that the world GDP effects will amount to US$ 49.9~186.2 billion (0.12~0.45%) and the welfare gain will amount to US$ 49.7~157.7 billion. The GDP growth effects are mainly due to effects of trade expansion, which amount to US$ 265.3~382.0 billion. The simulation result also indicates that developed countries need to consider positively the arguments of developing countries on the controversial issues related to agriculture. In return for the concessions by the developed countries, the developing countries will likely accept further discussions related to the sectoral proposals and services liberalization.